



The Mobile Economy Africa 2016



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The GSMA represents the interests of mobile operators worldwide, uniting nearly 800 operators with almost 300 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces industry-leading events such as Mobile World Congress, Mobile World Congress Shanghai and the Mobile 360 Series conferences.

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Executive Summary

Almost half the population of Africa subscribed to mobile services in 2015

At the end of 2015, 46% of the population in Africa subscribed to mobile services, equivalent to more than half a billion people. The region's three dominant markets – Egypt, Nigeria and South Africa – together accounted for around a third of the region's total subscriber base. Subscriber growth rates are now beginning to slow and will increasingly converge with the global average, as affordability challenges become a key barrier. Over the next five years, an additional 168 million people will be connected by mobile services across Africa, reaching 725 million unique subscribers by 2020. Eight markets will account for the majority of this growth, most notably Nigeria, Ethiopia and Tanzania, which will together contribute more than a third of new subscribers.

Migration to mobile broadband is accelerating

Subscribers across Africa are increasingly migrating to mobile broadband services, driven by network rollouts and mobile operator device and data strategies. Mobile broadband connections accounted for a quarter of total connections at the end of 2015, but will rise to almost two-thirds by 2020. 4G network launches are gaining traction: by mid-2016, there were 72 live LTE networks in 32 countries across Africa, half of which have launched in the last two years.

The launch of new mobile broadband networks across the region coincides with the growing availability of low-cost devices. The number of smartphone connections has almost doubled over the last two years to reach 226 million, accounting for a quarter of total connections in the region. This reflects strong uptake in the established mobile markets, such as Egypt, Kenya, Nigeria and South Africa, as well as some relatively new 3G markets,

notably Algeria, Cameroon and the Democratic Republic of Congo. Over the next five years, the region will add a further half a billion smartphone connections, taking the adoption rate to more than half of total connections.

The migration to mobile broadband and growing levels of smartphone adoption are expected to lead to a further boost in mobile data traffic growth, repeating the trend seen in other regions. Many operators in the region recorded data traffic growth of more than 50% in 2015. As a result, data revenue as a share of total revenue is rising rapidly across the region, reaching 15% on average but considerably higher for mobile operators in the more advanced markets such as South Africa and Egypt.

Mobile generated 6.7% of Africa's GDP and 3.8 million jobs in 2015

In 2015, mobile technologies and services generated 6.7% of GDP in Africa, a contribution that amounted to around \$150 billion of economic value. In the period to 2020 we expect this to increase to more than \$210 billion (7.6% of GDP) as countries benefit from the improvements in productivity and efficiency brought about by increased take-up of mobile services.

The mobile ecosystem supported 3.8 million jobs in 2015. This includes workers directly employed in the ecosystem and jobs indirectly supported by the economic activity generated by the sector. The mobile sector also makes a substantial contribution to the funding of the public sector, with \$17 billion raised in 2015 in the form of general taxation. The number of jobs supported will increase to 4.5 million by 2020, while the tax contribution to public funding will rise to \$20.5 billion.

Mobile is the platform of choice for digital transformation in Africa

Mobile has emerged as the platform of choice for creating, distributing and consuming innovative digital solutions and services in Africa. Many local and global innovators and tech entrepreneurs are now using the expansion of advanced mobile infrastructure in the region and the growing adoption of smart devices to deliver mobile-based solutions that directly appeal to local interests and cultures.

The tech start-up ecosystem in Africa is increasingly active; there are approximately 310 active tech hubs across the region, including 180 accelerators or incubators. The range of tech start-ups funded in recent years and the size of deals reflect the accelerating development of the ecosystem. Moves by some mobile operators in the region to open up their APIs to third-party developers create significant opportunities for tech innovation and further development of the start-up ecosystem. Mobile operator APIs such as messaging, billing, location and mobile money enable start-ups to scale and extend their services to a broader customer base.

Mobile can help address social challenges and the UN Sustainable Development Goals

Mobile technology continues to play a central role in addressing a range of social challenges, including unregistered populations, the digital divide and financial inclusion. In September 2015, the UN introduced its Sustainable Development Goals (SDGs) to the world — a 17-point plan to end poverty, combat climate change and fight injustice and inequality by 2030. Mobile connectivity is essential to the achievement of the SDGs given the power of mobile technology to accelerate inclusive growth and sustainable development in a way no other technology can.

Mobile is addressing the challenge of unregistered populations in Africa, where more than 400 million people lack an official form of identification. Mobile technology is well placed to address the challenge of birth registration, given high penetration levels and geographic coverage, particularly in rural areas, with operators in countries such as Senegal, Tanzania and Uganda already tackling the issue.

Mobile internet adoption in Africa continues to grow rapidly; the number of mobile internet subscribers tripled in the last five years to 300 million by the end of 2015, with an additional 250 million expected by 2020. However, by 2020 60% of the population will still be unconnected. Significant barriers to adoption remain, particularly for underserved groups such as women, rural communities and young people.

Mobile money continues to improve financial inclusion in Africa. The region accounts for 52% of the 271 live mobile money services in 93 countries and 64% of all active mobile money accounts. Six new services were launched in Africa in 2015, with another four in the first half of 2016. Mobile money is having a significant impact in enabling efficient and convenient international money transfer.

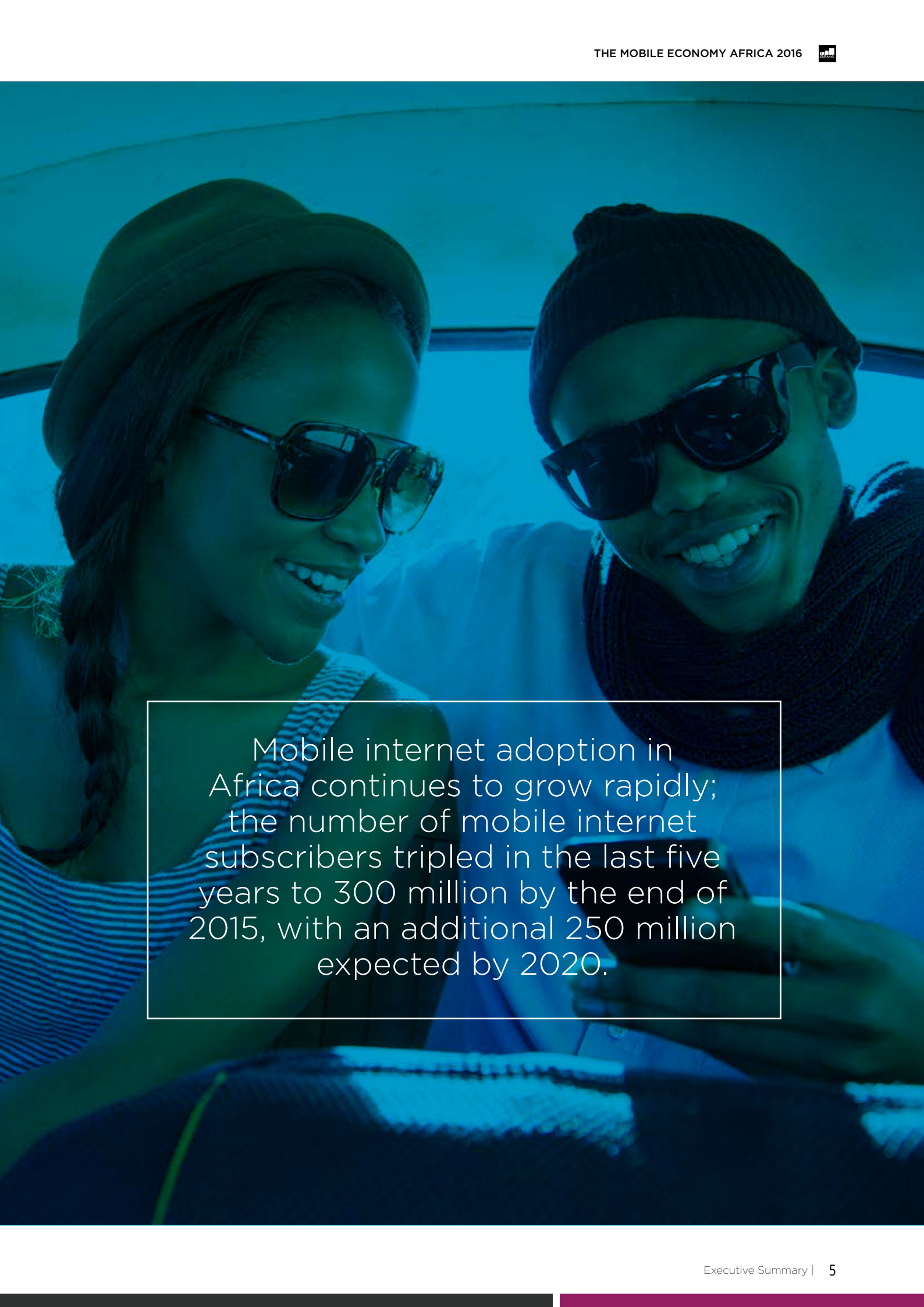
Importance of spectrum in delivering greater connectivity

Africa is heavily dependent on mobile networks to deliver the connectivity that its hundreds of millions of citizens and companies need. The capacity and coverage of any wireless network is largely determined by the radio frequencies it is able to use. If policymakers across the region step up efforts to allow mobile operators to gain access to the spectrum they need, Africa will enjoy major social and economic benefits. Spectrum has no intrinsic value, but can be a very valuable resource when put to productive use.

Issues to be addressed include the shortage of appropriate spectrum for mobile operators, caused in large part by the slow progress of the switchover from analogue to digital terrestrial television. Most African governments failed to meet the International Telecommunication Union's (ITU) deadline for the switchover (June 2015) despite the urgent need to release this spectrum for mobile broadband services. African governments also need to begin preparing for the World Radiocommunication Conference (WRC) in 2019, where they will identify bands to allocate for the next generation of mobile technologies. These 5G technologies will further increase wireless throughput speeds and network responsiveness, enabling a broad range of new services for businesses and individuals.

In Africa, as elsewhere in the world, governments cannot afford to let spectrum lie idle. Radio frequencies need to be employed as efficiently and effectively as possible. In practice, that means releasing spectrum in a way that ensures that the licence holder will invest in mobile broadband networks.

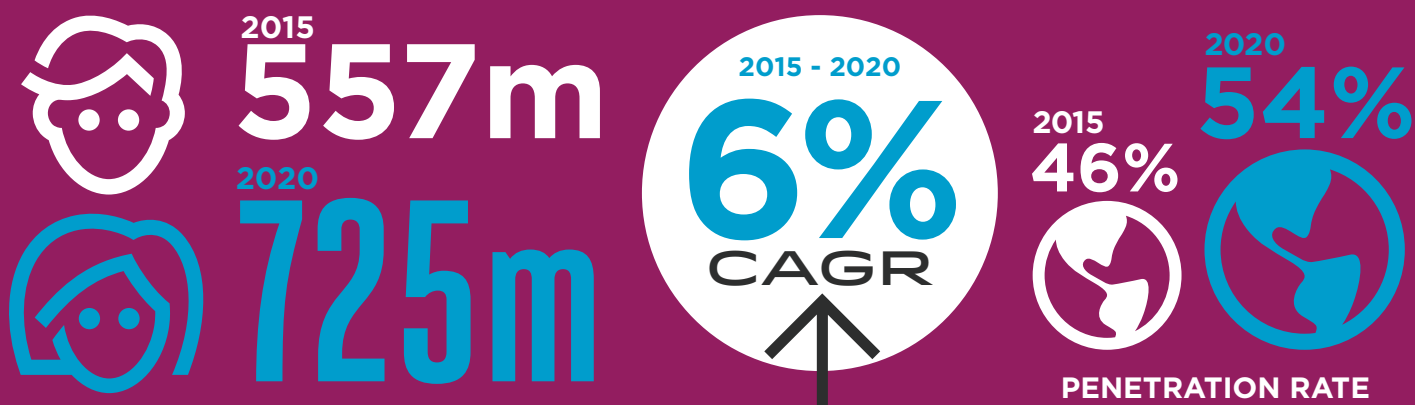
In particular, policymakers in Africa need to ensure that the low-frequency spectrum below 1 GHz is employed to extend mobile broadband coverage across their countries. Reducing the digital divide between urban and rural areas will boost economic activity, help to alleviate poverty, improve healthcare and education, expand financial inclusion and enhance agriculture. There is no time to lose.



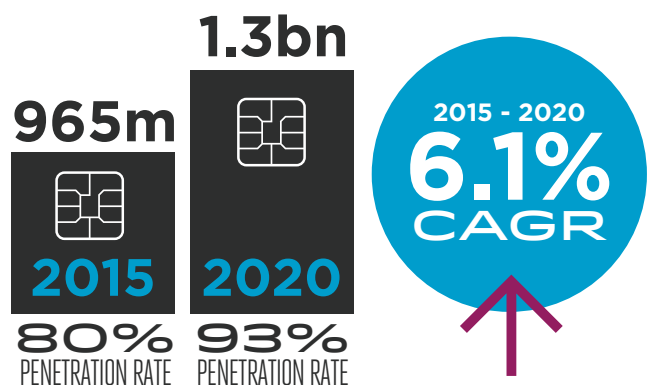
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MOBILE ECONOMY AFRICA 2016

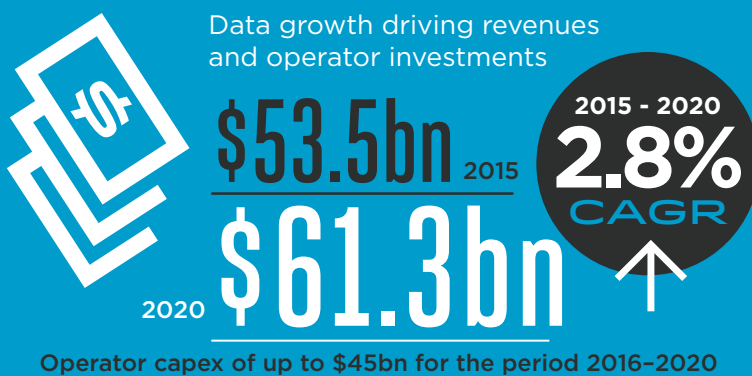
Unique subscribers



Connections Note: Excluding M2M

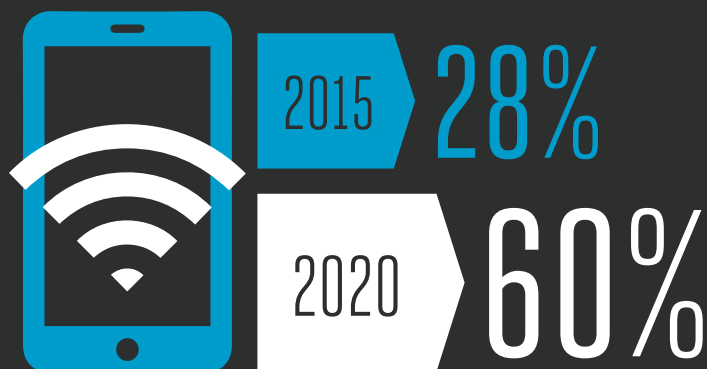


Mobile operator revenues

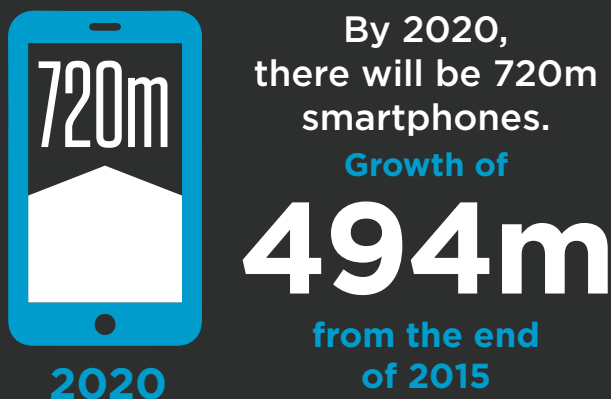


Accelerating moves to mobile broadband networks and smartphone adoption

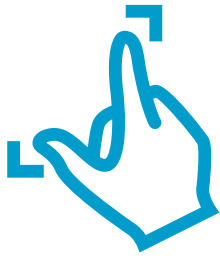
MOBILE BROADBAND CONNECTIONS



SMARTPHONES



Mobile contributing to economic and social development across the world



Delivering digital inclusion to the still unconnected populations

Mobile internet penetration
2015: 25%
2020: 41%



Delivering financial inclusion to the unbanked populations

in 42 countries in Africa
via 157 service providers
as of June 2016



Delivering innovative new services and apps

Number of M2M connections to reach
36m by 2020

Mobile industry contribution to GDP

2015

\$153bn

GROWING TO, BY 2020

2015
6.7%
GDP



\$214bn

2020
7.6%
GDP

Public funding

Mobile ecosystem contribution to public funding before regulatory fees



2015

\$17bn

Employment

Jobs directly supported by mobile ecosystem in 2015

1.3m



Plus an additional 2.4M indirect jobs supported in 2015

1 Industry overview

1.1 Slowing subscriber growth

By the end of 2015, there were 557 million unique subscribers in Africa, accounting for 965 million connections. Africa is the second largest region behind Asia Pacific in terms of unique subscribers (12% of the global subscriber base) but is also the least penetrated. At the end of 2015, less than half of the population subscribed to mobile services, well below the global average of 63%, and lower than that of the Middle East (58%), Asia Pacific (62%) and Latin America (65%).

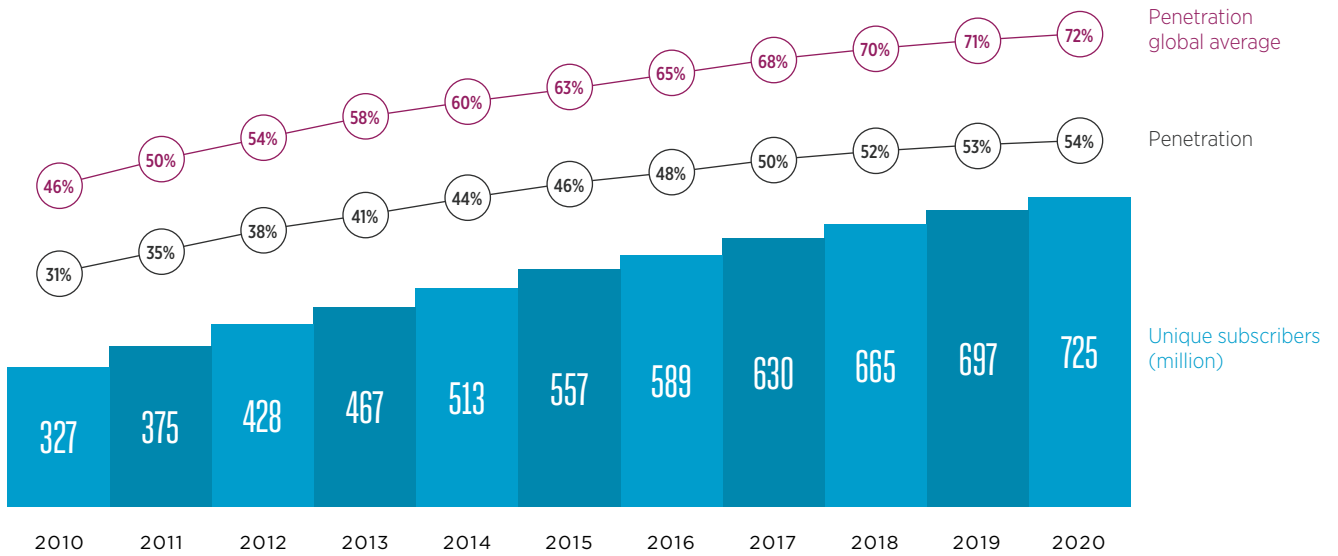
Growth has been rapid up to this point: subscriber numbers have grown at an average annual rate of 11% over the last five years, the fastest growth rate globally. However, in 2015, subscriber growth was less than 9% and will increasingly converge with the global average over the next few years: average annual growth between 2015 and 2020 will be 6% compared to a global average of 4%. This will nevertheless be the fastest growth rate of any region.

Over the next five years, an additional 168 million people will be connected by mobile services across Africa, reaching 725 million unique subscribers by 2020. Eight markets will account for the majority of this growth, most notably Nigeria, Ethiopia and Tanzania, which will together contribute more than a third of new subscribers.



Figure 1

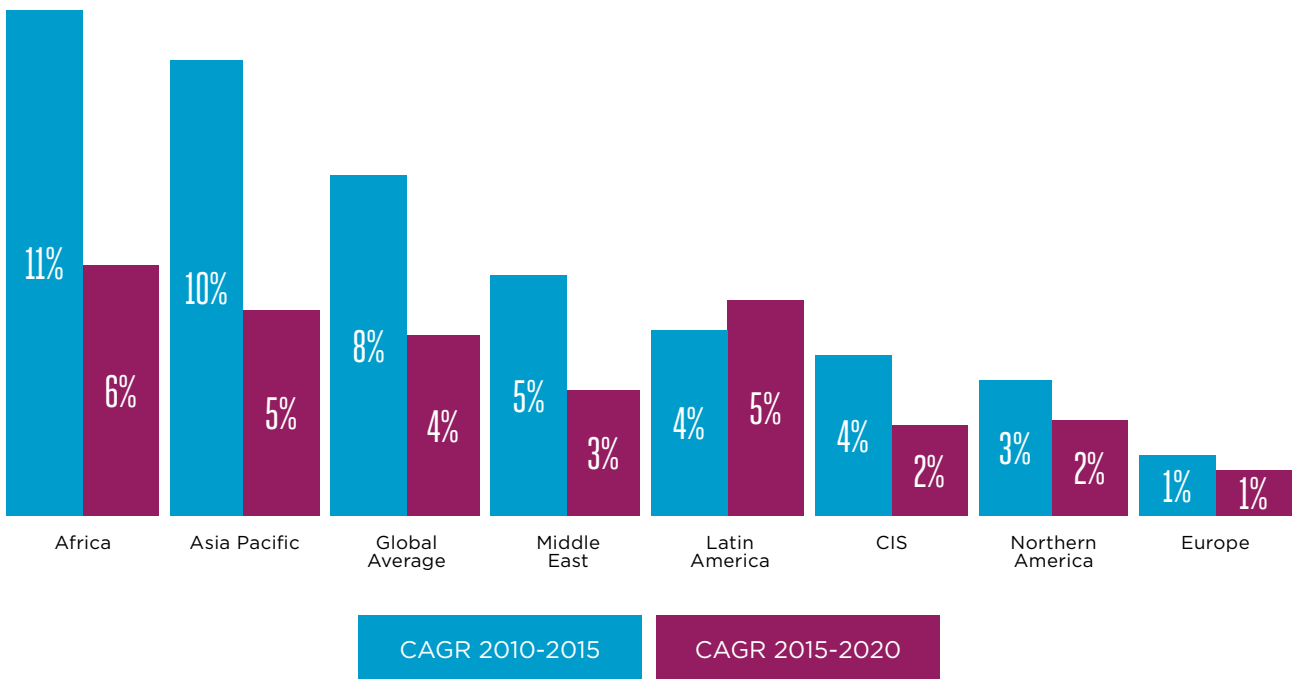
Unique mobile subscribers in Africa



Source: GSMA Intelligence

Figure 2

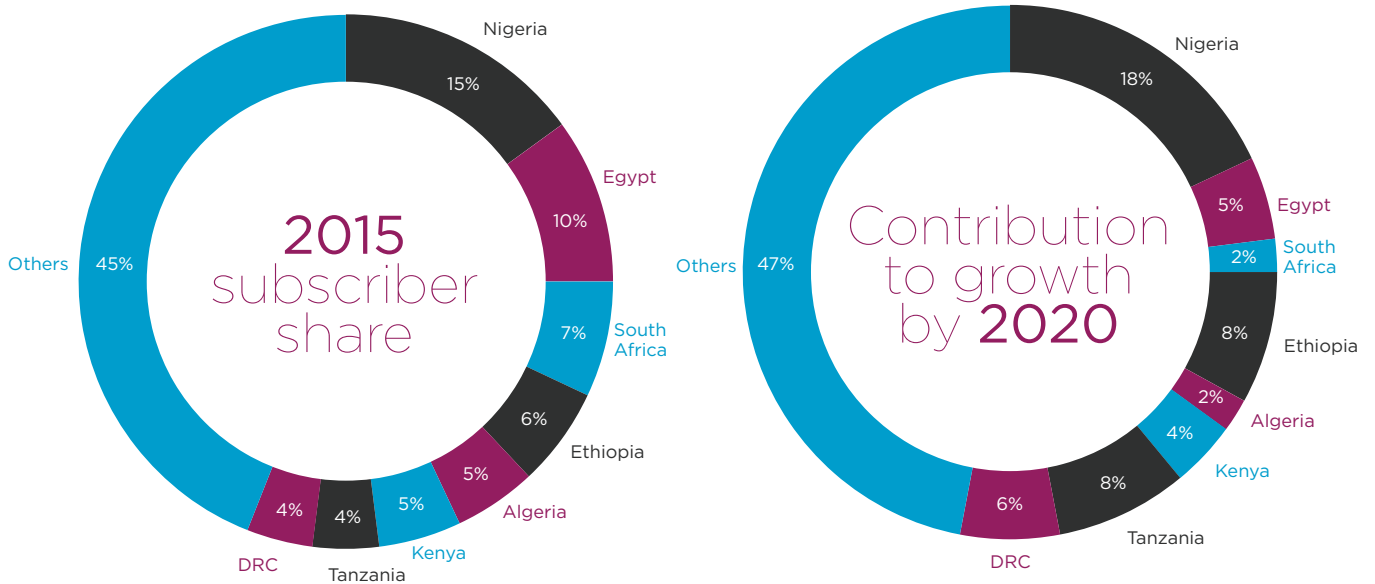
Unique subscriber growth by region



Source: GSMA Intelligence

Figure 3

Contribution to subscriber growth



Source: GSMA Intelligence

Although Africa will exhibit the fastest subscriber growth rate of any region over the next five years, subscriber penetration will still be the lowest, at 54% in 2020. Significant barriers to the take-up of mobile services in the region remain.



Cost: countries in Africa have among the highest total cost of mobile ownership as a proportion of income, particularly for those at the bottom of the income pyramid.



Coverage: as of the first quarter of 2016, 3G and 4G networks covered 50% and 16% of the population across the region respectively, around 30 percentage points lower than the global average for both technologies.



Technical literacy: literacy rates in Africa (particularly in Sub-Saharan Africa) are among the lowest in the world, hindering use of mobile services.

These barriers are particularly acute for the majority of the population who live in rural areas, where low ARPU levels make it difficult for mobile operators to justify the high costs of network deployment and maintenance. Overcoming these barriers and connecting the unconnected could lead to significant growth in the region.



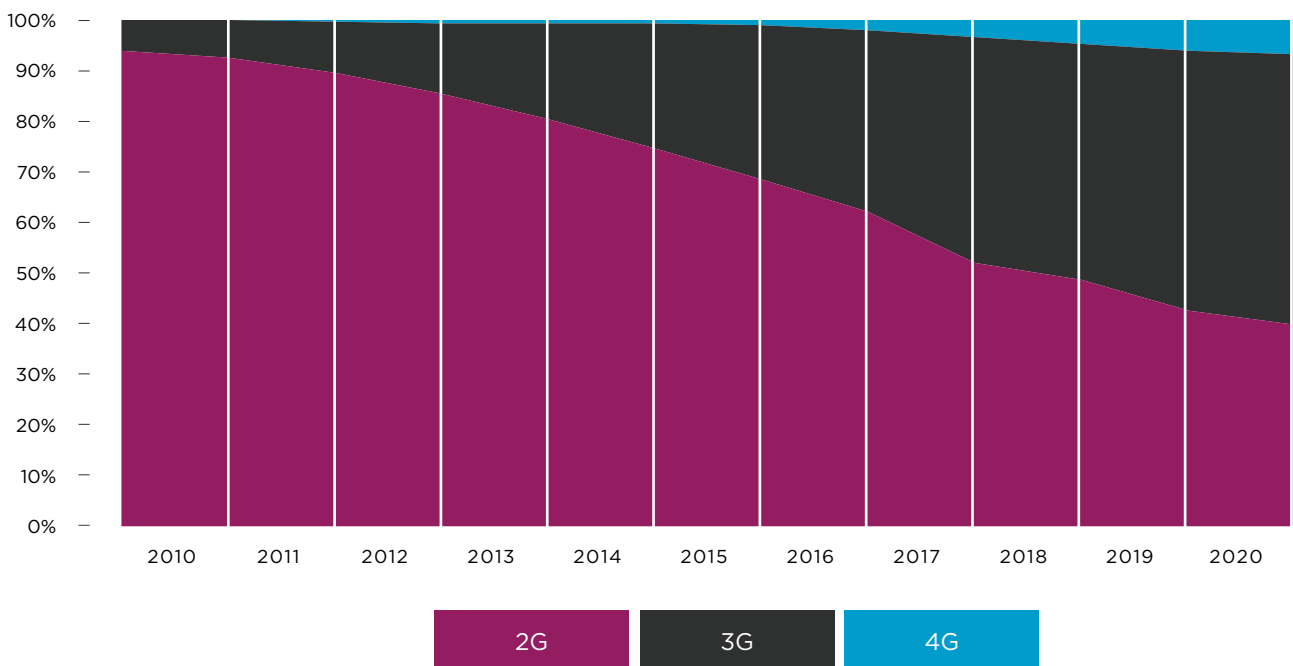
1.2 Migration to mobile broadband accelerating

Subscribers in the region are increasingly migrating to mobile broadband services, driven by network rollouts and mobile operator device and data strategies. Mobile broadband connections will almost triple over the next five years, overtaking 2G in 2019 and reaching 60% of total connections by 2020 (up from just over a quarter in 2015).

Figure 4

Technology migration in Africa

Percentage of connections



Source: GSMA Intelligence

3G technology will account for the vast majority of mobile broadband connections for the foreseeable future, but 4G network launches are gaining traction. As of June 2016, there were 74 live LTE networks in 32 countries across Africa, half of which have launched in the last two years. Recent launches include Lumitel Burundi in February 2016; three networks (Tunisie Telecom, Orange and Ooredoo) in Tunisia in March; Cellcom Liberia, ntel Nigeria, Zain Sudan, Zantel Tanzania and Airtel Uganda in April; and Vodacom Tanzania in June. MTN Nigeria plans to launch its 4G LTE network in selected cities in July 2016, using 800 MHz spectrum it acquired from the takeover of CDMA operator Visafone. 4G

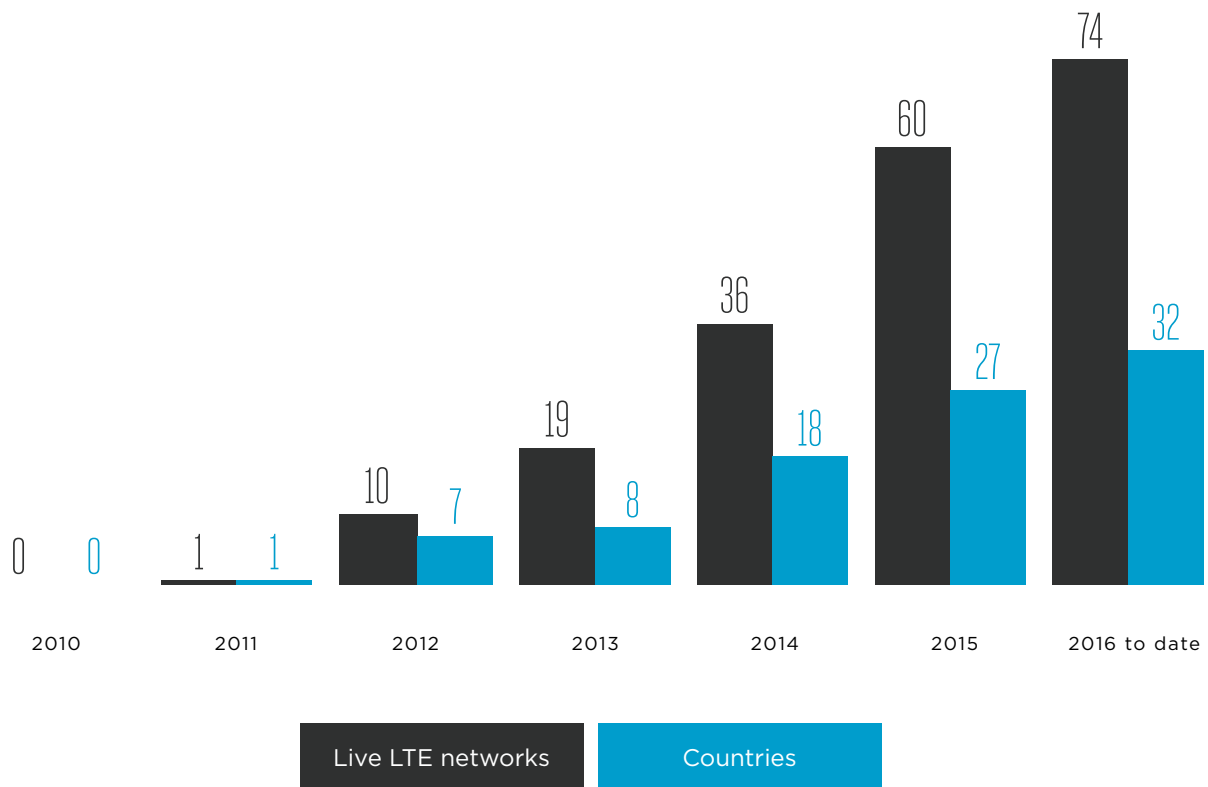
licences are expected to be issued in Egypt later in 2016 or early 2017, enabling operators to launch services in one of the region's largest and fastest-growing markets.

The launch of new LTE networks across the region is expected to lead to a further boost in mobile data traffic growth, repeating the trend seen in other regions.

However, echoing the issues affecting the overall uptake of mobile services in Africa, high device and service costs relative to income levels, as well as limited network coverage, are holding back 4G adoption growth in most markets.

Figure 5

Live LTE networks in Africa (cumulative)



Source: GSMA Intelligence

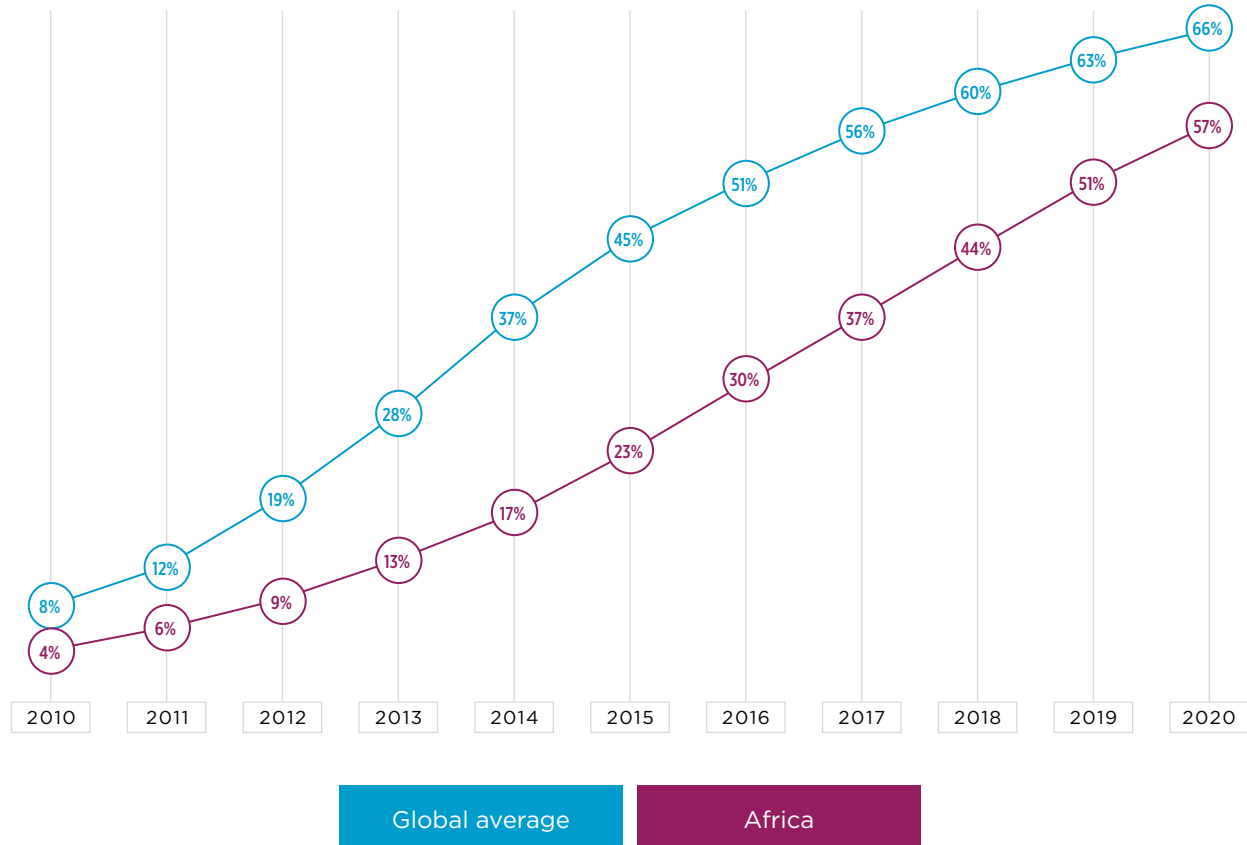
1.3 Growing adoption of smartphones and other advanced services

The growth of mobile broadband subscribers in Africa largely reflects the rising smartphone adoption rate: the number of smartphone connections has almost doubled over the last two years to reach 226 million, accounting for a quarter of total connections in the region. Growth has been driven by strong uptake in the more technologically advanced mobile markets, such as Egypt, Kenya, Nigeria, and South Africa, as well as some relatively new 3G markets, notably Algeria, Cameroon and the Democratic Republic of Congo. The region will add a further half a billion smartphone connections by 2020, taking the adoption rate to more than half of total connections, driven largely by the increasing availability of low-cost devices.

Figure 6

Smartphone adoption growing in Africa

Percentage of connections



Source: GSMA Intelligence

The average selling price (ASP) of smartphones has fallen significantly in most markets across the region: smartphone ASP across Africa was \$160 in 2015, down from around \$230 in 2012.¹ Further, and crucially for those with limited income, sub-\$50 smartphones are becoming a reality. For example, MTN Nigeria offers two smartphones for less than \$50 – the Smart S720i and Smart Mini S620i. Similarly, Orange recently launched a \$40 smartphone, the Orange Rise 3i, bundled with three months’ worth of voice minutes, SMS and data (500 MB) and pre-loaded with educational content.² Devices such as these are key to overcoming the affordability barrier in Africa, which prevents many people, particularly poorer people in rural areas, from owning and using data-enabled devices and services.

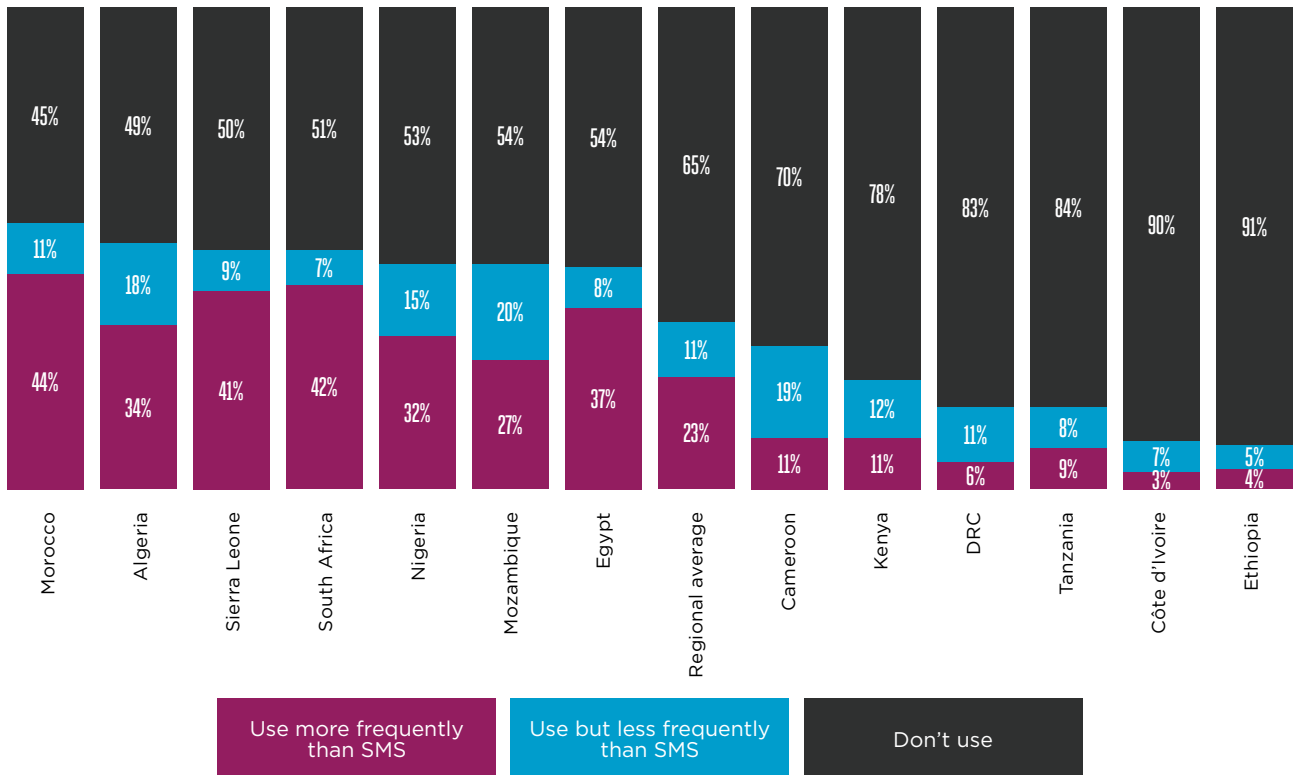
Migration to mobile broadband and growing smartphone adoption is also bringing with it

increasing use of data services. Although still not as widespread as in other regions, more and more people across Africa are using IP messaging apps such as WhatsApp: on average across the region, around a quarter of mobile phone owners use IP messaging apps on a regular basis, and an additional 10% use them infrequently.³ There is of course wide variation in usage across Africa, from more than half of mobile phone owners in Morocco and Algeria using IP messaging apps, to fewer than one in ten in Côte d'Ivoire and Ethiopia.

There may however be headwinds in the near future. In early 2016 WhatsApp announced it will stop supporting Blackberry and Nokia devices by the end of the year; this could significantly affect a large proportion of the 750 million feature phones still in use across Africa.

Figure 7

IP messaging usage in Africa – low but growing



Source: GSMA Intelligence Consumer Survey 2015

1. Source: Strategy Analytics
 2. Source: "Orange unveils \$40 smartphone with data, strikes Google deal", CNBC, February 2016
 3. Source: GSMA Intelligence Consumer Survey 2015

Growing mobile broadband and smartphone usage is driving strong growth in mobile data traffic: MTN Cameroon reported a 62% increase in data traffic in 2015, while MTN Nigeria and Vodafone Egypt recorded data traffic increases of 59% and 73% respectively in the first quarter of 2016. As a result, data revenue as a share of total revenue is rising rapidly across the region, reaching 15% on average and considerably higher for mobile operators in the more advanced markets such as South Africa and Egypt.

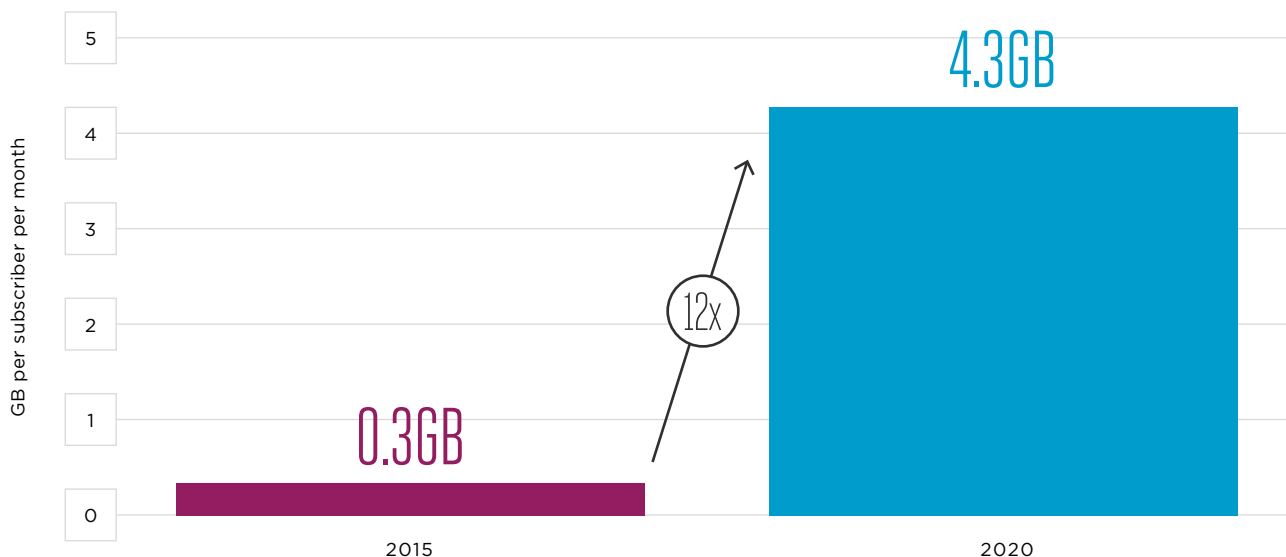
Mobile operators have introduced innovative new business models to stimulate data usage among low income users and better monetise the increasing data traffic. For example, in Rwanda MTN launched a sponsored data service, Fonepass, in December 2015 in partnership with mobile solutions provider U2opia Mobile. Targeted at users with limited or no access to the internet, the service allows customers

to access popular mobile apps such as Wikipedia, Binu, TripAdvisor and Library with no data charges. Fonepass gives users access to more mobile data through sponsorships and enables MTN to offer its subscribers more value while monetising its mobile data network.

According to Cisco, mobile data traffic will grow 16-fold from 2015 to 2020 across the broader Africa and Middle East region (excluding Saudi Arabia), from 257 petabytes per month in 2015 to more than 4 exabytes per month by 2020. This represents an average annual growth rate of just under 75%, much higher than the global average of 53%. The amount of data used monthly by each unique subscriber will increase substantially from an average of 0.3 GB in 2015 to 4.3 GB in 2020; by then, mobile will account for 40% of total IP traffic across the region, up from 15% now.

Figure 8

Mobile data to grow rapidly over the next five years

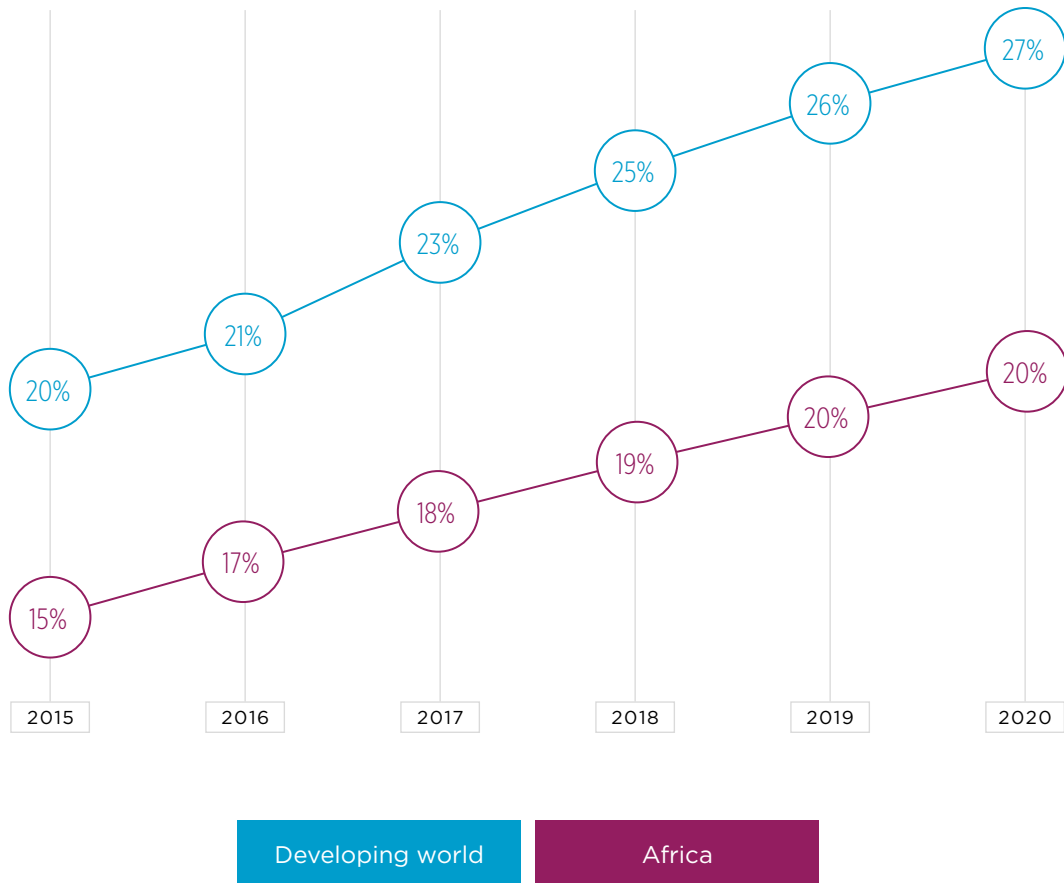


Source: Cisco, GSMA Intelligence
Note: MEA excluding Saudi Arabia

Across Africa as a whole, data revenues accounted for around 15% of total service (recurrent) revenues in 2015, some five percentage points below the developing world average. The ongoing growth in data traffic described above, driven by the accelerating migration to mobile broadband and operator initiatives to further stimulate and monetise data traffic, will boost this to 20% by 2020. However, a number of developing markets, particularly in Asia Pacific, are experiencing faster growth in data revenues, driven by factors such as higher rates of smartphone adoption and a more rapid move to mobile broadband.

Figure 9

Data as a percentage of service revenues



Source: GSMA Intelligence



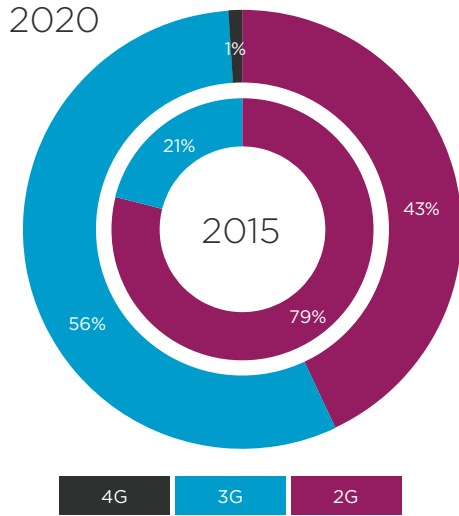
1.4 Fragmented markets leading to consolidation

Africa has a number of highly competitive markets, with several comprising five or more operators. Although there are some outliers, such as Ethiopia where incumbent Ethio telecom still has a monopoly, many countries in the region are still seeing significant competitive pressures, which continue to weigh on prices. The Nigerian market has recently seen the introduction of a new operator, Ntel, which launched a 4G-only network in Lagos and Abuja in April 2016. This may lead to increased price competition in a market already affected by a weak macroeconomic backdrop and regulatory action, particularly around mandatory SIM registration.

Although low penetration rates suggest significant subscriber growth potential in most markets, the negative impact of low prices on operators' margins and their ability to invest in network expansion has raised the prospect of consolidation in the region. Consolidation can help operators move to more sustainable business models and support more efficient investment. Examples of recent moves to consolidate in Africa include Orange strengthening its West African footprint through the acquisitions of Airtel subsidiaries in Burkina Faso and Sierra Leone, Cellcom Liberia in January 2016, and Tigo in the DRC in April 2016.

ECOWAS (Economic Community of West African States)

TECHNOLOGY MIX



SUBSCRIBER PENETRATION

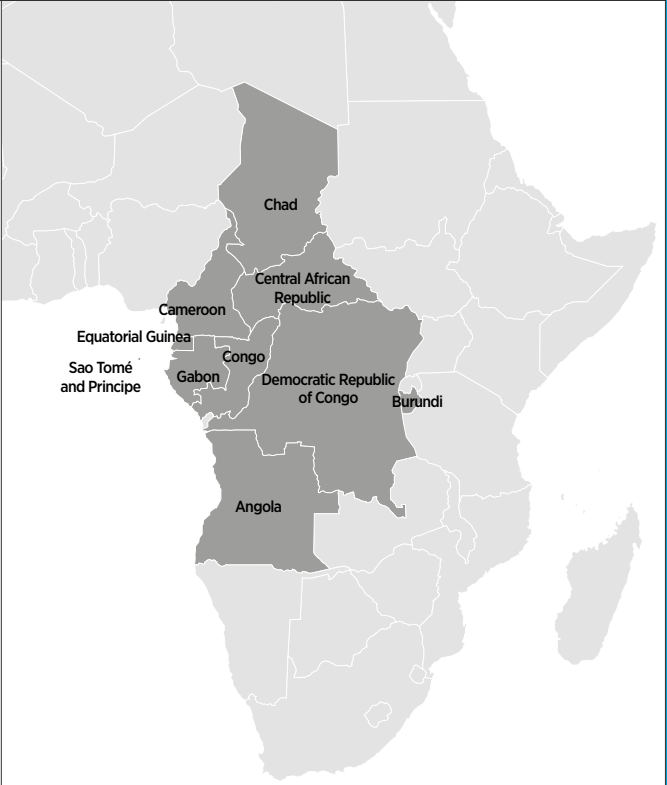
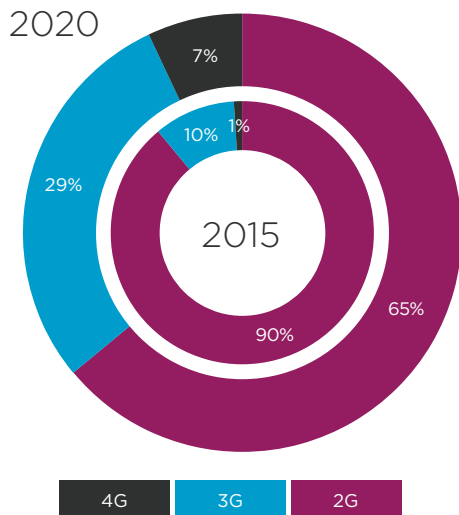


SMARTPHONE ADOPTION

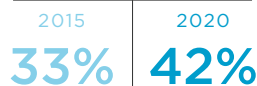


ECCAS (Economic Community of Central African States)

TECHNOLOGY MIX



SUBSCRIBER PENETRATION



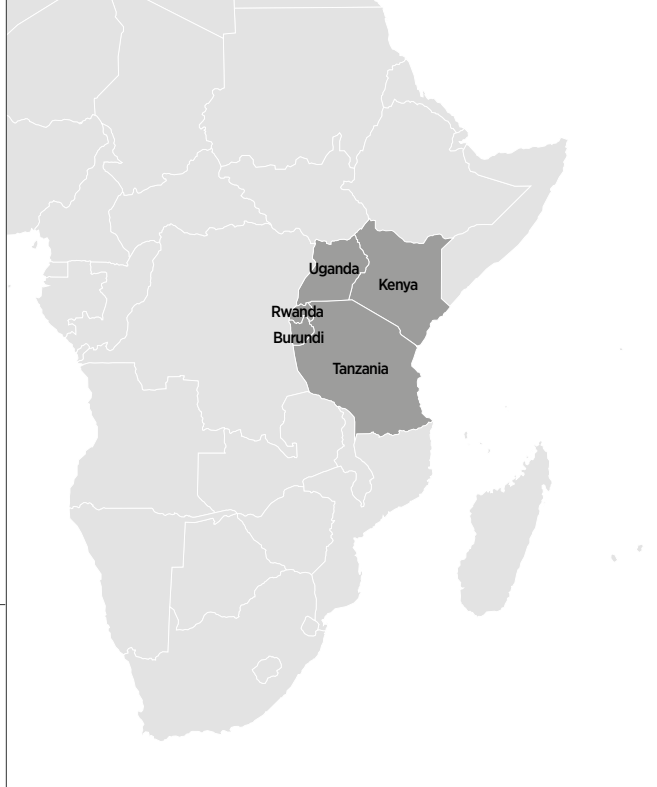
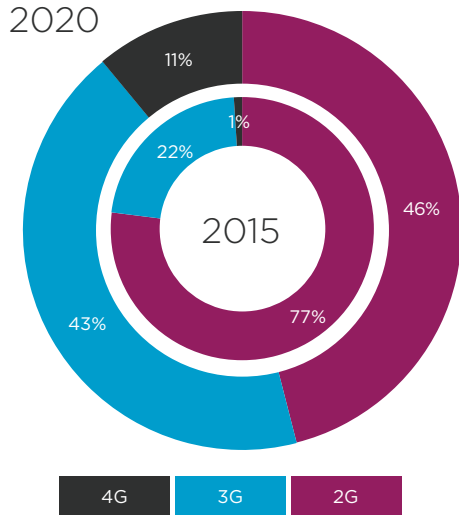
SMARTPHONE ADOPTION





EAC (East Africa Community)

TECHNOLOGY MIX



SUBSCRIBER PENETRATION

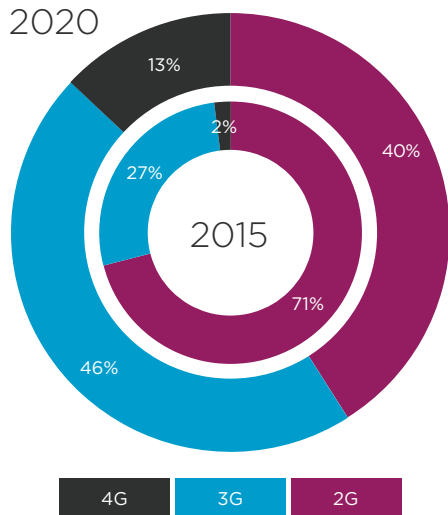


SMARTPHONE ADOPTION

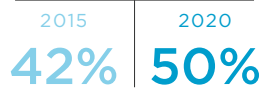


SADC (Southern Africa Development Community)

TECHNOLOGY MIX



SUBSCRIBER PENETRATION



SMARTPHONE ADOPTION





Mobile revenues grew by **3.8%** year-on-year in 2015 to reach **\$53.5 billion**, mainly driven by data revenues.

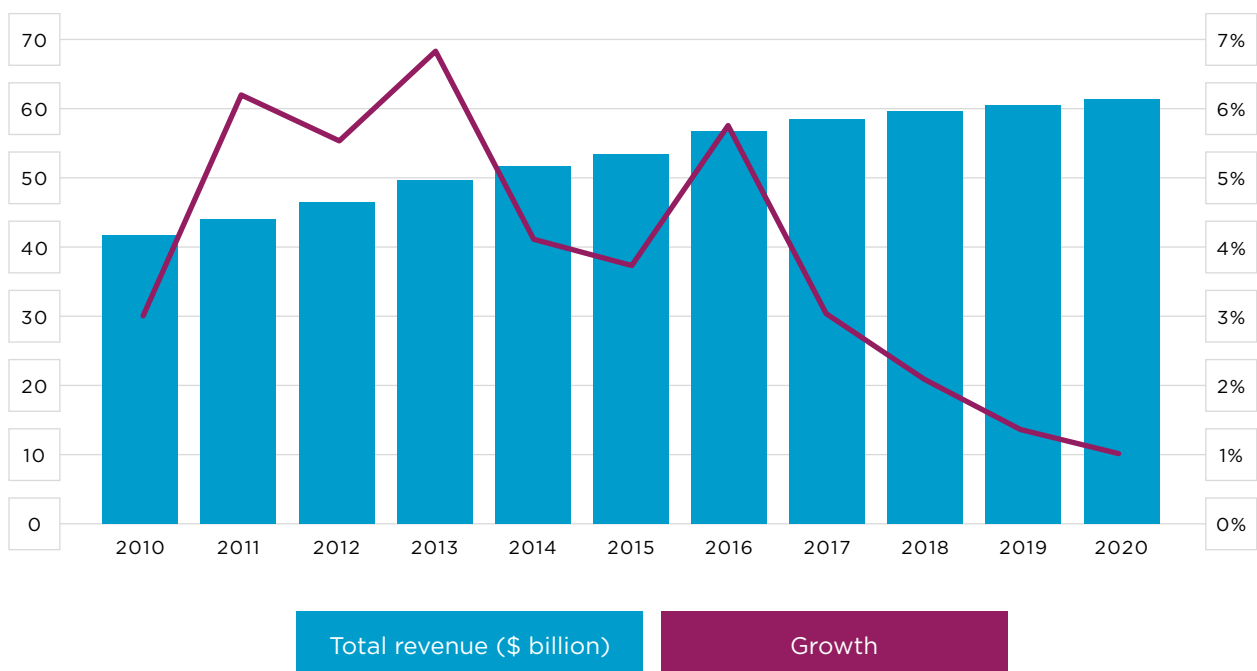
1.5 Revenue growth slowing in the region

Mobile revenues grew by 3.8% year-on-year in 2015 to reach \$53.5 billion, mainly driven by data revenues, which now account for a fifth or more of total revenues for many operators. There is a substantial variance between spot-rate revenue growth and historic-rate revenue growth in US dollars, reflecting the high levels of currency volatility in the first half of the decade, particularly in 2015 when several local currencies depreciated markedly. The annual growth rate will continue trending downwards over the next five years, underlining the challenge for operators to find new revenue growth opportunities amid increasing cost pressures.

Voice and SMS still account for the largest share of revenues and have showed resilience to the threat of IP-based services, mostly due to low smartphone adoption. However, the situation is changing rapidly; smartphone adoption and access to mobile broadband networks have increased significantly in recent years. As a result, global apps such as WhatsApp, Viber and Skype, along with local alternatives in some countries, now feature prominently in the communications landscape as many consumers reining in mobile spend attempt to switch to cheaper alternatives from internet players. Although the use of IP-based services supports data revenue growth (mobile operators have consistently reported double-digit data revenue growth over the last five years), the increasing pressure on traditional voice and SMS revenues will continue to weigh on overall revenue growth.

Figure 10

Total mobile revenues



Source: GSMA Intelligence

The economic headwinds confronting many countries in Africa and the attendant adverse impact on private consumption growth also create significant risks for revenue growth. The economies of resource-rich countries, such as Angola, Nigeria and Algeria, have taken a hit from the fall in the price of crude oil and other commodities. The broader impact of the economic slowdown (including rising inflation and unemployment) and the removal of consumer subsidies in some markets (such as the fuel subsidy in Nigeria) are affecting consumer spend and therefore mobile revenues. Revenues in dollar terms have also been materially impacted by the recent weakness of local currencies against the dollar.

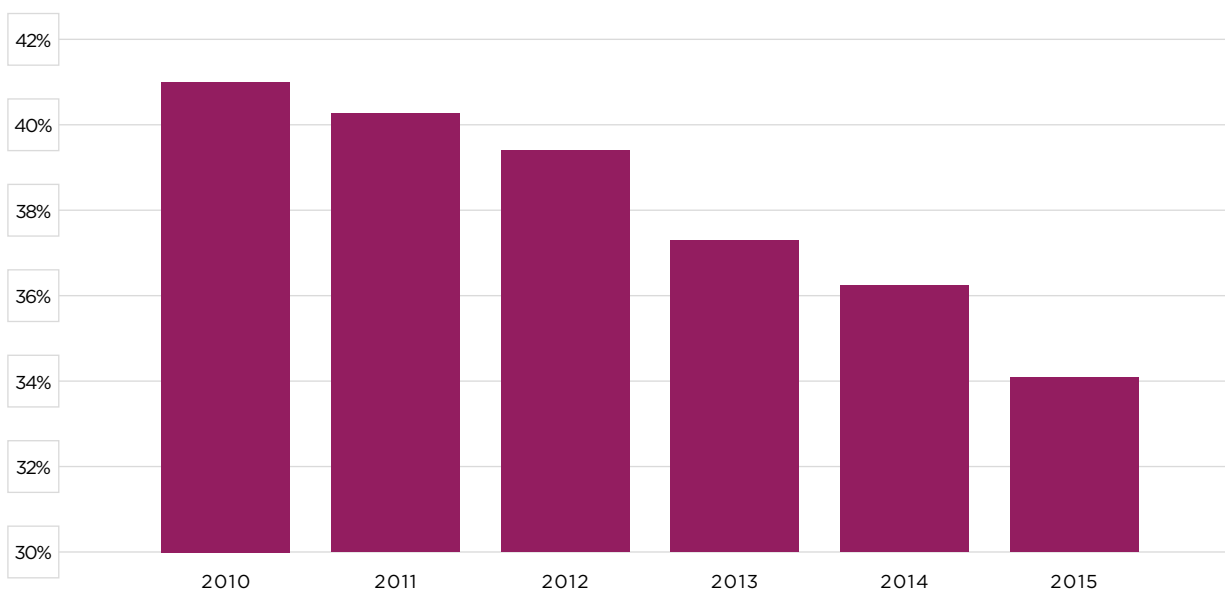
Egypt, Tunisia, Morocco and several other tourist hotspots have seen a significant fall in visitor numbers amid security concerns; figures from the United Nations World Tourism Organisation (UNWTO) show that visits to North Africa fell by 8% in 2015, compared to global growth of 4%, a situation that adversely affected the mobile usage levels of both local customers and foreign visitors.

As large proportions of consumers in the region are in the lowest tier of the income pyramid, the weak economic outlook increases the risk of spending cutbacks by hard-pressed consumers who can take advantage of the flexibility permitted by prepay services (more than 90% of connections in Africa are prepay). The sizeable proportion of operator revenues from users in this segment means any changes in their usage patterns have a material impact on revenue growth.

Rising competition, slowing growth and in many markets increased regulatory actions have affected margins, which have fallen by more than six percentage points over the last five years. Increasing cost pressures, particularly driven by a combination of rising inflation and local currency depreciation, are now contributing to the squeeze on operating margins. Mobile operators from across the region have commented on these pressures over recent months, including most from the major markets of South Africa, Nigeria and Egypt. As a result, mobile operators continue to take steps to manage cashflow and margin pressures through cost-reduction measures such as network sharing and the sale of tower assets.

Figure 11

EBITDA margins under pressure



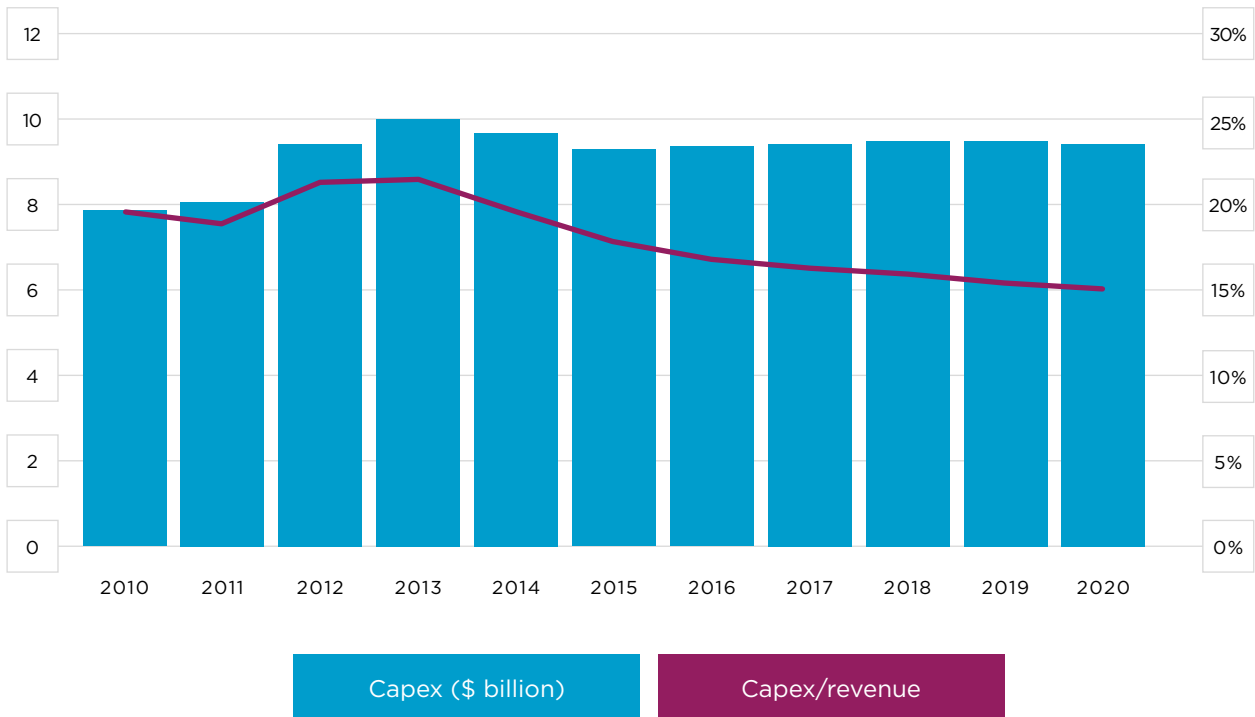
Source: GSMA Intelligence

Overall capex in Africa increased sharply between 2011 and 2013, primarily due to aggressive rollout of mobile broadband networks across the region. However, capex levels fell in 2014 and will likely remain stable over the period to 2020. A major factor affecting capex levels is the depreciation of local currencies; the value of the local currencies of many large markets in the region, including South Africa, Egypt, Nigeria, Kenya and Tanzania, recorded double-digit depreciation between 2014 and mid-2016. This significantly increased the cost of foreign

capital and made imported equipment and services more expensive. It also meant that investments by mobile operators over the last two years to cope with rising mobile data traffic and to meet coverage expansion targets are not adequately reflected by the dollar value of capex levels over the same period. Over the next five years, capex levels will remain stable as economic concerns continue to weigh on investment appetite and network sharing reduces the cost of infrastructure rollout for mobile operators.

Figure 12

Capital expenditure in Africa: outlook steady despite cashflow pressure



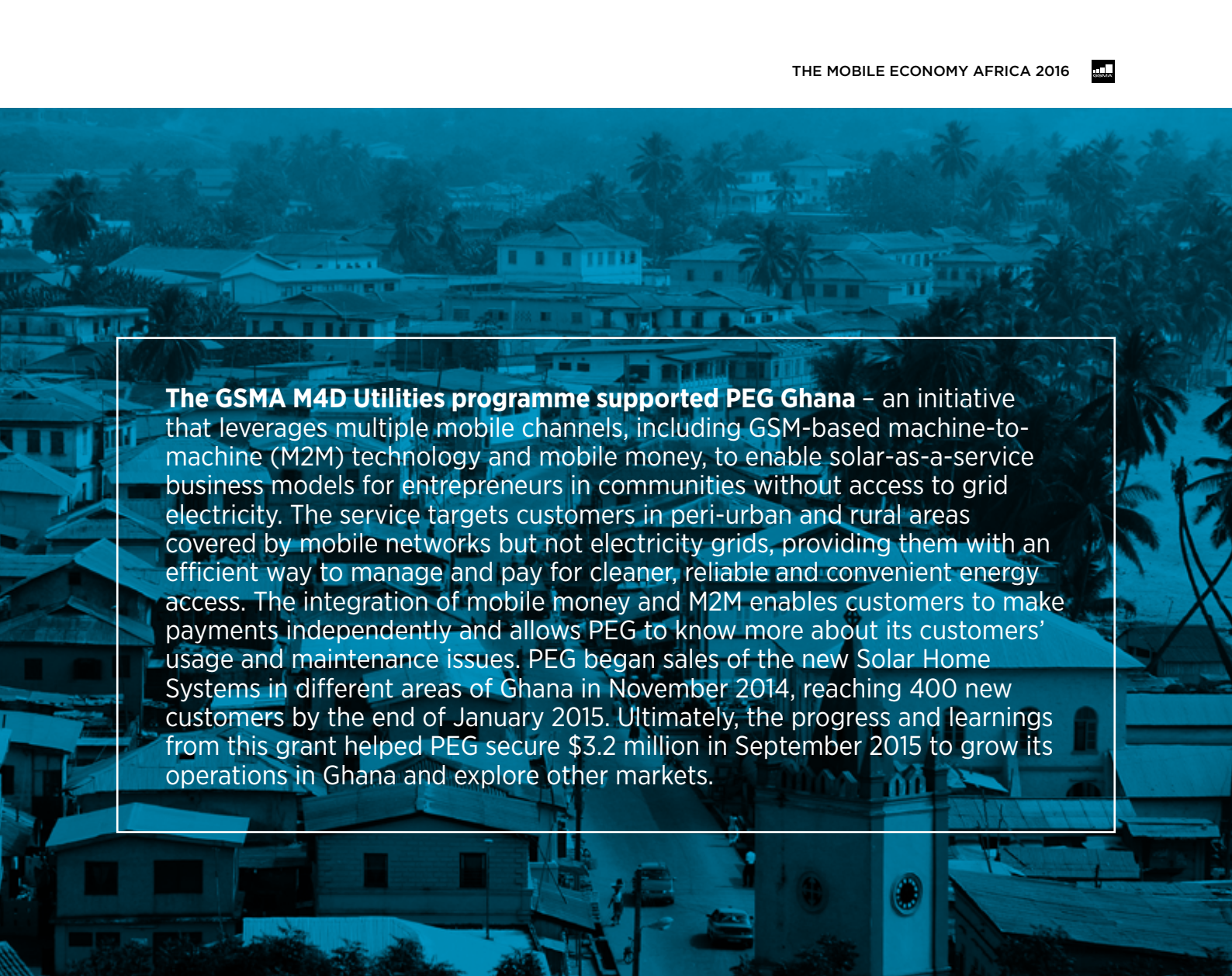
Source: GSMA Intelligence

2 Mobile delivering growth and innovation across Africa

2.1 Mobile as the platform for the digital economy in Africa

Mobile has emerged as the platform of choice for creating, distributing and consuming innovative digital solutions and services in Africa. Several factors are driving this trend, including the expansion of advanced mobile networks, the growing adoption of smart devices, the convenience of accessing real-time, feature-rich content and services on the go, and the underdevelopment of alternative technologies, notably fixed-line connectivity, in the region.

Although global content providers such as Facebook and Google have launched localised services to tap into the increasingly tech-savvy consumer base, there is growing interest from consumers in home-grown solutions that directly appeal to local interests and cultures, and that address unique social and economic challenges faced by consumers in the region. For example, there are innovative solutions in the region that leverage the size and reach of mobile infrastructure, distribution channels, mobile payments and technologies to improve access to utility services for underserved communities.



The GSMA M4D Utilities programme supported PEG Ghana – an initiative that leverages multiple mobile channels, including GSM-based machine-to-machine (M2M) technology and mobile money, to enable solar-as-a-service business models for entrepreneurs in communities without access to grid electricity. The service targets customers in peri-urban and rural areas covered by mobile networks but not electricity grids, providing them with an efficient way to manage and pay for cleaner, reliable and convenient energy access. The integration of mobile money and M2M enables customers to make payments independently and allows PEG to know more about its customers' usage and maintenance issues. PEG began sales of the new Solar Home Systems in different areas of Ghana in November 2014, reaching 400 new customers by the end of January 2015. Ultimately, the progress and learnings from this grant helped PEG secure \$3.2 million in September 2015 to grow its operations in Ghana and explore other markets.

The technology hubs springing up across Africa represent a key source of locally developed applications. There are approximately 310 active⁴ tech hubs across the region, including 180 accelerators/incubators, according to research by the GSMA Ecosystem Accelerator programme. The top three countries in terms of tech hubs are:

- **South Africa:** 51
- **Kenya:** 26
- **Nigeria:** 23

In March 2016, application accelerator company Neumob launched points of presence in Kenya, Nigeria and South Africa to enable local app developers to improve the performance, security and user experience of their applications.

Meanwhile, the tech start-up investment ecosystem in Africa is increasingly active, with the range of tech start-ups funded and size of deals reflecting the accelerating development of the ecosystem. In 2015, 125 African tech start-ups raised approximately \$185 million⁵, with Kenya, Nigeria and South Africa receiving more than 80% of the funding. However, this amount pales in comparison to the \$27.3 billion⁶ raised by start-ups globally in the same year, underlining the need for more investment to fund start-ups in the region as well as diversification of target markets to enable broader development of the start-up ecosystem.

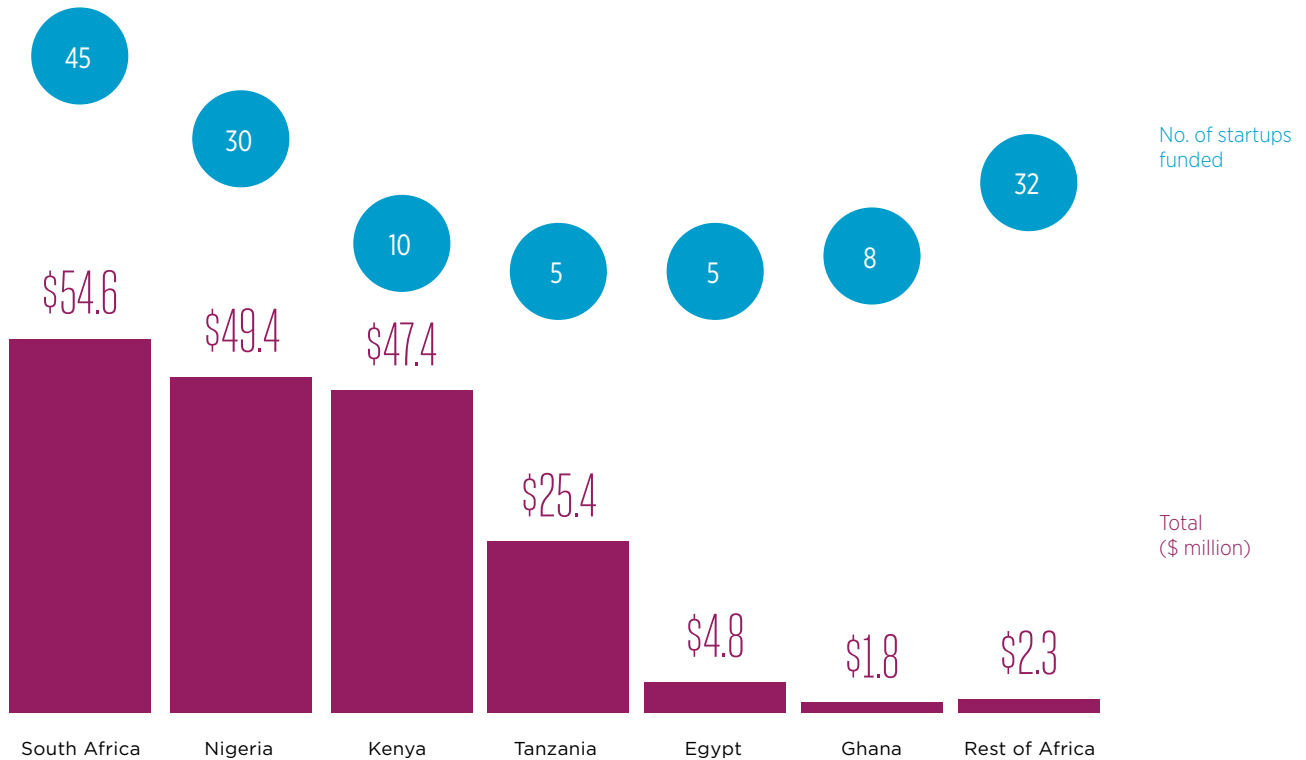
4. Hubs having their own website with activity on social networks or on their websites

5. Disrupt Africa 2016: African Tech Start-ups Funding Report 2015

6. CB Insights

Figure 13

2015 tech startup funding landscape



Source: Disrupt Africa

Key stakeholders in the start-up ecosystem need to collaborate to ensure that new mobile-based solutions achieve scale and sustainability. Governments need to become more directly involved in supporting tech hubs, given their potential to create new jobs, develop solutions to tackle social challenges and positively engage young people. Multilateral and non-government organisations also have a role to play in the emerging tech innovation landscape, particularly in providing technical support and a platform for collaboration.

The GSMA's Ecosystem Accelerator programme focuses on bridging the gap between mobile operators and start-ups, enabling strong partnerships that support the growth of commercially sustainable mobile products and services. By opening the dialogue between start-ups and operators, the programme helps operators contribute their assets and expertise to the most promising ideas.

These partnerships bring the most impactful mobile solutions to the people and places that need them most, generating the greatest socioeconomic impact. The initiative is supported by the GSMA, its members and the UK Department for International Development (DFID).



2.2 Operator API assets to accelerate tech innovation

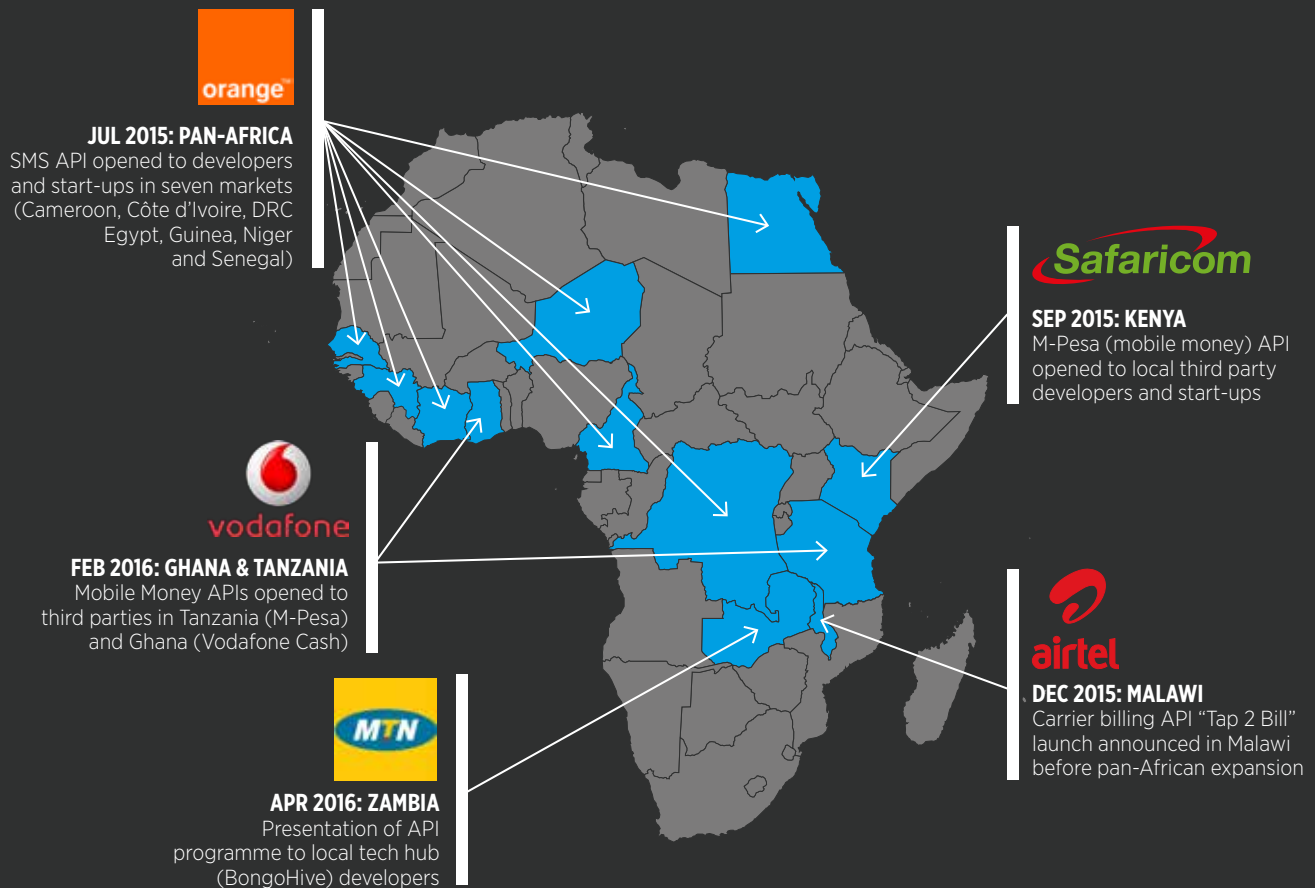
Mobile operators already play a central role in nurturing the development of innovative solutions in Africa. They have traditionally supported various initiatives to identify and develop new talent and solutions, including incubators, accelerators and competitions, mostly through funding and mentorship. Operators have also invested in and backed co-branding initiatives with tech start-ups in the region; for example, MTN, Millicom and Orange have equity stakes in Africa Internet Group, the parent company of some of Africa's best known e-commerce platforms, including Jumia, Kaymu and Jovago.

Some mobile operators in the region have also opened up their APIs⁷ to third-party developers (Figure 14). This ushers in a new dimension of operator and start-up ecosystem engagement, and follows several years of learnings from API programmes launched by pioneering mobile operators, such as Telefónica (BlueVia programme), Deutsche Telekom (Developer Garden), AT&T (Developer Program) and the GSMA (OneAPI).⁸

7. APIs (application programming interfaces) make it possible for third parties to use certain mobile network functions within their applications
8. APIs: A bridge between mobile operators and start-ups in emerging markets, GSMA, 2016

Figure 14

Recent operator API initiatives in Africa



Source: APIs: A bridge between mobile operators and start-ups in emerging markets, GSMA, July 2016.

Mobile operator APIs such as messaging, billing, location and mobile money provide a significant opportunity for start-ups to scale and extend their services to a broader customer base. For example, a start-up can offer SMS-based localised content to its users depending on their city or area, and then charge them by deducting the amount from their mobile airtime. Such a service would leverage three operator APIs simultaneously: SMS, location and direct operator billing.

Table 1

Selected operator API use cases

API	Country	Operator	Start-up	Use case
SMS	Côte d'Ivoire	Orange	Sycelim	Sycelim created a system to manage medical insurance connecting the insurer, patient and caregiver. The solution uses the Orange SMS API to allow both the doctor and patient to be kept up to date during the insurance approval process.
USSD & billing	Senegal	Orange	MLouma	MLouma is a web portal that connects buyers and sellers of agricultural products. In 2015, it integrated Orange APIs to build a USSD version, which allows users without smartphones and internet connectivity to access the service. It also adopted the Orange billing API to give wholesale buyers an alternative payment solution.
Billing	South Africa	MTN Vodacom	Hello Doctor	Hello Doctor is a mobile-based (text or call) Q&A service with registered doctors. Patients can pay for the monthly service using their MTN or Vodacom airtime (via carrier billing APIs).
Mobile money	Kenya	Safaricom	Sendy	Sendy is a USSD (on the driver side) and iOS/Android (on the customer side) on-demand, door-to-door package delivery mobile application. Following integration with Safaricom's M-Pesa API, Sendy users can now top-up their accounts using M-Pesa within the Sendy app.

Source: APIs: A bridge between mobile operators and start-ups in emerging markets, GSMA, July 2016.

Call to action: steps key stakeholders can take to accelerate the digital economy through locally relevant innovations

Government – Continue to support tech innovation hubs and development of digital skills.

Investors – Increase and diversify funding across the continent, beyond South Africa, Nigeria and Kenya, for broader development of the start-up ecosystem.

Donors – Continue to support innovation centres, especially in those markets with less capital from private-sector investors.

Mobile operators – Open and harmonise APIs, and collaborate with one another to enable innovators access to key platforms. Accelerate outreach efforts to educate and support the local developer community about operator APIs and engage with them more broadly. For example, in July 2016, Orange Middle East & Africa (MEA) confirmed its commitment to further opening APIs and making them increasingly accessible to the digital ecosystem in the region.

2.3 Mobile delivering jobs and growth

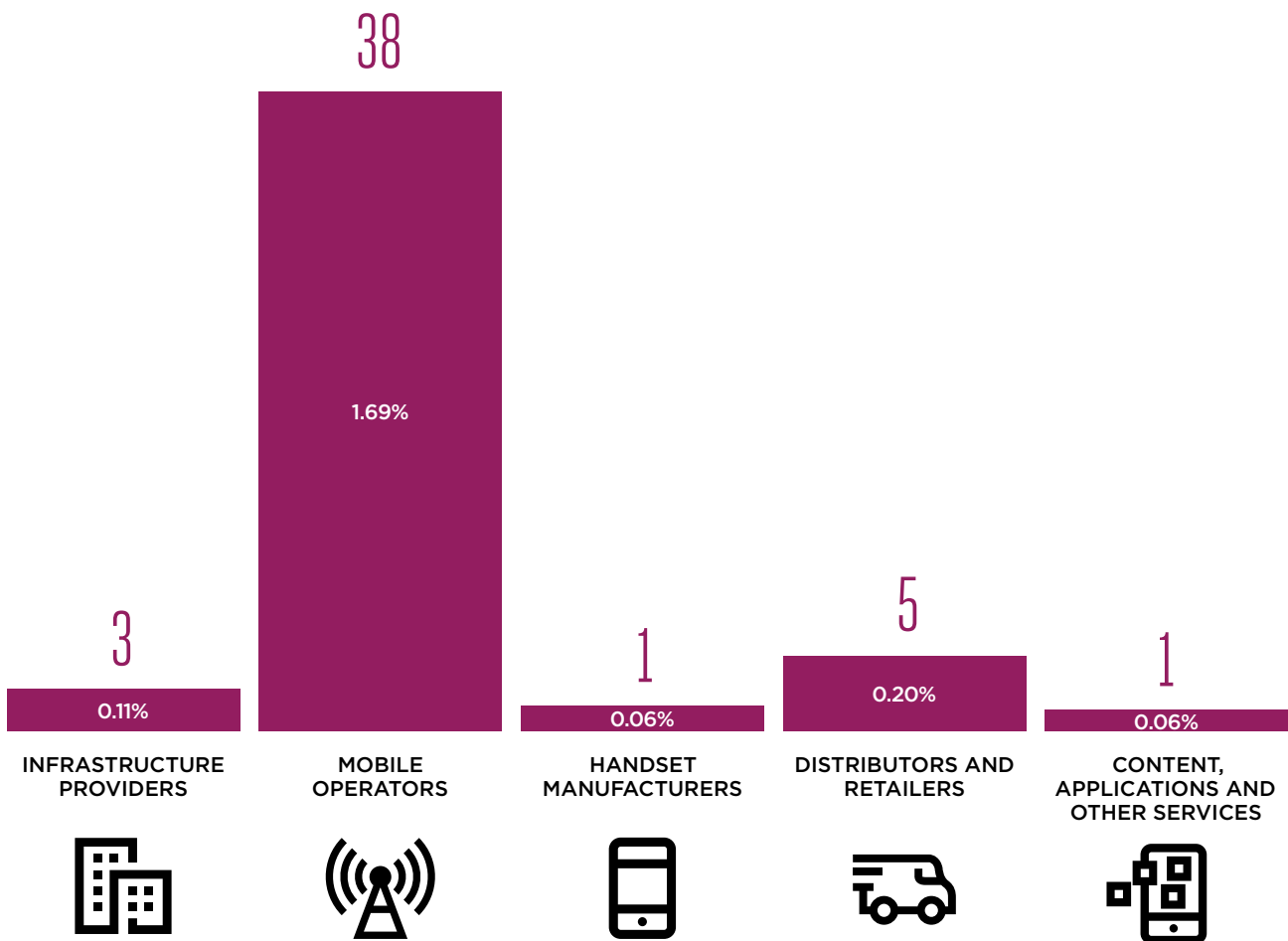
The mobile ecosystem makes a significant contribution to the economies in Africa, in terms of economic growth, job creation and public funding. The mobile ecosystem consists of mobile network operators, infrastructure service providers, retailers and distributors of mobile products and services, handset manufacturers and mobile content, application and service providers.

The direct economic contribution to GDP of these firms is estimated by measuring their value added to the economy, including employee compensation, business operating surplus and taxes. In 2015, the total value added generated by the mobile ecosystem was around \$50 billion (or 2.1% of GDP), with network operators accounting for well over half of this.

Figure 15

Direct GDP contribution of the mobile ecosystem

\$ billion, % 2015 GDP



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

In addition to their direct economic contribution, firms in the mobile ecosystem purchase inputs from their providers in the supply chain. For example, handset manufacturers purchase inputs from microchip providers and content providers require services from the IT sector. Furthermore, some of the profits and earnings generated by the ecosystem are spent on other goods and services, stimulating economic activity in those sectors.

We estimate that in 2015, this additional economic activity generated a further \$12 billion in value add (or 0.6% of GDP) in the region.

The use of mobile technology also drives improvements in productivity and efficiency for workers and firms. There are three ways in which this takes effect:

1 The first is the use of basic mobile voice and text services, which allows workers and firms to communicate more efficiently and effectively (for example, by reducing unproductive travel time). There is significant variation across Africa in mobile connections penetration, ranging from less than 10% in Eritrea to more than 100% in Botswana and Tunisia.

2 The second is the use of 3G and 4G technology, which allows workers and firms to use mobile data and internet services (for example, by improving access to market information in the agricultural sector). The impact of mobile internet is particularly significant in countries where fixed broadband penetration is relatively low.

3 The third is the next generation of mobile services, in particular M2M and the Internet of Things. The impact of these is expected to be limited in Africa over the next five years as take-up will initially grow in other regions of the world. In the longer term, however, we expect these services to drive significant benefits in the region.

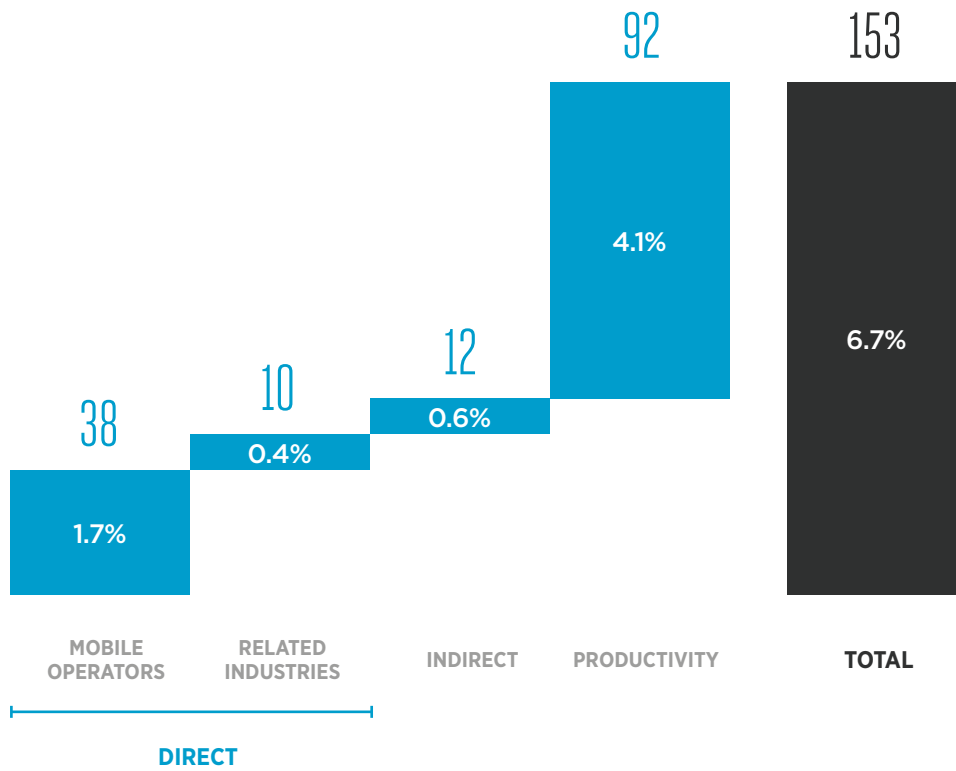
We estimate these productivity impacts were worth around \$92 billion in 2015 (or 4.1% of GDP). Overall, taking into account the direct, indirect and productivity impacts, in 2015 the mobile industry made a total contribution of \$153 billion to Africa economies in value added terms, equivalent to 6.7% of the region's total GDP.



Figure 16

Total (direct and indirect) contribution to GDP

\$ billion, % 2015 GDP



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



Employment

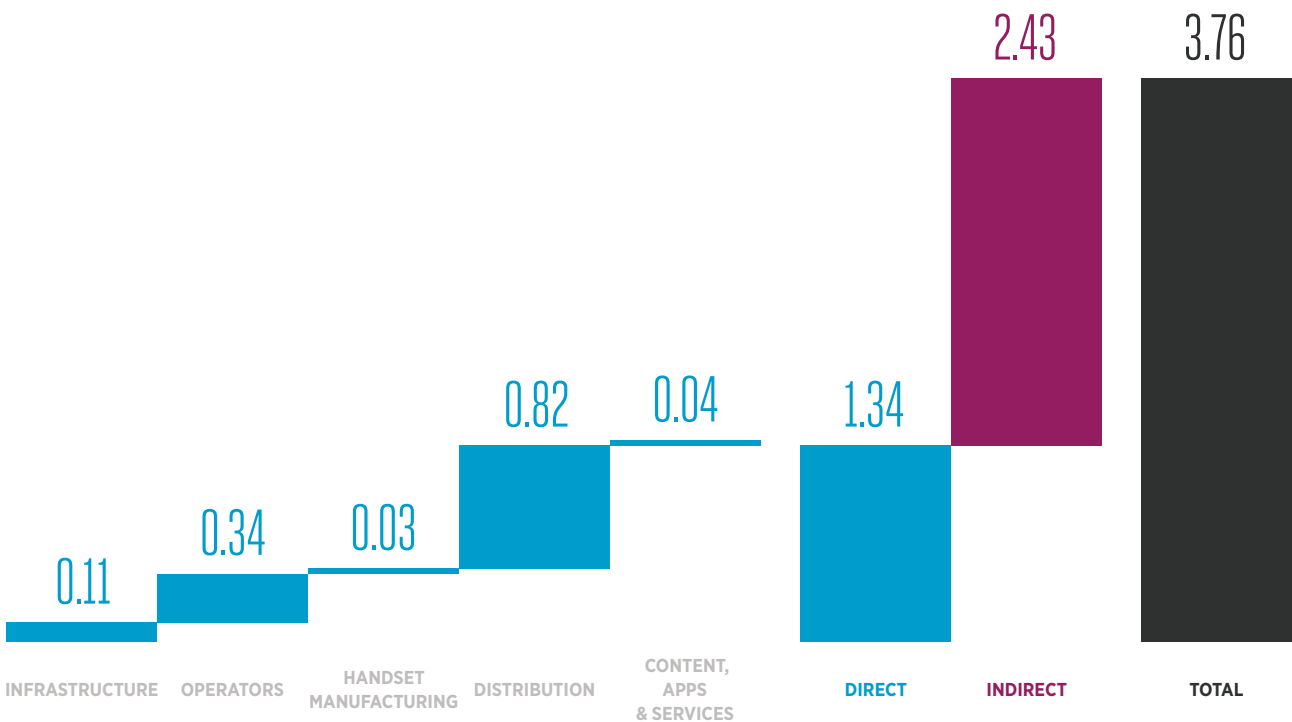
In 2015 mobile operators and the ecosystem provided direct employment to approximately 1.3 million people in Africa. In addition to this, economic activity in the ecosystem generates jobs in other sectors. Firms that provide goods and services as production inputs for the mobile ecosystem (for example microchips or transport services) will employ more individuals as a result of the demand generated by the mobile sector. Furthermore, the wages, public funding contributions and profits paid by the industry are spent in other sectors, which provide additional jobs.

We estimate that in 2015, around 2.4 million jobs were indirectly supported in this way, bringing the total impact (both direct and indirect) of the mobile industry to 3.8 million jobs.

Figure 17

Employment impact

Jobs, millions



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

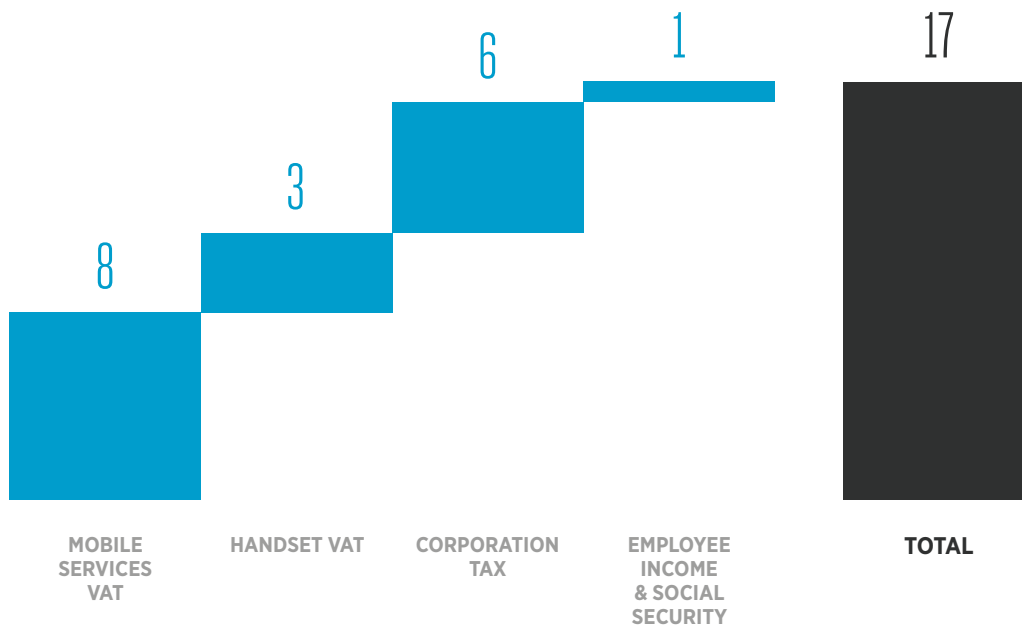
Public funding contribution

The mobile ecosystem also makes a significant contribution to the funding of public sector activity in the region through general taxation. For most countries, this includes value-added tax, corporation tax, income tax and social security from firms and employees. We estimate that the ecosystem made a tax contribution to the public finances of the region's governments of \$17 billion in 2015.

Figure 18

Contribution to public funding by the mobile industry

2015, \$ billion



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



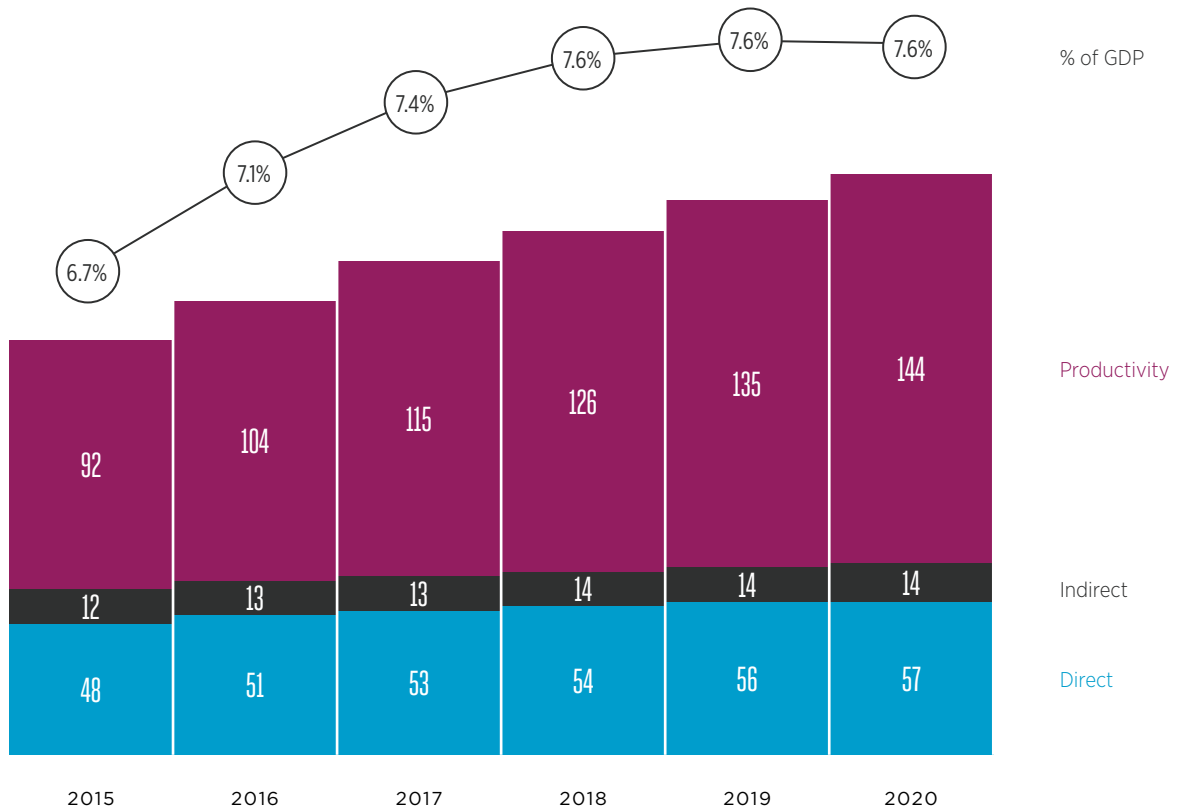
2.3.1 Outlook and trends for the period 2015–2020

We expect the economic contribution of the mobile industry in Africa to continue to increase in both relative and absolute terms. In value-added terms, we estimate the ecosystem will generate \$214 billion by 2020 (7.6% of GDP). The majority of this increase will be driven by improved productivity, particularly from the increasing adoption of mobile internet services.

Figure 19

Outlook to 2020

\$ billion and % of GDP



Source: GSMA Intelligence

At the same time, there will be increases in the number of jobs generated by the mobile ecosystem and the overall contribution to public funding. The former will increase to 4.5 million by 2020 (including both direct and indirect jobs), while the tax contribution to public funding will total \$20.5 billion.

3 Mobile addressing social challenges in the developing world

3.1 The potential for mobile to unlock digital identity for all in Africa

The international community recognises identification as a fundamental enabler of socioeconomic and political development. Without proof of identity, citizens cannot access a wide range of services, assert rights or fully participate in the digital and analogue worlds. The identification gap – the 1.5 billion people who the World Bank estimates lack a proof of official ID – has been identified as a key challenge to progress. This is reflected in the UN Sustainable Development Goal 16.9: by 2030, provide legal identity to all (including birth registration).

The identification gap is particularly acute in Africa, with more than 400 million people across the continent lacking an official ID, the highest proportion of the total population of any region. The problem disproportionately affects those in rural areas, vulnerable populations and women, compounding challenges such as asserting property rights and gaining access to financial services or subsidies. Failure to register a birth and the lack of an official ID can make it difficult for children to access primary healthcare facilities or government-funded vaccination programmes, and can lead to exclusion from the education system.

Robust digital identity systems can produce huge savings for citizens, government and business; can increase transparency and accountability; and can drive innovation. The rise of mobile and digital technology provides a transformative opportunity to offer new identity services that are more efficient and effective than paper-based and traditional identity systems. A global survey conducted by Boston Consulting Group found that digital identity systems create gains in efficiency and convenience that could save taxpayers up to \$50 billion per year globally by 2020.⁹ Well implemented digital

identification systems can have a significant positive impact on financial inclusion, gender equality, access to health services and social safety nets, and governance.

Identification is becoming of even greater relevance in the increasingly digitised global economy, with individuals requiring a digital identity if they are to participate in the digital societies of the future. The mobile ecosystem and smartphones are providing innovative ways to access a growing range of services and content. However, recent research from the GSMA has highlighted the majority of countries in the region are now implementing mandatory mobile SIM-card registration, which requires proof of identity. This provides a clear challenge for the substantial population that lacks a formal identity: these individuals will not be able to access mobile communications, further exacerbating digital, social and economic exclusion. This could also fuel incidents of identity fraud or mobile handset theft. While mobile registration databases should not substitute a national identity registry, they may provide an effective functional registry that could be used for authorising consumers' access to other services.¹⁰

- In **Tanzania**, SIM registration was introduced in 2010 using a paper-based system of forms and a copy of the customer's ID, with up to 12 different documents possible for ID. In 2015 electronic records were accepted for registration. The record contains an electronic form with photographs of the ID document and of the person. This simplified the process, sped up confirmation by the operator that the record was complete and improved reliability. The new electronic records can also be used to address know-your-customer (KYC) requirements for other services.
- **Pakistan** and **Nigeria** have differing approaches to using registration data as digital identity. In Pakistan, operators can verify a mobile user's biometrics against a central government database before the SIM registration is completed. The Nigerian model does not involve such a verification mechanism; rather, the biometric (thumbprint impression) along with an ID reference and photograph are held on file. The Pakistani government and telecoms regulator have encouraged the use of mobile registration to enable value-added services. The validated ID is accepted as meeting the KYC requirement for mobile banking, and the government is looking to use the ID to provide access to e-government services. Nigeria specifically prohibits the use of the ID information for anything other than mobile registration, limiting the opportunity to use the data for value-added services.

9. SIA eGov study, based on analysis from Boston Consulting Group, 2013
 10. Mandatory registration of prepaid SIM cards, GSMA, April 2016

The GSMA Digital Identity programme is working with mobile operators, governments and the development community to demonstrate the potential for mobile to enable and accelerate sustainable digital identity for all and provide life-enhancing services that have social impact. By developing and testing new use-cases that meet the needs of the underserved, generating research and insights, and addressing policy and regulatory issues, the GSMA aims to stimulate and drive the use of mobile in the digital identity ecosystem.

Potential use cases for mobile identity solutions include the following:

- enabling civil registration (births, deaths and change of marital status)
- enabling access to government payments and accelerating the uptake of e-government services
- enabling access to financial services.

In the case of civil registration, birth registration is a fundamental stepping-stone in ensuring the provision of an official identity. Birth registration

is mandatory in a number of countries across Africa, but even in countries where this is the case, a substantial proportion of births are still not registered. According to data from UNICEF, in Sub-Saharan Africa only 44% of children under five years old are registered. Challenges include the lack of efficient communication between rural communities and national birth registration offices.

Mobile technology is well placed to address these challenges, given its high penetration levels and geographic coverage, particularly in rural areas. Mobile identity solutions remove the need for individuals to travel to registration centres and can allow for much more efficient registration processes, while mobile operators are able to utilise their extensive networks of retail and distribution agents. A number of mobile operators are already employing their wide geographic reach, particularly in rural parts of Africa, to facilitate birth registration processes. Examples include Orange in Senegal, Uganda Telecom and Tigo in Tanzania, in partnership with UNICEF.

Mobile birth registration in Tanzania

Tanzania has one of the lowest rates of birth registration in Africa – around 80% of Tanzanians do not have birth certificates, according to the 2012 census. Most parents in rural areas do not register their children because of the steep cost, long distances to registry offices, cumbersome process and lack of awareness of the benefits; parents have to pay TZS3,500 (\$1.6) for a birth certificate within 90 days of a child's birth, or TZS4,000 after 90 days, as well as travel costs.

In October 2015, the government launched a nationwide drive to help parents register their children's births by mobile phone as part of plans to better plan health, education and other public services. The system allows a health worker to send the baby's name, sex, date of birth and family details by phone to a central database, and a birth certificate is issued free of charge within days. The initiative is run by the government registration agency RITA, in partnership with Tigo and UNICEF, and expects to register 90% of all newborns within the next five years.



3.2 Delivering digital inclusion and addressing the digital divide

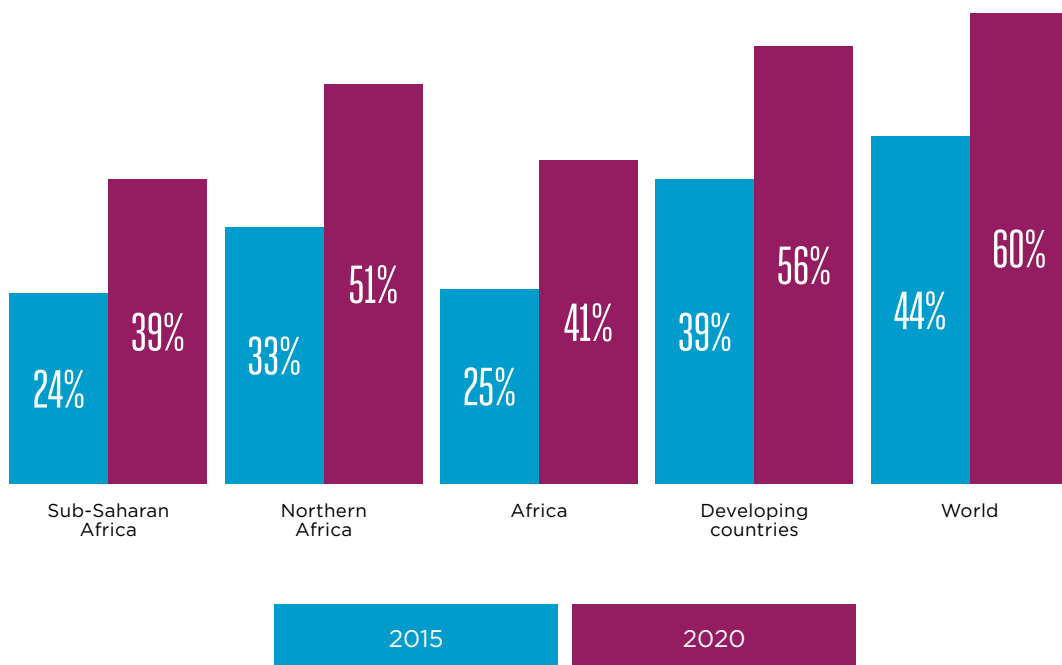
Mobile internet adoption in Africa continues to grow rapidly; the number of mobile internet subscribers tripled over the last five years to 300 million by the end of 2015. Around half of them connect to the internet via high-speed mobile broadband¹¹ networks. Over the five years to 2020, an additional 250 million people are expected to subscribe to a mobile internet service, with the majority of new subscribers connecting through a mobile broadband network.

However, the number of internet subscribers in the region represents only a quarter of the total population. Some 900 million people are digitally excluded and unable to enjoy the socioeconomic benefits that mobile internet can bring. By 2020,

60% of the population will still be unconnected. There remain significant barriers to adoption, particularly for underserved population groups (rural, women, low income and youth).

Figure 20

Mobile internet subscriber penetration



Source: GSMA Intelligence

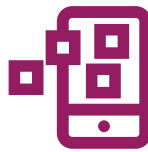
11. 3G or 4G network services

Digital inclusion – defined here as the expansion of global connectivity and mobile internet adoption – can extend various economic and social benefits to previously unconnected populations, fuelling a virtuous circle that reduces poverty, improves infrastructure and services, and further increases internet access and usage. By extension, unconnected and underserved communities risk falling further behind, widening the digital divide, if the barriers to digital inclusion remain unaddressed.

The GSMA Connected Society programme works with and on behalf of the mobile ecosystem to address these four key challenges to increasing digital inclusion:



Network coverage: expanding the commercially sustainable coverage of mobile broadband networks to underserved population groups (typically in rural or remote communities) by promoting infrastructure sharing, regulatory best practice and technical innovation.



Digital skills and awareness: providing training to people so they understand the benefits and opportunities of being online and have the skills to use the mobile internet.



Affordability: addressing key issues such as mobile-specific taxation to help make internet access more affordable, especially for citizens at the bottom of the pyramid.

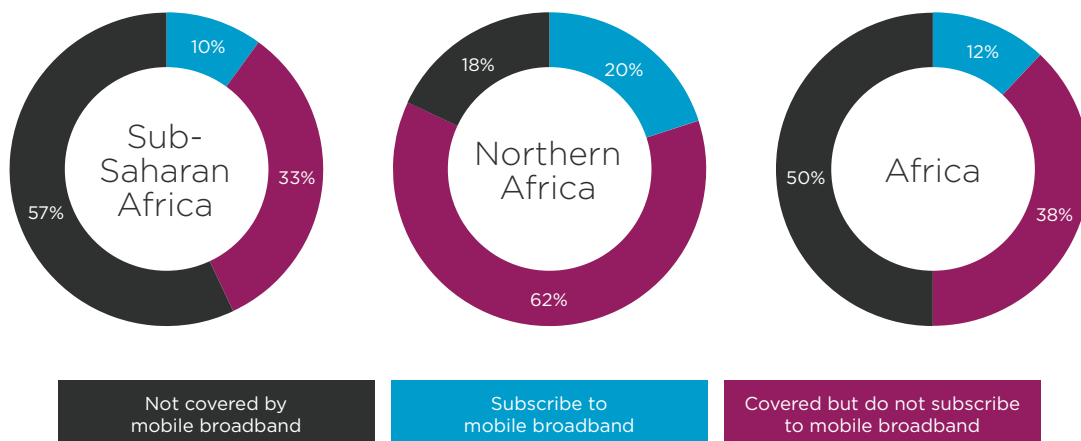


Locally relevant content: encouraging and promoting the development of content and services that are relevant to underserved population groups.

In Africa, limited network coverage remains a key barrier to mobile internet adoption. Presently, mobile broadband networks cover around 50% of the population, meaning that 600 million people in the region do not have access to a mobile broadband service. However, other non-infrastructure barriers continue to weigh on internet adoption as evidenced by the fact that three quarters of the population with mobile broadband coverage in the region – equivalent to 440 million people – do not yet subscribe to mobile broadband services (Figure 21).

Figure 21

Mobile broadband in context, 2015



Source: GSMA Intelligence



3.2.1 Closing the coverage gap

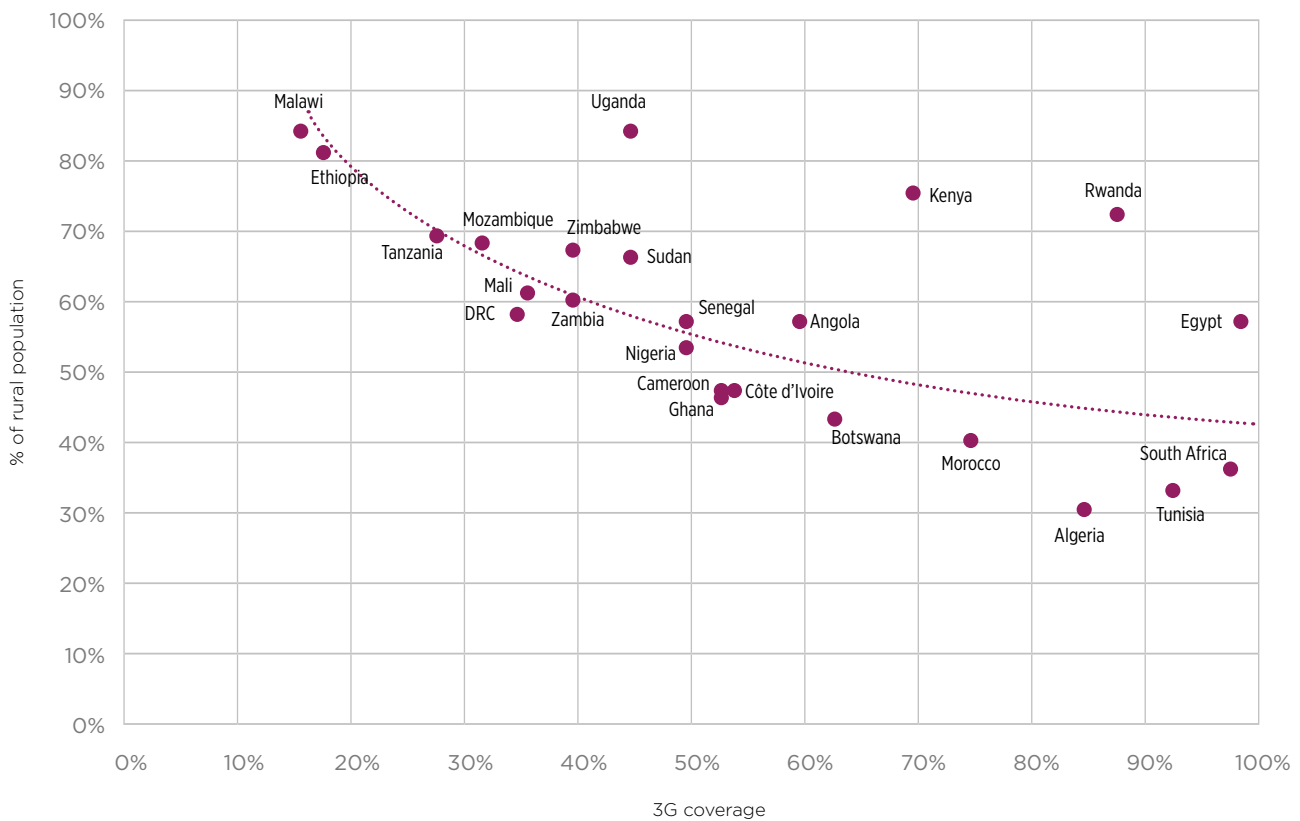
Closing the coverage gap requires a multi-dimensional approach and collaboration between the mobile industry and governments. Mobile operators' direct investment in infrastructure deployment has so far proven effective in expanding coverage to current levels.

Moving further into rural and remote areas, where two thirds of the population in Africa live, is a much greater challenge and often proves uneconomical. Many rural communities are sparsely populated, lack access to grid electricity, and are surrounded by difficult terrains, such as mountains and forests, which significantly increases the cost of deploying and maintaining conventional network infrastructure. In many countries, the rural

populations are also characterised by relatively high instances of poverty and, by extension, low purchasing power. As a result, mobile operators are finding it increasingly difficult to justify investing in capital-intensive infrastructure deployments in these areas. This is reflected in the strong correlation between 3G coverage and proportion of the population living in rural areas (Figure 22).

Figure 22

Impact of rural population on 3G coverage



Source: GSMA Intelligence, World Bank data



Mobile operators have adopted unconventional mechanisms, such as infrastructure sharing, to improve the economics of rural deployment. Infrastructure sharing – passive¹² or active¹³ – enables mobile operators to deploy networks more efficiently, optimise asset utilisation and reduce running costs compared to standalone deployment. Passive infrastructure sharing has taken off in Africa, with independent tower companies, led by HIS, Helios Towers Africa, Eaton Towers and American Tower Corp., playing major roles. Active infrastructure sharing has the potential to boost spectral efficiency and give operators the flexibility to redeploy infrastructure to more remote and underserved areas, but this is yet to take hold in the region, partly due to a lack of enabling regulatory framework.

As private investment depends heavily on the regulatory climate, stable and efficient policies and regulations are essential for mobile operators to have the best conditions to roll out mobile broadband networks in underserved areas. For example, given the benefits of infrastructure sharing, governments need to establish policies that allow all types of infrastructure sharing and roaming agreements, based on commercial private

negotiation, and collaborate with local municipalities to support and facilitate the deployment of shared infrastructure. In Uganda, for example, the government is developing a National Broadband Strategy that will promote open access and infrastructure sharing to reduce infrastructure duplication and, by extension, the cost of network deployment.

Governments can also subsidise part of the backhaul infrastructure where necessary, but in many cases a reduction in the industry-specific supply tax rate is sufficient to improve the business case for coverage expansion. Additionally, policymakers can support rural expansion efforts by offering fair and non-discriminatory access to public infrastructure. The majority of existing infrastructure in remote areas, including buildings, open spaces such as parks and squares, legacy fixed-line telecoms infrastructure and public utilities, is owned by governments and public institutions. Making the infrastructure available for installation of cell sites would reduce the cost and complexity of network deployment while guaranteeing security for network equipment in remote locations.

12. Operators share physical components of a cell site (e.g. installing multiple antennas on a single tower)
13. Operators share the radio access network (RAN) or, at a more advanced level, the core network

3.2.2 Addressing the consumer barriers

To better understand the consumer barriers to internet adoption, we analysed the results of the GSMA Intelligence Consumer Survey 2015¹⁴ which covers 54 countries globally, including 13 countries in Africa: Algeria, Cameroon, Democratic Republic of Congo, Côte d'Ivoire, Egypt, Ethiopia, Kenya, Morocco, Mozambique, Nigeria, Sierra Leone, South Africa and Tanzania. In each country approximately 1,000 people were interviewed face-to-face, and were selected so that they were representative of the urban/rural and gender splits of the population. The key findings of the survey for the 13 African countries included the following:



Lack of awareness and locally relevant content was identified as the biggest barrier by 72% of respondents in Egypt and around half of the respondents in Algeria, Morocco, Nigeria and South Africa. It was less of a barrier in several Sub-Saharan African countries, such as Ethiopia (18%), Tanzania (20%) and Sierra Leone (21%).



Affordability recorded the widest spread among respondents, with only 9% and 12% of respondents in Ethiopia and Algeria, respectively, considering it a barrier but around half of respondents in South Africa (46%), Sierra Leone (54%) and Egypt (55%).



Lack of digital literacy and skills is the biggest barrier identified by two-thirds of the respondents in Ethiopia (62%) and Sierra Leone (60%), and around half of those in Tanzania and Morocco. Around a quarter of respondents in Algeria and South Africa consider it a barrier.

14. Consumer barriers to mobile internet adoption in Africa, GSMA Intelligence, July 2016

Table 2

Top consumer barriers to internet adoption

Barrier	Lack of awareness and locally relevant content	Lack of digital skills and literacy	High cost of devices and services (Affordability)
Algeria	51%	23%	12%
Cameroon	43%	28%	27%
Congo, Democratic Republic	45%	28%	21%
Côte d'Ivoire	35%	30%	17%
Egypt	72%	39%	55%
Ethiopia	18%	62%	9%
Kenya	46%	37%	25%
Morocco	49%	51%	33%
Mozambique	34%	27%	39%
Nigeria	53%	32%	24%
Sierra Leone	21%	60%	54%
South Africa	57%	24%	46%
Tanzania	20%	45%	43%

Source: GSMA Intelligence

Note: Represents the share of respondents that identified that factor as a barrier to mobile internet adoption. Respondents could choose more than one answer.

The survey also shows that there is a gender gap¹⁵ in mobile ownership in 6 out of the 13 markets in the survey, and particularly the less mature mobile markets such as DRC and Ethiopia. Across the region, 307 million females in Africa do not own mobile phones, according to a GSMA Connected Women study.¹⁶ Women in Africa are on average 13% less likely to own a mobile phone than men, which translates into 27 million fewer women than men

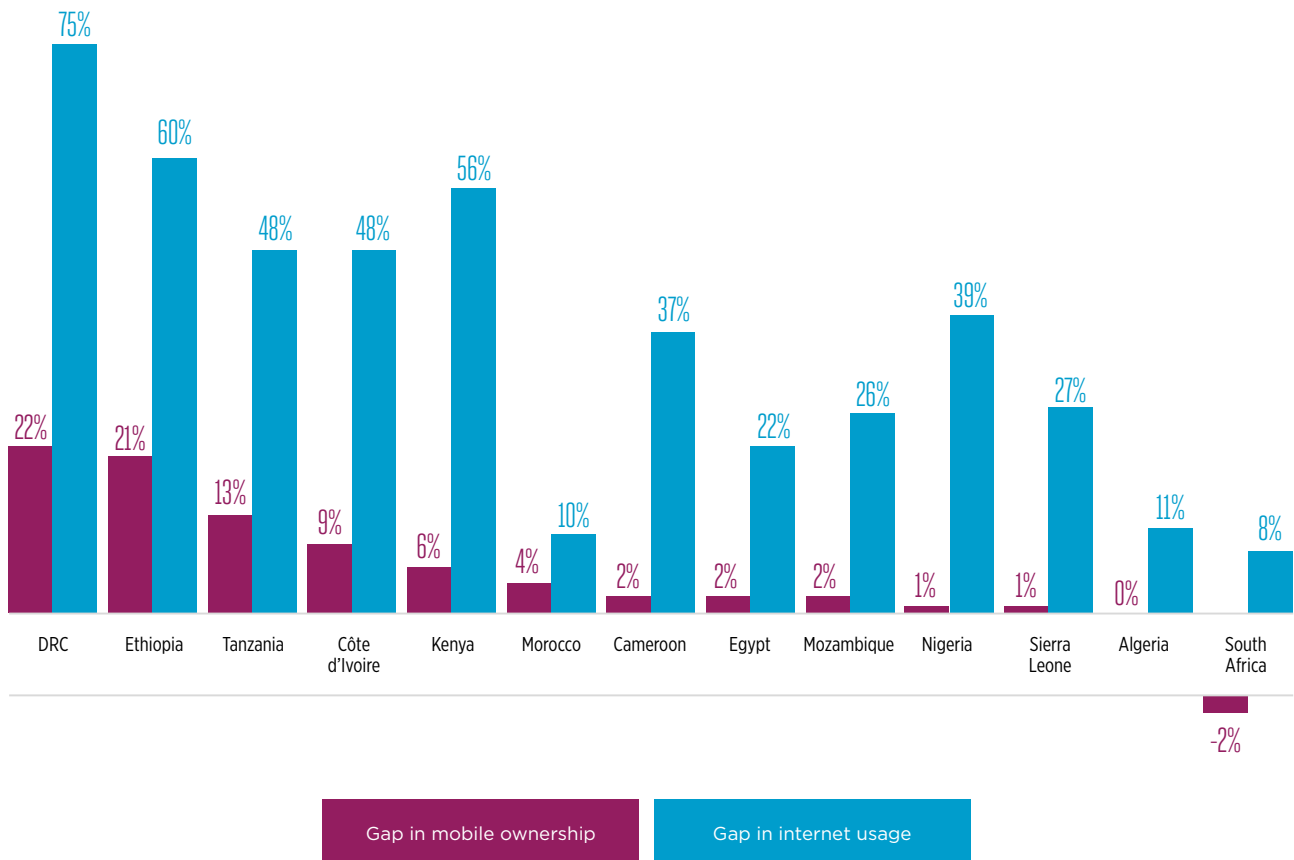
owning mobile phones in Africa. In Niger, women are 45% less likely to own a phone, while in DRC this number is 33%. Cost is a barrier for women as they often have lower incomes or are less financially independent than men. Other barriers include safety and harassment, technical literacy and confidence, network quality and coverage, and operator/agent trust.

15. GSMA Connected Women defines the 'gender gap' as how less likely a female is to own a mobile phone (or use a mobile service) than a male. Gender gap in ownership (%) = ((male phone owners (% of male population)) - (female phone owners (% of female population))) / (male phone owners (% of male population))

16. Bridging the gender gap: Mobile access and usage in low and middle-income countries, GSMA, 2015

Figure 23

The gender gap is generally greater in internet usage than mobile phone ownership



Source: GSMA Intelligence Consumer Survey 2015

The gender gap in internet usage is more significant (Figure 23), with women having far lower access to the internet than men across the continent. This is driven by various barriers, which women often experience more acutely than men, such as a lower level of education and technical literacy. For example, only 25% of female mobile owners in DRC and 51% in Kenya reported that they could use

mobile internet without any help, versus 42% and 63% of men respectively. Addressing the gender gap in mobile phone ownership and mobile internet usage can deliver substantial benefits for women, the mobile industry and the economy by enhancing the quality of life for users, saving money and time, and improving access to health, education and employment opportunities.



Digital skills and local content

Digital skills and local content determine the value that people derive from being on the internet. In Africa, an increase in digital skills has the potential to stimulate demand and increased supply of local content, therefore enabling the development of robust digital ecosystems. However, the region's rich variety of cultures and languages is currently not being catered for by existing mobile content and services, while low education levels and poor social infrastructure, particularly in rural areas, remain major obstacles to the development of digital skills. Addressing these challenges requires collaboration and action from key stakeholders across the mobile ecosystem, including governments, mobile operators, ecosystem players and non-governmental organisations (NGOs).

Mobile operators play a key role in creating and distributing local content, mostly through value-added services that address various socioeconomic issues and the lack of affordable access to essential services such as health, education, energy and financial services. Relevant localised content relating to particular areas, such as agriculture and education, have the potential to make key sectors more efficient, help bring users onto the Internet,

and incentivise them to improve their digital skills. In Tanzania, Millicom's partnership with local start-up Ubongo delivers maths and science content in an interactive way to pupils through the operator's mobile education initiative EduMe. In Malawi, Airtel's agricultural VAS M'Chikumbe provides agronomic advice via interactive voice response on a range of local crops and farming practices, including tips for addressing challenges at different stages of the agricultural cycle. More than 150,000 Airtel subscribers have used the service to date. Similar initiatives across Africa are driving digital inclusion among underserved population segments, notably women, young people and rural dwellers.

Mobile operators are also partnering with global content providers on localised content and other initiatives to improve digital skills in the region. In February 2016, Airtel partnered with Facebook to launch the latter's Free Basics initiative in Nigeria, with more than 85 free services dedicated to health, education, jobs and finance, while Orange partnered with Google to provide access to popular Google products and help customers to better understand the benefits and direct value that mobile internet can bring.

Local content improving digital inclusion

Wazazi Nipendeni is an informative m-health service that offers localised content with text messages and clinic appointment reminders in Swahili to pregnant women, mothers with new-born babies, and caregivers to women and children, with the objective to promote healthy behaviours in pregnancy and early childhood care. The service, which is offered in partnership with all four operators in Tanzania – Airtel, Tigo, Vodacom and Zantel – is available nationwide. A total of 1,250,000 people have registered for the service, of which 350,000 are active users.

MTN Ghana, in partnership with weather company Ignitia, offers highly localised weather forecasts to farmers, who receive daily text messages during the rainy season. Nine months after launch, about 80,000 farmers, most of them in rural areas, had signed up to the service.

Affordability

Lack of affordability of mobile services creates barriers for the unconnected. In many African countries, including the Democratic Republic of Congo, Mozambique, Senegal, Mali and Tanzania, the cost of mobile ownership, which includes the cost of the device and mobile services (voice, SMS and data), is above 5% of personal income. Low-income consumers are most affected by the affordability barrier; in both Chad and Niger, for example, mobile broadband represents around 200% of the annual income of the bottom 20% of the population.¹⁷

Sector-specific taxes, such as airtime excise and SIM taxes, imposed in developing countries on both consumers and mobile operators affect the affordability of services, and reduce incentives for investment and rollout in rural, less profitable areas. In March 2016 the Nigerian government proposed a 9% communication service tax to be

paid by consumers of voice, data, SMS and MMS. By increasing the cost to consumers, the tax will adversely affect adoption of mobile, especially among vast swathes of the unconnected population in lower income groups.

Addressing the affordability barrier requires the creation of policy frameworks which reduce sector-specific tax and fees on mobile to align them with those that apply to other standard goods and services. This has the potential to stimulate investment in extending connectivity, especially in rural areas; increase mobile service adoption; deliver economic growth; and increase government tax revenues in the medium term. A GSMA study on the effects of reforms to sector-specific tax and fees in a number of countries shows increases in mobile adoption and GDP growth in 2020, relative to a scenario with no tax reform (Table 3).

Table 3

Estimated impact of mobile tax reforms across selected countries

Country	Mobile-specific tax reform	Impact
Democratic Republic of Congo (DRC)	Abolition of excise tax of 10% on mobile services	3.2 million connections (+5%) \$970 million in GDP (+2%) \$28 million in tax revenue
Ghana	Reduction in service tax on voice services and abolition on data	1.3 million connections (+3%) \$598 million in GDP (+1%) \$0.67 million in tax revenue
Tanzania	Reduction in the excise tax on mobile services from 17% to 10%	2 million connections (+5%) \$549 million in GDP (+1%) \$11 million in tax revenue
Tunisia	Abolition of the 5% industry fee on mobile services	0.4 million connections (+2%) \$314 million in GDP (+1%) \$22 million in tax revenue

Source: GSMA/Deloitte country studies.

Note: Impacts are estimated as the difference between the modeled scenario and a base case scenario with no tax reduction in 2020.

17. Digital Inclusion and Mobile Sector Taxation, GSMA, 2016

Call to action – steps key stakeholders can take to accelerate the mobile economy through improved digital inclusion

Government – Prioritise long-term aims of digital inclusion, rather than short-term income maximisation. Enable policies that allow all types of infrastructure sharing, and provide fair and non-discriminatory access to public infrastructure for rural rollout. Government agencies and research institutions should collaborate with innovators to digitise relevant data and information for end users.

Donors and investors – Learn and invest in what is holding back women, rural and the youth segments from digital inclusion. Invest in digital skills and advocate for an enabling policy environment for rural connectivity. Partner with governments to improve the ICT infrastructure of public institutions.

Mobile operators – Accelerate rural connectivity expansion plans, in partnership with government. Enable and encourage locally relevant content and identify approaches to overcoming the digital skills and gender gap.

3.3 Mobile delivering financial inclusion

Mobile money continues to deepen financial inclusion in developing countries. The number of registered mobile money users grew by 31% in 2015 to reach a total of 411 million globally, a third of which are active, while the volume of transactions grew by 27% to more than 1 billion. Africa accounts for 52% of the 271 live mobile money services in 93 countries and 64% of all active mobile money accounts. Six new services were launched in the region in 2015 (including for the first time in the Seychelles), with another four services in the first half of 2016 (including for the first time in Gambia).

As the reach of mobile money continues to expand, the potential to change the landscape of financial inclusion for the unbanked or underserved is that much greater. According to the World Bank's data on financial inclusion¹⁸, the number of unbanked adults globally fell from 2.5 billion in 2011 to 2 billion in 2014. The impact of mobile money in Sub-Saharan Africa is shown by the ten-percentage point increase in the number of adults with a mobile money account from 24% in 2011 to 34% in 2014.

Mobile money is now available in six of the seven markets where less than 20% of the adult population have an account at a financial institution. Increasingly, mobile operators are tracking data on the gender and urban/rural split of their customer base to capture the social and commercial opportunities of reaching underserved segments of the population. Available data shows that, globally, 37% of customers are female while 47% live in rural areas.

18. Findex 2014



AT A GLANCE: MOBILE MONEY IN AFRICA

OF THE 271 LIVE
MOBILE MONEY
SERVICES GLOBALLY,

 **54%**

ARE IN
SUB-SAHARAN AFRICA

MARKETS WHERE
INTEROPERABILITY*
IS LIVE IN THE REGION

 **3**

Madagascar, Rwanda
and Tanzania



REGISTERED
ACCOUNTS
GREW BY 29%

A TOTAL OF
226m
IN 2015

THE REGION
ACCOUNTS FOR

 **63%**

OF ACTIVE
MOBILE MONEY
ACCOUNTS
GLOBALLY (90-DAY)

ECOSYSTEM TRANSACTION
VALUES IN AFRICA GREW
34% IN 2015,
AND WERE WORTH

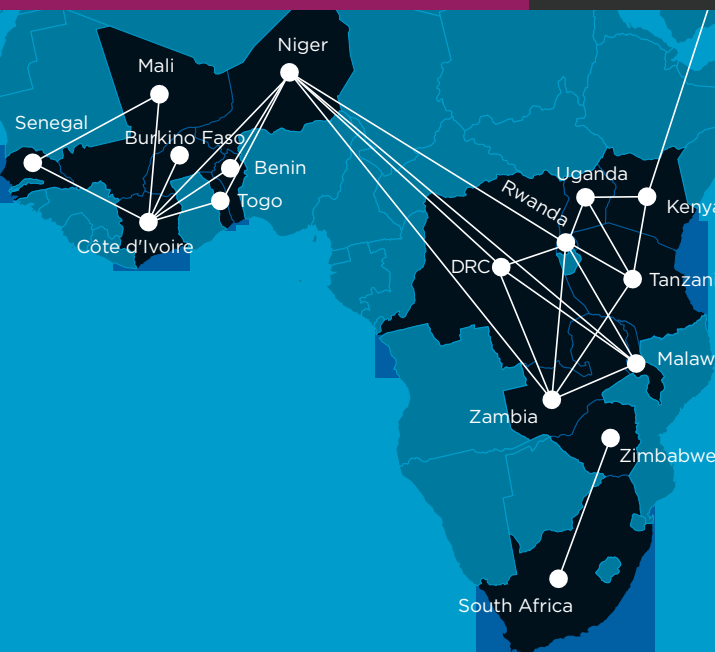
 **\$1.2bn**

IN DECEMBER

ACTIVE MOBILE MONEY
AGENTS IN AFRICA
GREW BY

 **30%**
IN 2015

ACCOUNTING FOR 43%
OF ALL ACTIVE AGENTS
GLOBALLY



GLOBALLY, CROSS-BORDER MOBILE MONEY
REMITTANCES GREW MORE THAN
ANY OTHER ECOSYSTEM PRODUCT IN 2015

4 OUT OF **5**

MOBILE MONEY-BASED
INTERNATIONAL REMITTANCE
TRANSACTIONS OCCUR IN AFRICA

* The ability for customers to undertake money transfers between two accounts at different mobile money schemes, or to transfer money between accounts at mobile money schemes and accounts at banks.

Mobile money interoperability and industry collaboration continue to gather steam with launches in three new interoperable account-to-account markets in 2015 and more expected in 2016. Globally, the number of markets where mobile money customers can send and receive money from customers of other mobile money services has increased to eight, with three of these – Madagascar, Rwanda and Tanzania – in Africa. Meanwhile, the increasing number of services connected to banks means that mobile money is performing an important role in providing access to savings and credit for mobile money customers who were previously excluded from the formal financial system, allowing banks to leverage the mobile access channel, and ultimately contributing to greater financial inclusion.

Mobile money is having a significant impact enabling efficient and convenient international money transfer. Cross-border mobile money remittance initiatives expanded to 29 corridors in 2015, connecting 19 countries by the end of the year; 17 of them are in Africa and accounted for 83% of all international remittances. Using mobile money as both a sending and receiving channel for international money transfers can significantly bring down the cost of remittances for users. Consequently, more regulators are recognising the importance of creating an open and level playing field for mobile money services, although there are challenges around complex foreign exchange regulation and risk management that need to be overcome if the industry is to make significant progress in this area.



Call to action – steps key stakeholders can take to accelerate the mobile economy towards greater financial inclusion

Government – Create enabling policy environments for non-banks to provide digital financial services; ensure the poor are not excluded from mobile money by onerous KYC requirements.

Donors and investors – Learn and invest in new approaches to extend financial services to the underserved, especially women and rural populations; keep the needs of the underserved in focus for the mobile money industry; and advocate for enabling policy environments for digital financial services to reach scale.

Mobile operators – Accelerate and harmonise APIs to enable the full ecosystem; embrace interoperability to ensure wallets are interconnected with other providers.

3.4 Mobile addressing social challenges in developing markets

Countries across the developing world face a range of socioeconomic challenges that need to be addressed to engender inclusive growth and sustainable development. Large swathes of the population in some countries, particularly in rural areas, lack access to many essential services, including health, education and financial services. These issues are further compounded by rapid population growth, with the potential for high youth unemployment in the future, food shortages and lack of access to basic energy and utilities.

3.4.1 Supporting the UN Sustainable Development Goals




In September 2015, the UN introduced its Sustainable Development Goals (SDGs) to the world — a 17-point plan to end poverty, combat climate change and fight injustice and inequality by 2030. Mobile connectivity is essential to the achievement of the SDGs: globally, the industry has already connected 4.7 billion people, enabling greater inclusion in vast cities and remote villages, transforming communities, delivering healthcare in ways never imagined, opening doors to education, employment and income opportunities, creating smarter cities, empowering people with the tools they need to thrive, and driving a more sustainable planet.

The GSMA and mobile operators are united in support for helping achieve the SDGs in Africa, leveraging the power of mobile networks to accelerate this journey in a way that no other technology can. Across the region, mobile is already playing a key role in tackling various social and economic challenges around poverty eradication, agriculture, health, education, gender equality, water resource management and sanitation, affordable energy access, employment, infrastructure, inequality reduction, safer cities and climate change.

Table 4

Selected SDGs and mobile operator initiatives

CASE STUDIES

<p>2 ZERO HUNGER</p> 	<p>AGRICULTURE - End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.</p> <p>Agriculture is the main contributor to GDP in emerging markets and the largest employer. Mobile operators provide nutritional information to improve the health of people in emerging markets. They are also leading delivery of critical information to improve the crop yields and incomes of smallholder farmers.</p>	<p>Tigo Kilimo, Tanzania</p> <p>Tigo Kilimo is an agricultural value-added service provided by mobile network operator Tigo in Tanzania. The service offers information for farmers and can be accessed via four mobile channels: USSD, push SMS subscription, IVR or a helpline. Tigo Kilimo provides agronomic tips on ten major crops, market price information on the crops for key markets, and weather forecasts for 26 regions of the country. This service was launched in December 2012 and has more than 400,000 registered users.</p>
<p>3 GOOD HEALTH AND WELL-BEING</p> 	<p>HEALTH - Ensure healthy lives and promote well-being for all at all ages.</p> <p>Mobile is having a profound impact on the healthcare industry, with over 1,200 mobile health initiatives deployed to date. Mobile networks enable the delivery of mobile health to people and places previously unreached, providing healthcare to those who need it most.</p>	<p>Chipatala Cha Pa Foni, Malawi</p> <p>In December 2015, Airtel Malawi partnered with VillageReach V to relaunch 'Chipatala Cha Pa Foni' an integrated service merging the original maternal and child health Chipatala Cha Pa Foni service with Airtel Malawi's Dial-a-Doctor service. With this integrated service, a user can dial a shortcode and connect to a hotline worker. The hotline worker can directly refer appropriate cases to an on-call Dial-a-Doctor physician. Calls are answered in the local dialect Chichewa.</p> <p>The service also promotes a maternal and child health information service run by VillageReach. This was launched in one district and garnered approximately 1,000 calls per month. The partnership has led to the service scaling to four additional districts, with an average of 4,000 calls per month.</p>
<p>4 QUALITY EDUCATION</p> 	<p>EDUCATION - Ensure inclusive and equitable quality education, and promote lifelong learning opportunities for all.</p> <p>Mobile operators are working to support students and teachers in integrating mobile technologies into the classroom. Mobile also enables access to greater learning opportunities for youth in urban hubs and remote locations.</p>	<p>Najja7ni, Tunisia</p> <p>In Tunisia, where 30% of people below the age of 30 are unemployed, the Najja7ni m-learning initiative has helped more than 1 million marginalised young people improve their education, employability and financial inclusion.</p> <p>The initiative was launched in 2010 with an education service for primary and secondary school children, and has since developed with an m-English service in 2011 and the employment service in 2013 focused on helping young job seekers and entrepreneurs succeed in the job market. Najja7ni Education offers children from remote areas, and disadvantaged children in urban areas, the chance to learn mathematics, sciences, Arabic, French and English. The approach works through popular subject areas such as travel, technology and the environment and uses around 2,500 questions and answers.</p>

5 GENDER EQUALITY



WOMEN EMPOWERMENT - Achieve gender equality and empower all women and girls.

200 million fewer women than men own mobile phones in low- and middle-income countries. The mobile industry is working to close this gender gap and deliver socio-economic benefits to women, such as increased access to financial, health, education and employment services and opportunities.

6 CLEAN WATER AND SANITATION



WATER - Ensure availability and sustainable management of water and sanitation for all.

262 million people without access to an improved drinking water source live in areas covered by mobile networks. Mobile networks and services can improve the efficiency of water and sanitation services and extend their reach.

7 AFFORDABLE AND CLEAN ENERGY



ENERGY - Ensure access to affordable, reliable, sustainable and modern energy for all.

More than half of the 1.2 billion people who lack access to electricity are covered by mobile networks. Mobile technology can increase the access to and efficiency of reliable energy services through mobile payments and smart energy metering solutions.

CASE STUDIES

Sini Tonon and Tin Nogoya, Mali

In Mali, mobile money customers tend to use their mobile money account as cash storage, insurance products are lacking, and fertility and maternal mortality rates are some of the highest in the world. Orange Money saw an opportunity to launch two linked savings and insurance products targeted at Malian women, a previously untapped market.

Sini Tonon, the savings product, is offered on the Orange Money platform. The savings account can be opened by any Orange Money subscriber with a minimum initial deposit of XOF3,000 (approximately \$5), by selecting an option in the USSD mobile money menu to move money from the main wallet to the savings account.

Tin Nogoya is an insurance product that activates automatically when a savings balance reaches XOF40,000 (approximately \$66) in the Sini Tonon account. It gives the user 12 months of life/disability and maternal health insurance.

Sini Tonon has encouraged saving habits among both female and male customers, and Tin Nogoya is well positioned to provide previously uninsured customers with access to micro-insurance. With these products, Orange has the potential to penetrate new customer segments and increase usage rates for its mobile money service, especially among women.

Water usage monitoring solution, South Africa

Mobile operator MTN has developed a usage monitoring solution for water utilities. Its system is web-based; data can be accessed from any device with an internet connection. The utility's staff can view and monitor a number of sites, and receive information on the total monthly water consumption, the number of anomalies detected and solved, as well as those that remain unsolved, and the estimated monthly savings on water bills.

Results suggest significant savings for partners: a pilot test showed that a company losing 21,000 litres of water a day from a leak and paying a ZAR400,000 (\$30,800) bill every month as a result would save an estimated ZAR3.5 million (\$270,000) per year by using the monitoring platform.

Mobisol – pay-as-you-go solar, Rwanda

Mobisol launched its pay-as-you-go solar business in Rwanda in 2012. Mobisol offers off-grid customers in emerging markets prepaid solar home systems paid through a 36-month loan term, including customer support and maintenance. This PAYG model is enabled by mobile payments and GSM-based machine-to-machine (M2M) connectivity in the solar unit to monitor system usage and performance while providing Mobisol remote control.

Some 22% of all Mobisol customers in 2014 opted to buy the business kit to generate income with their systems, confirming Mobisol's expectations that 20–30% of customers would invest in a system that could generate revenue through a charging service. One of the most significant livelihood benefits to Mobisol entrepreneurs was the finding that they can earn an estimated RWF25,000 (\$35) per month from their phone and lantern charging business, exceeding the monthly cost of Mobisol's 100W system with the business kit. Furthermore, 80% of Mobisol entrepreneurs keep their business open 1.5 hours longer than before Mobisol, resulting in additional revenue.

4 How to deliver greater connectivity

Africa is heavily dependent on mobile networks to deliver the connectivity that its hundreds of millions of citizens and companies need. The capacity and coverage of any wireless network is largely determined by the radio frequencies it is able to use. If policymakers across the region step up efforts to allow mobile operators to have access to the spectrum they need, Africa will enjoy major social and economic benefits. Spectrum has no intrinsic value, but can be a valuable resource when put to productive use.



4.1 Extending and enhancing coverage

With use of online and digital services rising rapidly across Africa, the region's governments urgently need to release more spectrum for mobile broadband services. To enable Africa's citizens and companies to benefit from economies of scale and avoid cross-border interference, policymakers should look to make more internationally harmonised spectrum available to mobile operators.

Today, Africa is only scratching the surface of what is possible with mobile connectivity. Many of the continent's communities lack mobile coverage and mobile internet access, primarily because operators don't have sufficient low-frequency spectrum; bands below 1GHz are well-suited to covering rural areas and penetrating walls.

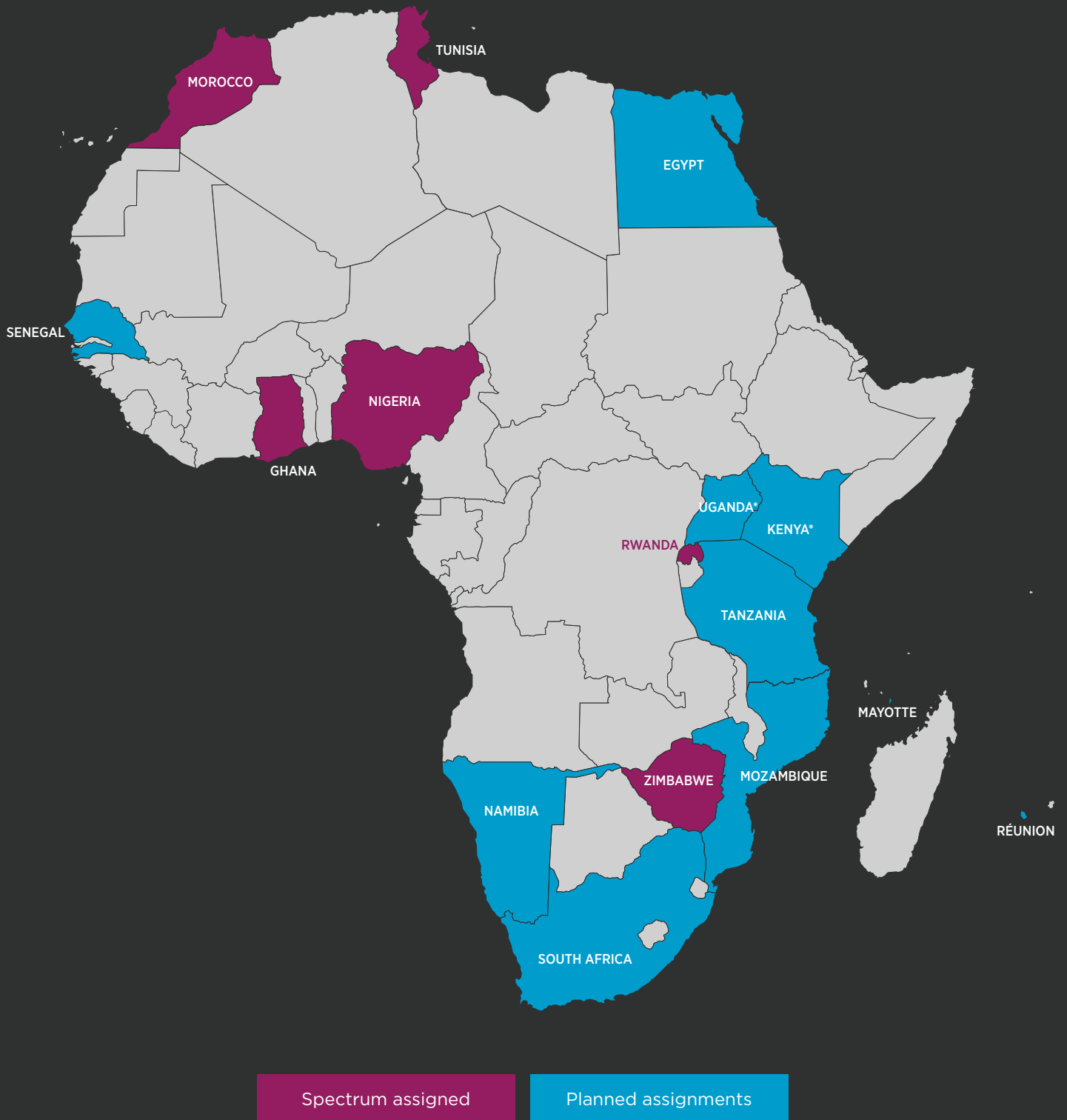
To address this pressing problem, African governments need to prioritise the release of the 800 MHz and 700 MHz frequency bands for mobile broadband services. Employing this low-frequency spectrum would enable mobile operators to dramatically increase coverage beyond urban areas, enabling many more people to access the Internet

and life-enhancing online apps and content, such as mobile money services, health information and educational material.

One of the major factors inhibiting the development of Africa's digital economy is the shortage of appropriate spectrum for mobile operators, caused in large part by the slow progress of the ongoing switchover from analogue to digital terrestrial television. Most African governments failed to meet the International Telecommunication Union's (ITU) deadline for the switchover (June 2015) despite the urgent need to release this spectrum for mobile broadband services.

Figure 24

Progress on UHF spectrum assignment in Africa



*Kenya and Uganda have assigned most of the 800 MHz band. The 700 MHz is still in the planning phase
Source: GSMA Intelligence

Some African countries have either completed the digital switchover process or are near to completion. This paves the way for mobile operators to roll out their networks, enabling citizens to benefit from new and innovative mobile services. Kenya, for example, completed the switchover in 2015, while Ghana is currently targeting the end of 2016.

In many countries, attempts to harness the digital dividend have been derailed by disputes over who should pay for the rollout of the set-top boxes required to receive digital television signals. South Africa, for example, has been working on the switchover for the past five years. The country began simultaneous broadcasting of analogue and digital TV broadcast signals in 2011. The digital terrestrial broadcasting network now covers 87% of the population, with the remainder of the country receiving satellite coverage. But analogue terrestrial TV is still being broadcast: stakeholders are debating the funding and local manufacturing of set-top boxes, while a private free-to-air broadcaster E-TV has mounted a legal challenge, as it wants the government to fund encryption in the set-top boxes.

The South African telecoms regulator ICASA has made several attempts to license the spectrum in the 700, 800 and 2600 MHz bands for mobile services. But the process has been put on hold until a policy review has been completed. This is likely to lead to the publication of a paper outlining how the South African government intends to implement its national broadband plan. Policymakers have indicated that they wish to appoint Telkom South Africa, the former fixed line incumbent part-owned by the government, to be the 'National Broadband Champion'. This would result in establishing a wholesale open access network, which could lead to challenges in establishing, funding and regulating the network. The GSMA has previously recommended that the government consider a mix

of demand- and supply-side initiatives to increase broadband penetration in the country.¹⁹ The latter should focus on a range of industry-led initiatives and government policies that can incentivise the desired outcomes.

Some African countries are even further off reaping the benefits of the digital dividend. In Nigeria, the most populous country in Africa, the 700 MHz band remains allocated to TV broadcasting after the country missed the June 2015 deadline. However, the government has established an inter-ministerial committee to ensure the process is completed in time for the Economic Community of West African States (ECOWAS) June 2017 deadline. Nigeria is also moving to release the 850 MHz band (previously assigned to CDMA mobile services) for 4G services in line with the ITU Region 1 800 MHz channel plan. In the new channel plan, two existing CDMA operators and a new entrant were assigned 2×10 MHz each. Other CDMA regional operators that have long been non-operational have also been reassigned within a 5 MHz block at the end of the band. Unfortunately, this fragmentation will mean that the full potential of this spectrum is unlikely to be realised.

In Senegal, the digital switchover was initially scheduled to be completed by 31 December 2015, but the 700 MHz frequency band is still partially occupied by analogue TV broadcasting due to delays in equipment delivery. Once the switchover is complete, the whole bandwidth (2×30 MHz) will be available to be assigned to 4G networks. Ideally, Senegal should also use the internationally harmonised 800 MHz frequency band to extend mobile broadband coverage, but this band is partially occupied by CDMA operators and by analogue TV broadcasting. As a result, only 2×20 MHz of spectrum in the 800 MHz band is available to be assigned for 4G services.

19. Government intervention in the South African broadband market, GSMA, September 2014

Funding the digital migration: Senegal

The deployment of new equipment as part of the digital switchover in Senegal is ongoing. EXCAF Telecom, which won the public tender in 2014, is leading the process. The company will entirely fund and build the new digital terrestrial television transmitters and then transfer the infrastructure to the Senegalese government. However, EXCAF will retain the right to the commercial use of two of the four multiplexers for a 10-year period.

As of today, 20 of the 25 sites specified in the switchover plan have already been built, with 10 of these active and broadcasting DTV programming. The remaining sites are expected to be operational by the end of the year, allowing the completion of the digital migration.

4.2 A roadmap for the release of new spectrum

At the World Radiocommunication Conference 2015 (WRC-15) in Geneva, government delegations agreed to allocate several important frequency bands for mobile services. Once they are in service, these bands will make a major difference to the connectivity available in Africa, reducing the digital divide between urban and rural areas. WRC-15 paved the way for the amount of internationally harmonised spectrum available for mobile services in Sub-Saharan Africa to increase by more than 50% to 1372 MHz. That will put the region on a par with Europe and Asia Pacific.

Sub-Saharan Africa (and Egypt)

Before: 885 MHz

New: 487 MHz

After: 1372 MHz

New bands: 700 MHz (96 MHz), L-band (91 MHz), 3.4–3.6 GHz (200 MHz)
3.3–3.4 GHz (100 MHz)

Broadly in line with the common proposals submitted by Africa before the event, the WRC-15 agreed to globally harmonise the following bands for mobile:

- **700 MHz** – low-frequency spectrum, well suited to extending mobile broadband coverage
- **1427–1518 MHz** – mid-range spectrum providing a good mix of coverage and capacity
- **3.4–3.6 GHz** – high-frequency spectrum, which could enable very fast data speeds in urban areas

WRC-15 also agreed to allocate one further new band (3.3–3.4 GHz) for mobile broadband in large parts of Africa, Asia Pacific and the Americas. Governments could release this high frequency band to provide a vital capacity boost in densely populated areas.

African governments also need to begin preparing for the next WRC in 2019, which will identify bands to allocate for the next generation of mobile technologies. These 5G technologies will further increase wireless throughput speeds and network responsiveness, enabling a broad range of new services for businesses and individuals. 5G will also deliver another step change in efficiency, lowering the cost of connectivity across Africa and other regions. The outcome of WRC in 2019 will be key on the journey to further mobile innovation and hyper connectivity.

The next steps towards greater connectivity

In the aftermath of WRC-15, Africa's governments and regulators need to review the current use of the new frequency bands allocated to mobile services (if this wasn't done during the process of WRC-15) and update their National Frequency Allocation Tables accordingly.

The next step is for governments to discuss with the mobile industry and other stakeholders when to make the bands allocated to mobile services at WRC-15 available for use. Ideally, the timeframes for the release of each band should be published in a spectrum roadmap that will help the mobile industry plan ahead and ensure appropriate equipment is available. African governments can coordinate the timely release of spectrum through regional bodies such as ECOWAS and SADC, and ultimately align positions through the ATU.

To maximise economies of scale and the availability of devices, governments also need to work with the mobile industry, the ITU, standards body 3GPP and other governments to optimise the channel plans for the new spectrum. Internationally harmonised channel plans will enable the mobile industry to deliver affordable devices and interoperability across networks and countries, and also reduce cross-border interference. For example, if regulators adopt the lower duplexer of the APT700 channel plan being used in Asia for the 700 MHz frequency band, Africa's citizens and businesses will be able to choose from a wide range of compatible devices already being produced by vendors for the Asian market. Wherever possible, new mobile licences should be based on internationally harmonised channel plans.

4.3 Assigning and pricing spectrum effectively

Spectrum has no intrinsic value. Value is only created when the spectrum is actually in use. Therefore, an effective licensing process is crucial to harness the potential of this key natural resource. Moreover, to give investors confidence, spectrum needs to be licensed in a way that is transparent, consistent and predictable. For operators to invest and build networks, there has to be a prospect of a return on investment. The return on investment needs to be at least as high as that in an alternative investment of similar risk.

When releasing spectrum, policymakers and regulators should look to adopt the following principles²⁰:

- Maximise the amount of available spectrum: licence all the available spectrum in a particular frequency band, rather than artificially ration it.
- Avoid fragmentation of spectrum: ensure that LTE services can be delivered through a minimum channel size of 2×10 MHz in order to ensure better spectral efficiency.
- Make the licence technology-neutral.
- License spectrum to those that value it most highly: carefully designed multi-round auctions are typically the best award mechanism.
- Spectrum rights and obligations should be clearly defined.
- Award long licence terms with a presumption of renewal.
- Ensure ongoing spectrum usage charges are predictable and clear.
- Let bidders know if there will be a new entrant before asking them to bid.
- Spectrum fees should be structured as 'sunk costs' to reduce distortions on future pricing and investment decisions.
- Spectrum fees should not be so high as to risk distortions: reserve prices should be low but non-trivial.
- Spectrum usage fees should be low and relate only to administrative costs of managing spectrum.

20. Source: Coleago Consulting, Spectrum Award Best Practices

Although auctions are often the most effective method of licensing spectrum when demand exceeds supply, other approaches can also work well. This is particularly the case where the government is trying to maximise the availability of mobile broadband. In 2012, for example, Chile assigned the 2.6 GHz band via a so-called beauty contest. The government set a very low price for the spectrum in recognition of the large amount of investment that would be required by mobile operators to meet the coverage conditions on time. All the incumbent mobile operators secured spectrum in the band and they collectively invested about \$600 million, meeting the licensing conditions ahead of schedule.

In Côte d'Ivoire, the government awarded spectrum using an administrative process. The government held initial discussions with the industry to discuss the licence renewal process and their appetite for 4G licences. The award process itself included several consultations with the mobile operators. However, countries have to ensure that beauty contests are fair and transparent.

Having administratively assigned 2×15 MHz in the 800 MHz band to Safaricom, the Communications Authority of Kenya (CA) came under fire, with some operators expressing dissatisfaction with what was perceived as opacity around the assignment. The CA has taken note of these concerns and is taking action to ensure that all market players have access to the 800 MHz band. In the meantime, Airtel has requested and been granted approval to commence LTE trials in the 800 MHz band. The regulator is also likely to take appropriate action to address concerns around interference issues in the band.

Kenya plans to license the 700 and 2600 MHz frequency bands jointly via an auction, following the controversy over the way it awarded 800 MHz spectrum. However, the CA intends to resolve the situation with the 800 MHz band before assigning the 700 and 2600 MHz bands. In the interim, the CA is urgently building the necessary expertise to handle the 700 and 2600 MHz assignments in the proper manner, and avoid the pitfalls experienced with the 800 MHz assignment.

Spectrum auctions can also fail if there are flaws in their design, highlighting the need for the regulator to set appropriate conditions of use and realistic pricing levels for spectrum. In Senegal, for example, the three incumbent mobile operators refused to bid in a January 2016 auction. This had set a reserve price of \$50 million for a 20-year licence for spectrum in the 700 and 1800 MHz frequency bands and did not allow for spectrum refarming. In Ghana, only one mobile operator bid for the 800 MHz spectrum auctioned in 2015, in response to a reserve price of \$67.5 million per lot of 2×10 MHz.

There was a similar outcome in the recent Nigerian auction of the 2.6 GHz spectrum band. Only one bidder expressed an interest in six of the 14 lots of 2×5 MHz spectrum on offer in the auction, at the reserve price of \$96 million for the six lots.

4.3.1 Maintaining market flexibility

Regulators need to ensure that spectrum rules do not constrain innovation and investment in their markets. In some cases, the weakest operators in a market cannot build a business case to make the investments necessary to maximise the use of their spectrum. The operator will then typically look to be acquired or sell some of its spectrum assets. But regulatory caps on how much spectrum an operator is allowed to hold can prevent the consolidation required to fuel further network investment.

In some cases, regulators and operators are able to reach a compromise. In Colombia, for example, Tigo was given the green light to buy UNE despite the fact that the acquisition would take Tigo over the spectrum cap. The consolidation was approved after Tigo agreed to return part of its spectrum in the upper frequency bands.

In many cases, consolidation can have a positive impact on consumers. After AT&T acquired Iusacell and Nextel in Mexico in early 2015, prices came down, roaming tariffs between the US and Mexico were eliminated, and overall industry investments in Mexico rose.

Ensuring spectrum is put to good use

In Africa, as elsewhere in the world, governments cannot afford to let spectrum lie idle. Radio frequencies need to be employed as efficiently and effectively as possible. In practice that means releasing spectrum in a way that ensures that the licence holder will invest in mobile broadband networks.

In particular, policymakers in Africa need to ensure that the low-frequency spectrum below 1 GHz is employed to extend mobile broadband coverage across their countries. Reducing the digital divide between urban and rural areas will boost economic activity, help to alleviate poverty, improve healthcare and education, expand financial inclusion and enhance agriculture. There is no time to lose.



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