Sub-Saharan Africa Mobile Observatory 2012

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and

Contents

Executive Summary

Over the past decade, sub-Saharan Africa (SSA), a region formed by 47[1] diverse countries with a combined population of over 830 million, has experienced significant economic growth. The region includes seven of the 10 fastest growing economies in the world.

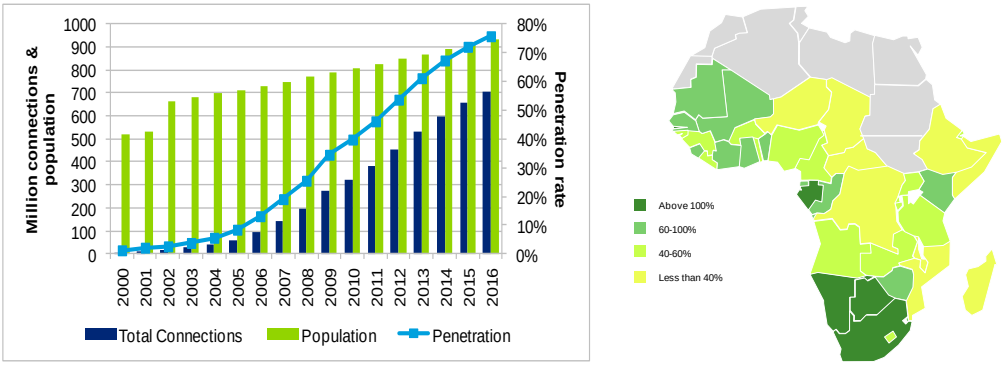
Mobile services have transformed African societies

Governments in SSA have successfully liberalised the telecommunications sector, and competition has increased service affordability. This has generated a remarkable rate of growth in the mobile market across the region, the highest worldwide.

Since 2000, the number of connections in SSA has grown by 44%, compared to an average of 34% for developing regions and 10% for developed regions as a whole. Mirroring the region's economic expansion, growth in mobile can reasonably be expected to continue in the medium term. Operators in five key SSA markets (Nigeria, Tanzania, South Africa, Kenya and Ghana) invested US$16.5 billion over the past five years and US$2.8 billion in 2011. Most of this investment has been focused on expanding network capacity, increasing the number of base stations in these five countries by 250% between 2007 and 2012.

This investment is critical to the citizens of SSA, as mobile services effectively provide all forms of telecommunications, to an extent not seen in any other part of the world. In SSA in 2010, there were 28 mobile connections for each fixed line subscription.

Figure 1: Mobile connections, population and penetration in SSA since 2000; and map of mobile penetration, 2012



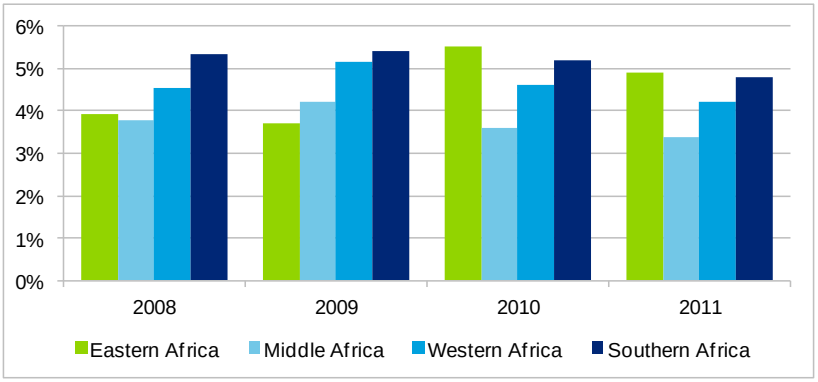
Source: Wireless Intelligence

The economies of SSA have benefited considerably from the growth of the mobile sector. In 2011, it is estimated that mobile operators and their associated ecosystems:

- Had a direct economic impact of US$32 billion, including paying US$12 billion in taxes
- Were associated with the creation of 4.4% of the region's GDP when adding the effects of mobile technology on workers' productivity

[1] Mayotte and Reunion were excluded from the analysis because of lack of data; South Sudan and Sudan will be part of a forthcoming report on Middle East and North Africa.

Figure 2: Total economic impact in SSA as a proportion of GDP



Source: Deloitte analysis

- Created more than 3.5 million full-time equivalent (FTE) jobs across both the formal and informal sectors. While the telecommunications industry produces some of the highest paid formal sector employment in SSA, there are numerous other ways in which employment has flourished, including phone credit distribution networks, shops selling mobile phone airtime in small denominations, individual traders selling airtime cards in the streets, and small-scale (and often informal) shops selling, repairing and recharging mobile phones.

- Supported the development of more than 50 tech hubs, labs, incubators and accelerators. This includes Nokia's dedicated research centre in Nairobi, focused on understanding the needs of African mobile users, in order to develop regionally specific products and content.

Mobile has the potential to deliver the benefits of the internet across the region, but constraints must be addressed

Mobile broadband has the potential to further expand this transformative experience by bringing the internet to consumers in SSA. The lack of affordability, coverage and reliability of fixed networks across the region means that mobile broadband is the only way for the vast majority of consumers to access the internet.

The proportion of web browsing using mobile technology relative to that done across fixed lines is therefore the highest in the world. For example, according to Statcounter, in Zimbabwe 58.1% of web traffic is mobile-based, as is 57.9% in Nigeria and 44% in Zambia, compared to a global average of 10%. This growth of mobile broadband can only be expected to continue, particularly among lower income groups; overall, mobile internet traffic is forecast to grow 25-fold over the next four years.

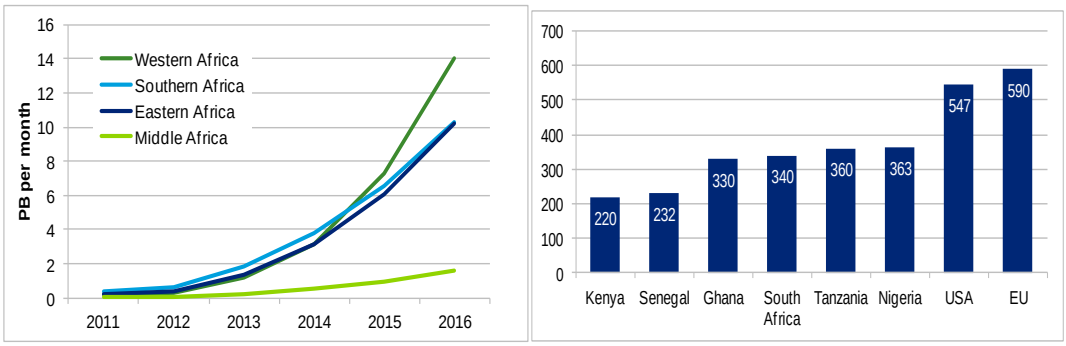
Mobile broadband has the potential to further increase economic productivity through improved information flows, reduced travel time and costs, and ultimately improved business efficiency. 3G penetration levels are forecast to grow by 46% through 2016 as the use of mobile-specific services develops. SSA is the world leader in mMoney initiatives, and the region led the development of more than 50 such programmes in 2011, compared to 20 in East Asia and fewer elsewhere. Of particular note is the role of Kenya as the global leader in mobile money transfer services through M-PESA.

However, as this report describes, a number of constraints exist for the development of the sector and the expansion of mobile broadband.

Access to harmonised spectrum is critical to the development of mobile broadband

The development of mobile broadband is expected to lead to rapid increases in mobile traffic. This has already been experienced in South Africa, where mobile data usage grew on average by 490% per year between 2007 (when it was introduced) and 2010. Availability of mobile spectrum is essential for the successful development and operation of mobile broadband. However, the amount of spectrum allocated to mobile services in Africa is currently among the lowest worldwide, with some countries allocating as little as 80MHz and many between 200MHz and 300MHz. In comparison, developed-market allocations typically exceed 500MHz, with Europe aiming to allocate 1000MHz, for example. Governments in SSA risk undermining their broadband and development goals unless similar levels of spectrum are made available.

Figure 3: Estimated total mobile internet traffic in SSA, by sub-region (2011–2016); and assigned mobile spectrum for leading SSA countries, 2011 (MHz)



Source: Wireless Intelligence and Deloitte analysis

In particular, releasing the Digital Dividend spectrum and liberalising existing spectrum licences so that operators can use spectrum in the 900MHz and 1800MHz bands for 3G or LTE technology would provide operators across SSA with the capacity required to support mobile broadband networks. The Digital Dividend band, in the lower end of the radio frequency spectrum, has the ideal characteristics for delivering mobile broadband. Without additional spectrum, the potential of mobile broadband may be constrained by increased costs (and therefore higher retail prices) and reduced coverage, as network investment budgets will be unable fully provide the network coverage required.

The importance of allocating sufficient harmonised spectrum to mobile is made clear by the potential economic effects. A recent GSMA study estimates the economic benefits of releasing additional spectrum[2] in the 800MHz and 2.6GHz bands. It considers the supply-side effects of spectrum availability using a detailed bottom-up analysis in the five key countries and Senegal. Across these countries, releasing spectrum in the 800MHz and 2.6GHz bands is estimated to potentially increase GDP by an extra US$22.6 billion between 2015 and 2020, including an additional $US4.9 billion in tax revenue. Additional spectrum would increase the number of connections in these countries by approximately 80 million by 2020, and an additional 10 million jobs would be created in these countries. If this analysis were extrapolated to include the release of spectrum in the 700MHz band and operators were free to use a portion of existing 1800MHz spectrum allocations for LTE services in the short term, further economic benefits could be realised. While some assumptions are required over traffic levels and the ratio of jobs created to GDP, this spectrum release has the potential to provide incremental benefits:

- Increase GDP by an extra US$11 billion between 2015 and 2020, including an additional US$2.3 billion in tax

[2] GSMA, "*The benefits of releasing spectrum for mobile broadband in Sub-Saharan Africa*", 2011.

- Create an additional 39 million connections, giving an average increase of 7% in mobile broadband penetration across these countries

- Create additional employment of 4.9 million

In summary, the combined effect of releasing the Digital Dividend (700MHz and 800MHz) and 2.6GHz bands and refarming the 1800MHz band would have a US$33.6 billion impact on GDP between 2015 and 2020, leading to the creation of 14.9 million jobs in the top six markets.

Mobile data usage impacts economic growth in the medium term by increasing the productivity of users. A recent Deloitte and GSMA study using data provided by Cisco Systems found that, on average, a doubling of mobile data use leads to an increase in GDP per capita of 0.51 percentage points. Extrapolating these results onto the future of SSA, GDP could increase by US$40 billion over the next four years, representing approximately 0.5% of the total GDP for the region during that period, assuming spectrum and other constraints to the roll out of the technology are addressed.

Liberalising spectrum has the potential to provide an effective short-term solution, allowing operators to deploy technology for mobile broadband while they wait for appropriate spectrum to be released. This trend has been observed in the United States and Europe in recent years, where operators have successfully 'refarmed' spectrum in the 900MHz and 1800MHz bands, previously used for GSM, to provide UMTS and LTE services.

As well as making more spectrum available for mobile, it is important that spectrum allocations align with internationally harmonised bands. If the same band plans are used internationally, the components of mobile devices can be standardised. This approach can lead to a significant fall in the cost of devices and therefore reduce retail prices and increase consumer take-up. It has been estimated that failure to achieve spectrum harmonisation in the region can increase device costs by up to US$9.3, representing up to 18% of an affordable smartphone's cost.

Taxation should not stifle the development of mobile broadband

Africa has the highest taxation as a proportion of the total cost of mobile ownership among developing regions worldwide. In particular, taxes on handset and mobile devices are much higher than in any other region, constraining citizens' access to mobile services.

Of particular concern are a number of sector-specific taxes on mobile terminals and usage, and special taxes on mobile usage have increased notably in recent years. Recently, Kenya, the world leader in mobile banking services, announced a new 10% tax on money transaction services, threatening an initiative that is in the vanguard of the country's economic and social development.

Standardised rights of way are required to support network deployment

Approval processes for tower and fibre deployment are a substantial obstacle to investment by the mobile community in SSA. This is already a critical issue, and it will intensify with the growth in mobile data traffic. Complex and uncoordinated national and local regulations and approval processes, especially with regard to rights of way, could be simplified.

Standardisation of rights-of-way access within each country, as well as regionally, could boost investment. This would be aided by the creation of centralised information points where network investors can access information on rights-of-way procedures and permissions.

A transparent, predictable and supportive regulatory regime is required

Mobile broadband requires significant investment from operators to acquire spectrum, upgrade and extend their existing networks, and potentially support customer device acquisition. A key factor that investors consider when deciding to invest in telecommunications is whether a modern, transparent and predictable regulatory regime is in place. To ensure investment in the sector continues and to attract foreign investment, increased transparency and certainty in regulatory frameworks is vital.

A collaborative approach between government and operators can maximise the benefits of growth

A collaborative approach can maximise the benefits of mobile-industry growth in sub-Saharan Africa, including substantial economic and social development, helping to lift populations out of poverty and extend social and digital inclusion. As mobile services surpassed fixed telecommunications in SSA, so too may mobile broadband overtake basic mobile services for sectors of the population that are currently unconnected.

Crucial to extending mobile broadband to all regions and all sectors of population is the allocation of mobile spectrum, and in particular the Digital Dividend, to mobile operators. In the short run, refarming existing spectrum will ensure that the advantages of LTE are felt quickly. As affordable smartphones, including models designed for the African market, become available in the coming years, mobile broadband provision could be further supported by reducing consumer taxation and by promoting and protecting mobile operators' network investments.

Affordable mobile broadband has the potential to bring significant advantages to African citizens of all income and education levels, and a host of new services in all areas, from banking to health and education, has the potential to transform the way African people communicate and live their lives. This is likely to trigger further social and economic development in the region. By working in partnership, mobile operators and governments can continue the remarkable success story of this industry in the region and extend its unique benefits across all African citizens.

1 Introduction

This report is part of the Mobile Observatory series commissioned by the GSM Association (GSMA). It focuses for the first time on sub-Saharan Africa (SSA), a region comprising 47 countries and a population of over 831 million people.

The report provides an overview of the mobile market in the region, highlighting the most recent developments and indicators. It also provides an estimation of the economic and social impact of the mobile industry in the region. The impact of further spectrum release and of other mobile regulations is also discussed.

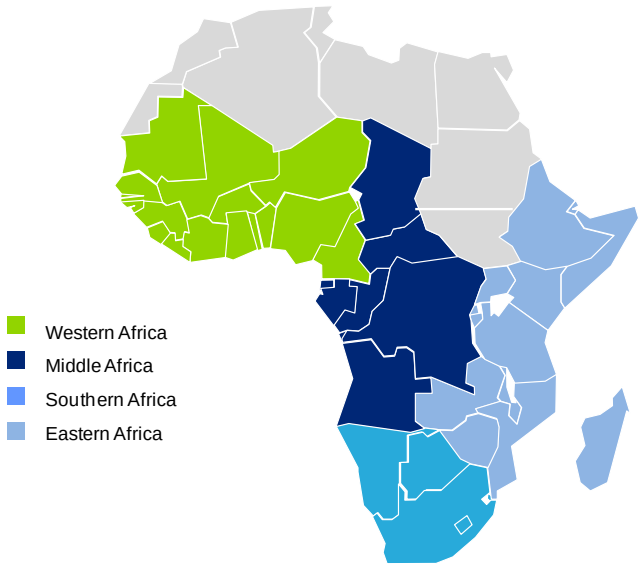
This report is based on publicly available information, data provided by the GSMA and Wireless Intelligence, as well as a series of country and regional reports prepared by Deloitte for the GSMA.

1.1 SSA comprises a set of diverse markets

The 47 countries within the SSA region show significant economic and social differences. While the average annual income per capita in the region stands at US$2,439, it varies from US$216 in the Democratic Republic of Congo (DRC), the poorest country, to US$14,660 in Equatorial Guinea, the richest country. The six most populous countries (Nigeria, Ethiopia, DRC, South Africa, Tanzania and Kenya) cover more than 50% of the population in the region.

For ease of presentation, when data allows, the countries studied have been grouped into sub-regions following the United Nation's Statistical Division classification.

Figure 3: SSA sub-regions

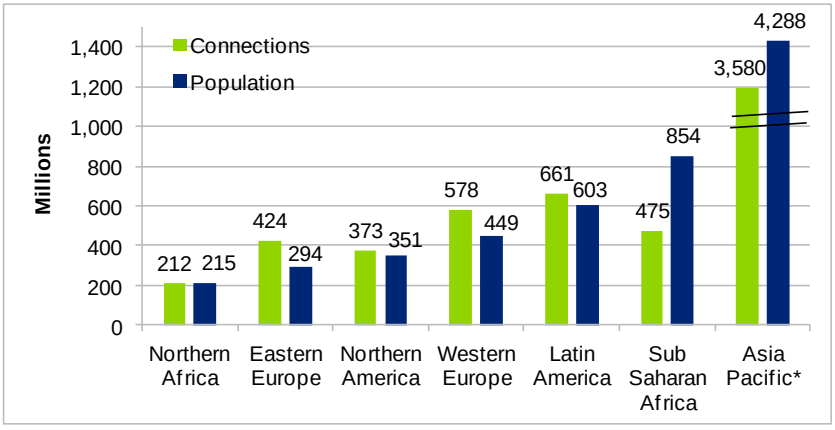


Source: United Nations

Western Africa includes 16 countries and a population of 312 million. The largest countries are Nigeria and Ghana, accounting for 60% of total population in the sub-region. In Eastern Africa, Ethiopia and Tanzania are the largest markets, while in Middle Africa, DRC and Cameroon have 67% of the total sub-regional population. Southern Africa includes only five countries, and South Africa accounts for 87% of the total.

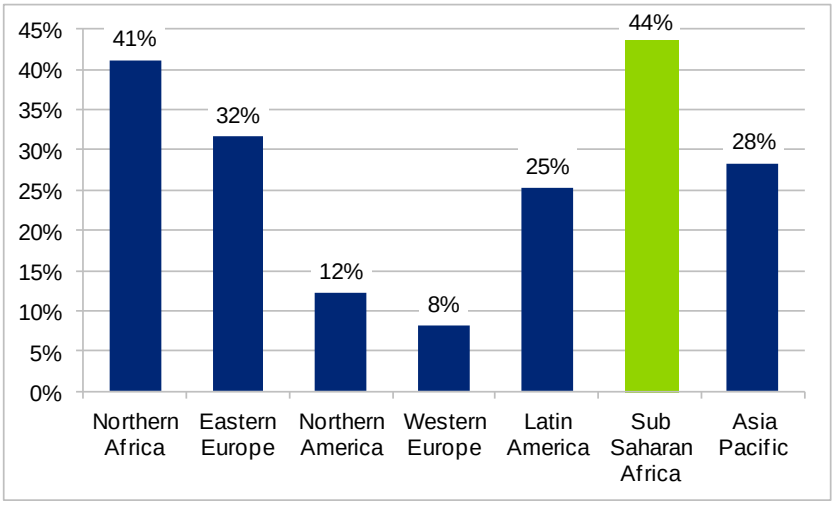
While SSA has only 8% of worldwide mobile connections, it has seen the highest rate of growth worldwide. Since 2000, the number of connections in SSA has grown by 44% (and in Africa as a whole by 43%), compared to an average of 34% for developing regions and 10% for developed regions. As of today, seven out of the 10 fastest growing countries in the world are located in SSA[3], and mobile connections are expected to increase significantly in the medium term[4].

Figure 4: Population and connections



*Source: Wireless Intelligence. *Asia Pacific bars rebased to fit axis range.*

Figure 5: Growth in the number of mobile connections, %, 2000–2012



Source: Wireless Intelligence

While covering the whole region, this report also presents more detailed information on five key mobile markets: Nigeria, Ghana, South Africa, Kenya and Tanzania (the five key markets), countries for which more data is available[5].

[3] Swedish Trade Council. Sub-Saharan Africa business opportunity analysis April, 2012

[4] Throughout the report, connections are presented as the total unique SIM cards (or phone numbers, where SIM cards are not used) that have been registered on the mobile network at the end of the period. Connections differ from subscriptions in that a unique subscriber can have multiple connections.

[5] Where available, data for Senegal is also provided.

2 Mobile Markets in SSA

This section introduces the key features of mobile markets in SSA, discussing growth in penetration and coverage, pricing and revenue trends, and the development of 3G and 4G[6] technology and of mobile internet.

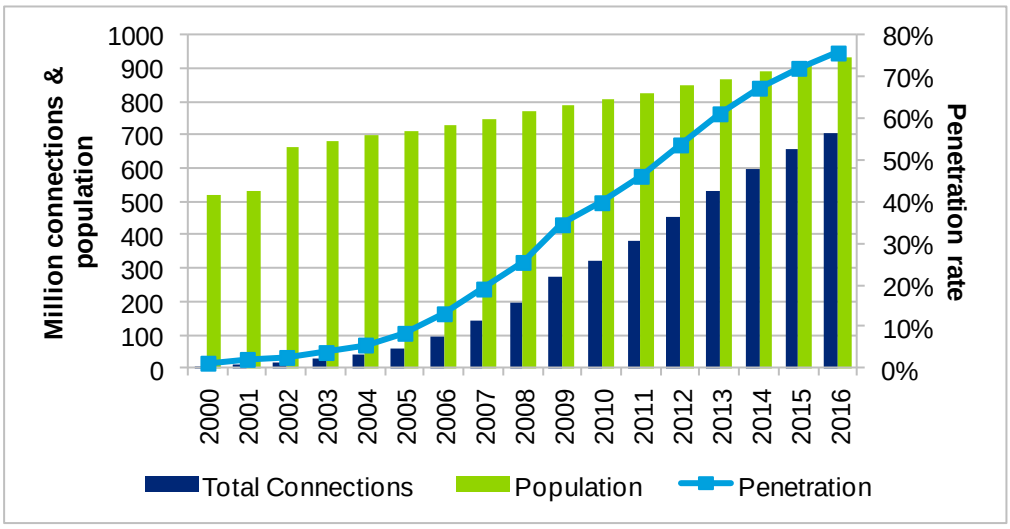
2.1 Mobile connections have grown substantially

Mobile penetration has increased rapidly in the last 12 years in the region, from just 1% in 2000 to 54% in 2012, representing a compound annual growth rate of over 36%. Today there are more than 454 million connections in SSA[7]. However, as it is common in SSA to share mobile phones or to use public mobile phones, mobile services extend far beyond actual penetration levels.

While growth has been witnessed in all markets, particular positive developments have occurred recently in Rwanda, where penetration increased by almost nine times from 2005 to 2009, and in Zimbabwe, where it more than doubled between 2009 and 2010.

Supported by income growth, it is expected that penetration will continue to grow steadily over the next few years, reaching 75% of the population and 700 million connections in 2016.

Figure 6: Mobile Connections, Population and Mobile penetration in SSA (2000–2016)



Source: Wireless Intelligence

In comparison, there were only 12.3 million fixed lines in SSA in 2010[8], with nearly half of them located in South Africa, indicating that mobile telephony is the key and often only provider of telecommunication services in the region.

Mobile penetration across the region is 54%, while fixed teledensity[9] is approximately 1.7%; there are therefore 28 mobile subscriptions for every fixed line in SSA. This highlights the importance of mobile network infrastructure for voice, data and internet in the region.

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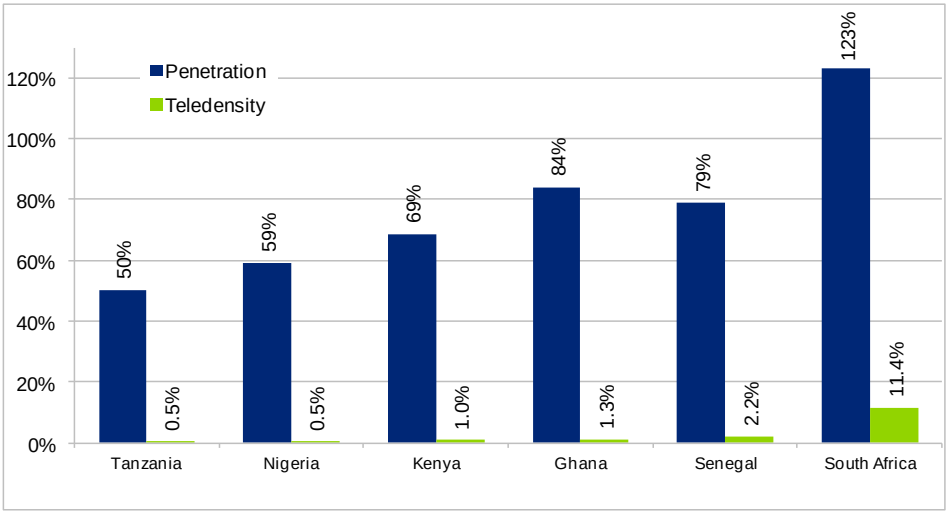
6 In this report, 4G refers to LTE technology, as this is the only technology being developed in sub-Saharan Africa.

7 Wireless Intelligence, 2012.

8 ITU, World Telecommunication/ICT Indicators Database, 2011.

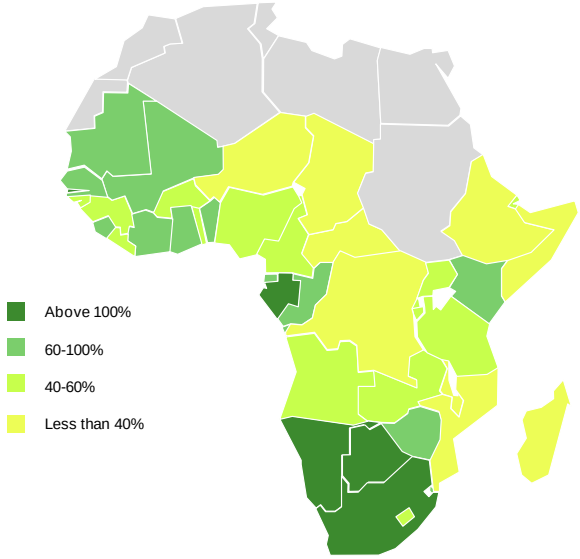
Figure 7: Mobile penetration and fixed teledensity in the five key markets and Senegal (2012)



Source: Wireless Intelligence, Buddecom. Data for available countries.

Mobile penetration varies widely across the sub-regions. Southern Africa has the highest mobile penetration, at 119%, mainly as South Africa shows a 123% penetration and over 50 million connections. Penetration is lowest in Eastern and Middle Africa at 39% and 40% respectively. However, mobile connections have been growing rapidly in these sub regions, increasing by 366% and 260% respectively in the last five years.

Figure 8: Penetration by country (2012)

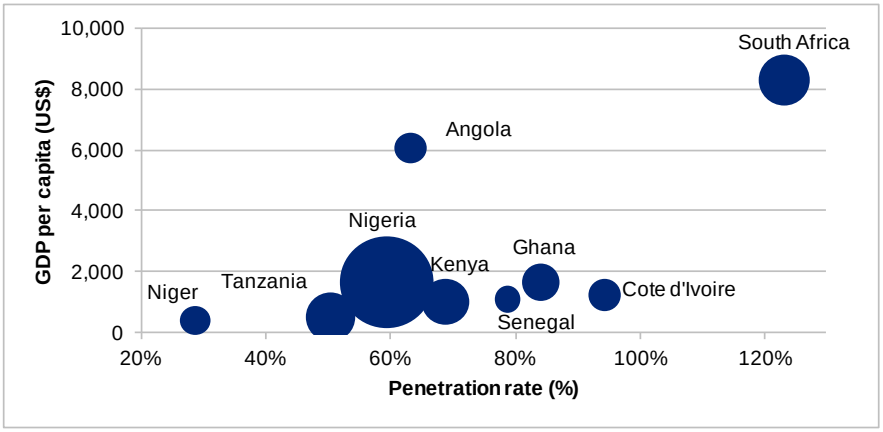


Source: Wireless Intelligence

In countries such as Gabon, Botswana, South Africa, Gambia and Namibia, penetration levels are similar to those witnessed in Europe, while in countries in the African horn mobile telephony has only recently developed.

[9] Fixed telephone lines per 100 people.

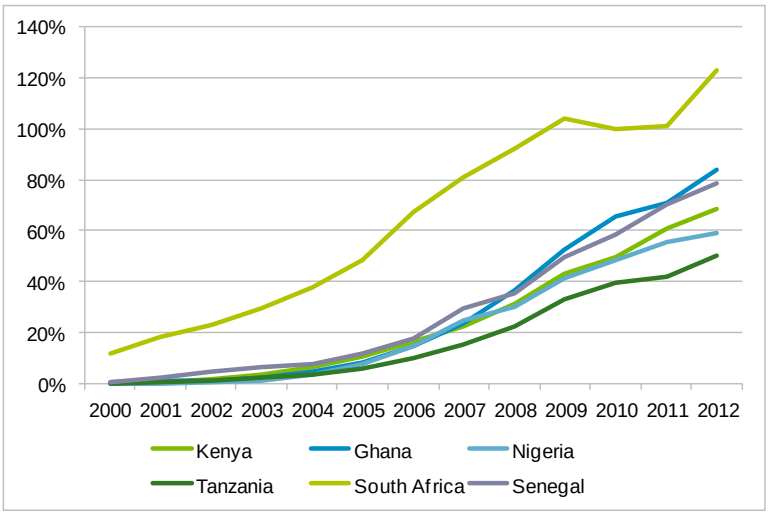
Figure 9: Penetration, GDP per capita and population in selected SSA countries (2012)



Source: Wireless Intelligence[10]

The five key markets currently represent 47% of total connections in the region, and penetration has increased by 81% per year on average between 2000 and 2012, with similar trends seen in Senegal.

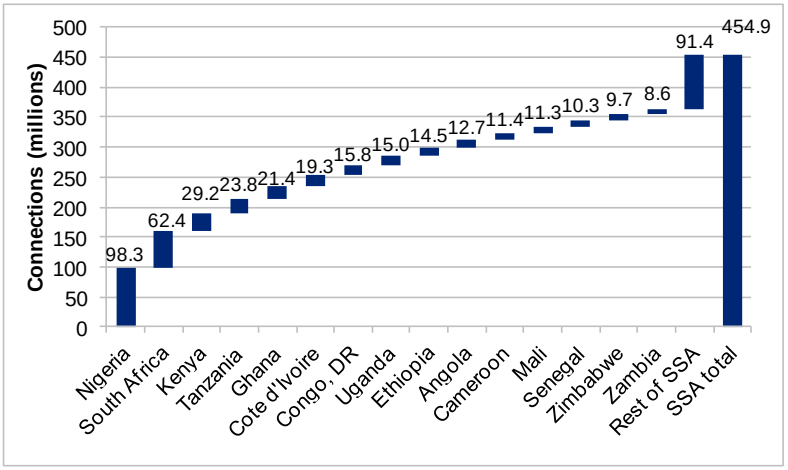
Figure 10: Penetration, five key markets and Senegal (2000–2012)



Source: Wireless Intelligence

[10] The size of the bubbles represents population.

Figure 11: Connections, top 15 countries (2012)

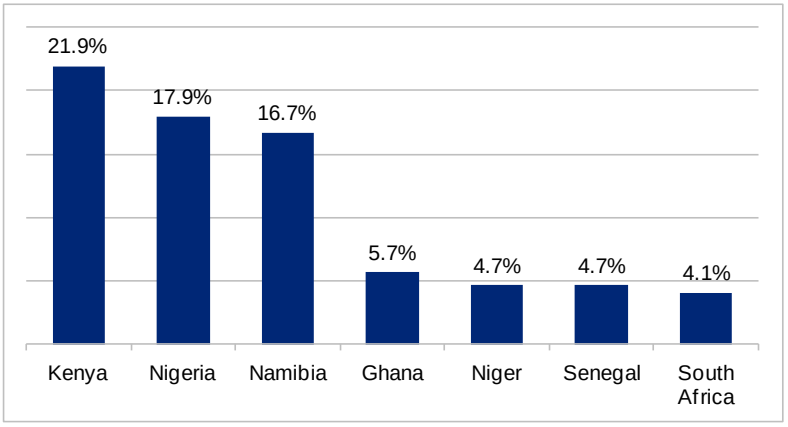


Source: Wireless Intelligence

2.2 Price reductions have led to substantial usage increases

Market growth, scale economies reducing handset prices and increasing market competition have led to steady price reductions in SSA in recent years and, in turn, affordability has driven the significant increase in the use of mobile. Between 2009 and 2010, price per minute fell, on average, by 10% in countries such as Kenya, Nigeria, Namibia, Ghana, Niger, Senegal and South Africa, with the largest decreases occurring in Kenya, Nigeria and Namibia.

Figure 12: Reductions in average effective price per minute in selected countries (2009–2010)

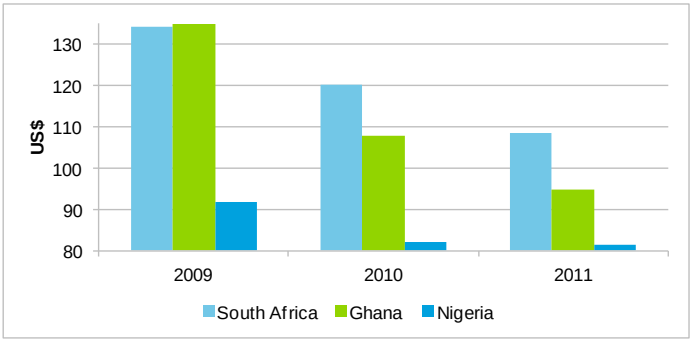


Source: Wireless Intelligence

A key contributing factor to the extension of mobile services in SSA has been the increased availability of affordable handsets, frequently as low as US$30[11]. While region-wide data is not available, in Ghana, Nigeria and South Africa, which together cover 40% of connections in the region, a 20% fall in device prices occurred between 2009 and 2011.

[11] http://www.balancingact-africa.com/news/en/issue-no-279/telecoms/south-africa-mobile/en

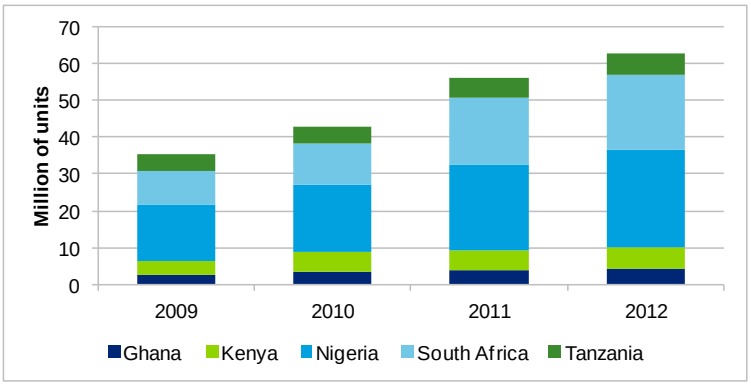
Figure 13: Reductions in mobile device prices (2009–2011)



Source: Gartner[12]

Prompted by reductions in prices, sales of mobile devices have grown steadily between 2009 and 2012; in the five key markets, sales have increased by 80%, from 35.3 million devices to 62.8 million.

Figure 14: Sales of mobile devices, five key markets (2009–2012)



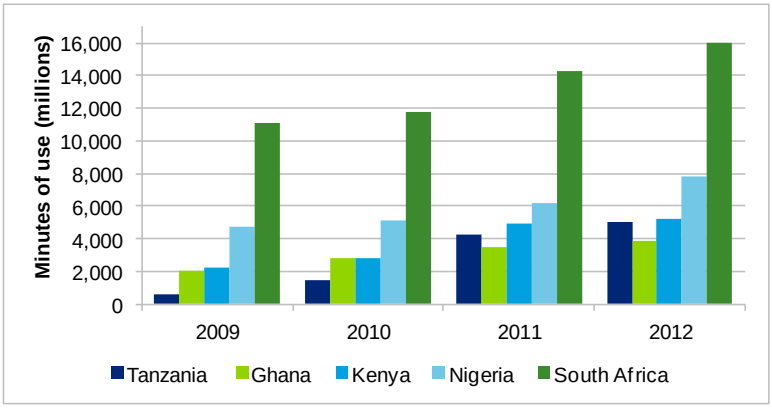
Source: Gartner

Both lower price per minute and lower mobile device cost have prompted an increase in mobile voice usage. Eighteen[13] of the top markets in the region for which data is available show an aggregate increase in minutes of use (MOU) of 40% between 2009 and 2011. Particularly positive market developments have occurred in Tanzania, where voice traffic has increased seven-fold between 2009 and 2012, and Kenya, with a 134% increase in MOU during the same period. In Ghana and Nigeria, MOU have increased 89% and 66% respectively between 2009 and 2012.

12 Gartner, Forecast: Mobile Devices, Worldwide, 2009–2016, 2Q12.

13 Benin, Botswana, Cameroon, Congo, Democratic republic, Congo, Ghana, Guinea, Kenya, Lesotho, Liberia, Mozambique, Nigeria, Rwanda, South Africa, Swaziland, Tanzania, Uganda, Zambia.

Figure 15: Minutes of use, five key markets (2009–2012) [14]



Source: Wireless Intelligence

2.3 Coverage increases have sustained price reductions to drive service growth

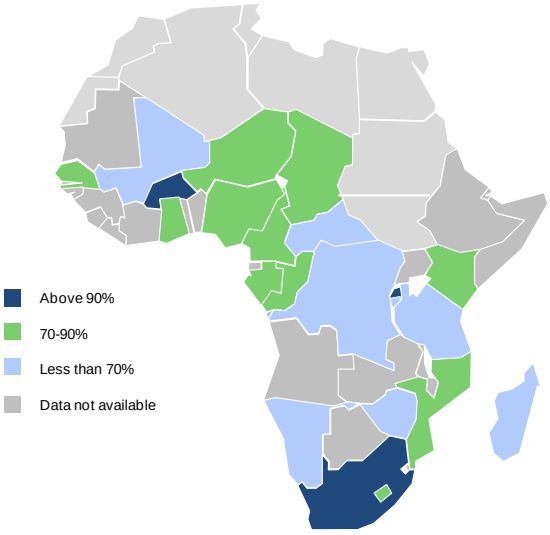
The growth in access and service availability has been made possible by mobile operators' investment in extending service coverage to an increased number of regions. Mobile phone coverage in SSA is provided through a network of base stations, and mostly through a radio transmission network. Due to unreliable electricity supplies across Africa, base stations are primarily powered by diesel generators. Despite these geographic and logistic constraints, today, nearly 76% of the SSA population is covered by mobile services, a significant increase from 65% in 2009.

Regionally, Southern Africa has the highest mobile coverage with 81% of the population covered, followed by Eastern Africa at 77%. Coverage is lowest in Western and Middle Africa, of 74% and 72% respectively. However, penetration in these two regions has increased by 19% and 5% respectively in the last three years[15]; this suggests that more coverage is needed to sustain further penetration increases, but this might be limited by available spectrum bands.

[14] Data is missing for MTN in South Africa for 2011 and 2012; minutes of use are therefore estimated to have grown at the same rate of connections for those years.

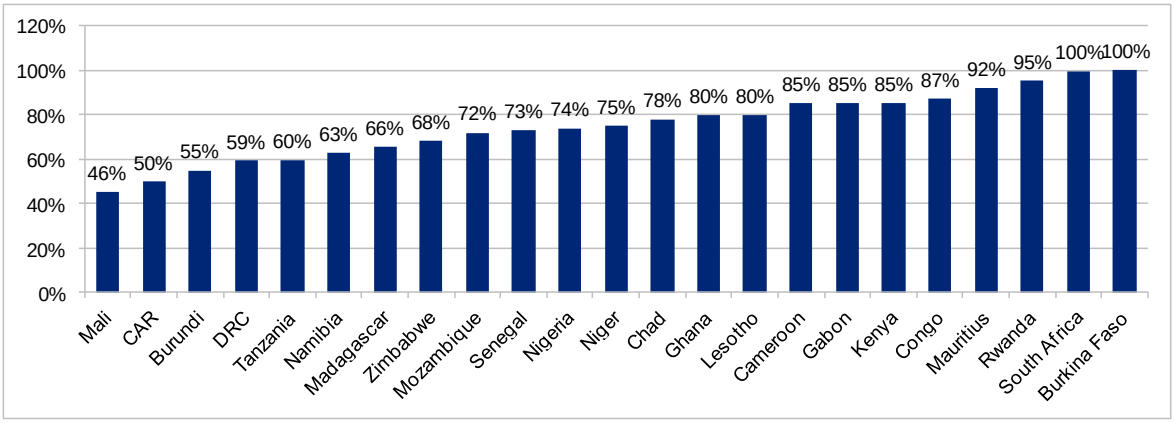
[15] Estimates of regional coverage are based on the countries for which data is available.

Figure 16: Coverage by country (2012)



Source: Wireless Intelligence

Figure 17: Coverage levels in selected SSA countries (2012)

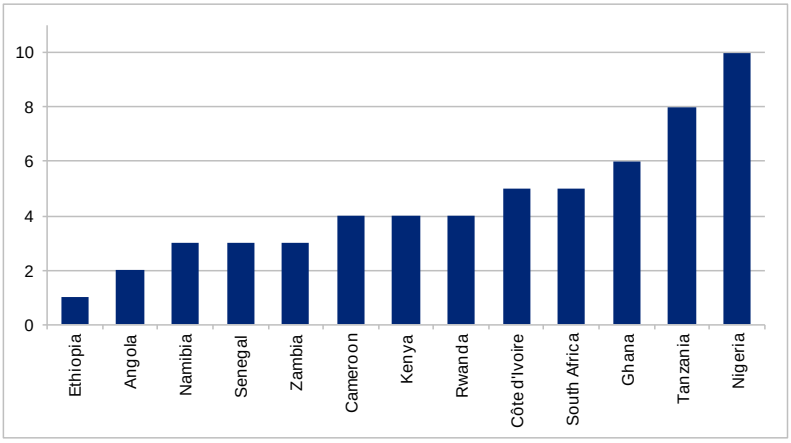


Source: Wireless Intelligence. Data for available countries

2.4 Healthy revenue growth has sustained investment

The mobile markets in SSA are extremely competitive, with an average of average 3.8 operators per country across SSA, and all the largest markets in the region have between three and six operators. A number of mobile companies have operations across the region, allowing them to capitalise their experience across several markets and contributing to robust competition.

Figure 18: Number of operators in selected SSA countries (2012)



Source: Wireless Intelligence

Both African and global communication groups operate in the region and the main operators by number of connections include Airtel, MTN, Vodafone, Sudatel, Etisalat, Orange, and Millicom, most of them with presence in more than three countries.

Table 1: Top operators in SSA by number of connections (2012)

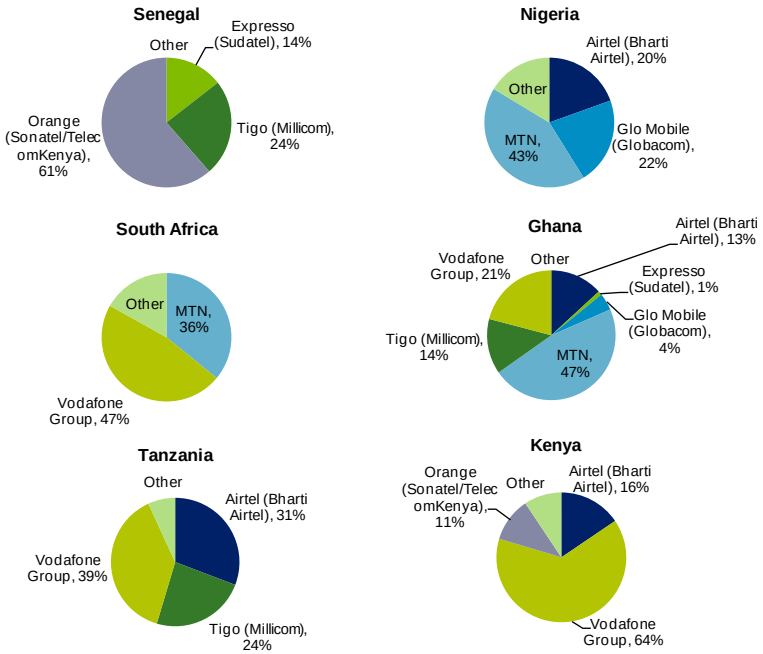
Operators	Total connections	Headquartered	Countries
MTN	103,319,174	South Africa	Liberia, Botswana, Guinea, Benin, Cameroon, Congo, Côte d'Ivoire, Ghana, Guinea-Bissau, Nigeria, Rwanda, South Africa, Swaziland, Uganda, Zambia.
vodafone	70,955,587	United Kingdom	DRC, Lesotho, Mozambique, South Africa (Vodacom), Tanzania, Ghana, Kenya (Safaricom)
airtel	63,507,689	India	Burkina Faso, Chad, Congo, DRC, Gabon, Ghana, Kenya, Madagascar, Malawi, Niger, Nigeria, Rwanda, Sierra Leone, Tanzania, Uganda, Zambia.
orange	28,592,053	France	Côte d'Ivoire, Botswana, Cameroon, CAR, Madagascar, Niger, Uganda, Equatorial Guinea, Mauritius, Guinea, Guinea-Bissau, Mali, Senegal, Kenya.
glo Globalcom	23,859,754	Nigeria	Benin, Ghana, Nigeria
اتصالات etisalat	19,402,674	UAE	Tanzania, Nigeria, Benin, CAR, Côte d'Ivoire, Gabon, Niger, Togo
tigo Millicom	16,961,871	Luxembourg	Chad, DRC, Ghana, Rwanda, Senegal, Tanzania, Mauritius.
sudatel سودانتل	2,147,588	Sudan	Mauritania, Ghana, Senegal, Guinea, Nigeria.

Source: Wireless Intelligence

The five key markets show very different mobile market structures, both in terms of operators and market share. Airtel and Vodafone are present in four of the main markets, with market shares ranging from 13% to 47%. Sudatel and Glo Mobile on the other hand are only present in two out of the five key markets, Ghana and Nigeria.

In Senegal the biggest operators are Sonatel, Millicom and Sudatel, with 61%, 24% and 14% respectively. In Ghana, MTN is the biggest operator in the market with 47% market share, followed by Vodafone (21%), Millicom (14%) and Airtel (13%). In Kenya Safaricom is the biggest operator with 64% of the market, followed by Airtel (16%), and Orange (11%).

Figure 19: Market shares in the five key markets and Senegal (2012)



Source: Wireless Intelligence

Prepaid connections are predominant in Africa as this allows consumers to buy airtime in very small increments, usually for immediate use. In fact, reducing airtime denomination proved a key success factor in extending affordability of mobile telephony. Therefore, only a few countries in the region show a prepaid proportion of total contracts at or below 95%.

Table 2: Countries with prepaid proportion of total contracts below 95% (2012)

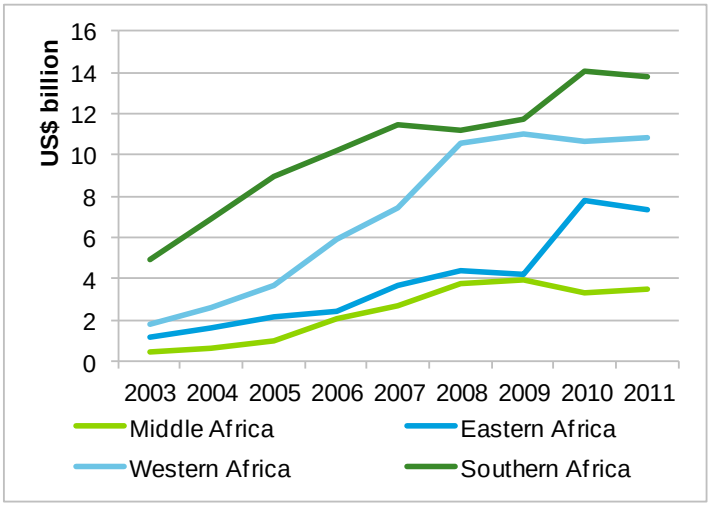
Country	%of total contracts
Lesotho	95.0%
Zimbabwe	94.4%
Namibia	93.1%
Mauritius	93.1%
Botswana	90.2%
South Africa	80.7%

Source: Wireless Intelligence

Mobile operators reported over US$35 billion revenues in 2011, growing by an average of 18% each year from US$8.2 billion in 2000. Most of the revenue is concentrated in Southern and Western Africa with US$14 billion and US$11 billion respectively[16].

[16] Data on revenues was not available for the following countries: Chad, Comoros, Congo, Djibouti, Equatorial Guinea, Eritrea, Gambia, Guinea Bissau, Niger, São Tomé and Príncipe, Seychelles, Sierra Leone, Somalia, Swaziland, Togo,

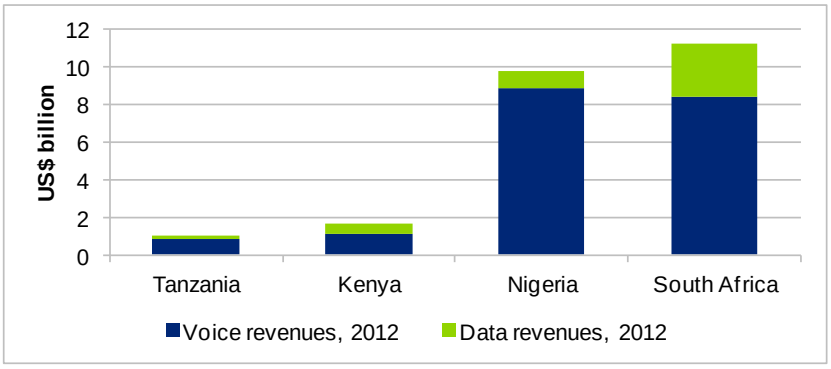
Figure 20: Total estimated mobile revenues in SSA (2000–2011)



Source: Wireless Intelligence and International Monetary Fund (IMF)

Voice services are still the main source of income for most operators. However, data revenues (including SMS) are gaining ground in Nigeria, South Africa and Kenya, where they currently account for 26% of total revenues, following a 67% growth over the last four years[17].

Figure 21: Revenue composition in Tanzania, Kenya, Nigeria and South Africa (2012)



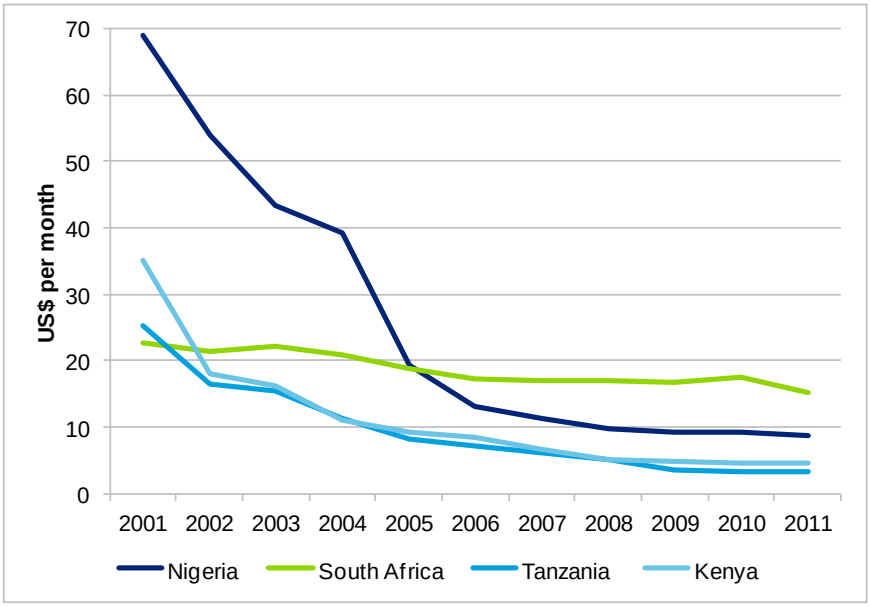
Source: Strategy Analytics, Wireless Device Strategies 2012

Increased competition provides benefits to consumers as it allows for service variety, price reductions and increased consumer surplus. Average revenue per user (ARPU) between 2001 and 2011 decreased on average by 80%, as a result of increased competition and due to lower income consumers gaining access to mobile services.

Uganda, Zambia. Sector revenues for these countries were estimated by applying Average Revenue Per User of the rest of the region to the number of subscriptions in each country.

17 GSMA/ATKearney, "*African Mobile Observatory 2011*".

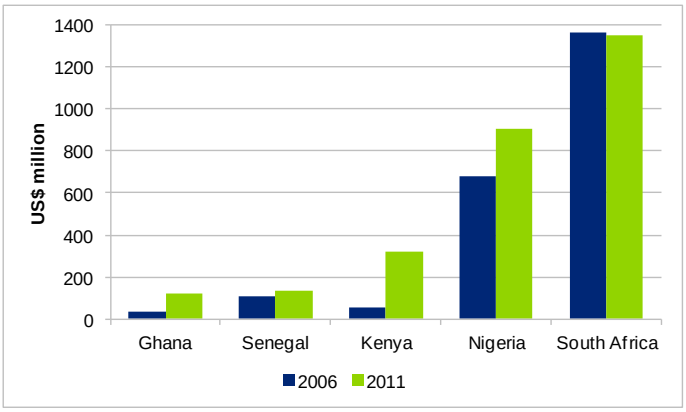
Figure 22: ARPU per subscription* in Nigeria, South Africa, Tanzania and Kenya (2001–2011)



*Source: Strategy Analytics, Wireless Device Strategies 2012. *Includes voice and data.*

Healthy revenue and market growth has prompted operators to invest significantly in SSA. This investment includes not only mobile network expansion, but also core networks, billing systems, spectrum licences as well as investment in handset subsidies. Often network investment also covers access cost and road construction, as well as power generation. Between 2006 and 2011, capital investment increased by 26% in Ghana, Senegal, Kenya, Nigeria and South Africa.

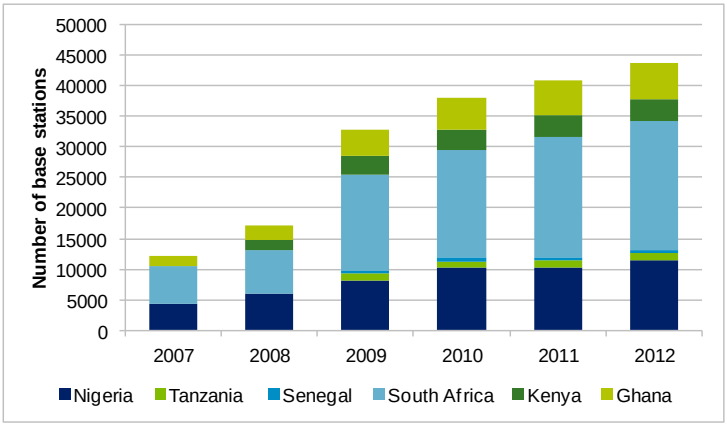
Figure 23: Annual mobile capex (2006–2011)



Source: Wireless Intelligence

Overall, operators in the five key markets invested US$2.8 billion in 2011, and a total of US$16.5 billion over the past five years. Most of this investment focused on expanding network capacity, and consequently the number of base stations in selected countries in the region increased by 250% between 2007 and 2012.

Figure 24: Investment in base stations in the five key markets and Senegal (2007–2012[18])



Source: Wireless Intelligence

Regional operators have committed to numerous investment plans, for example:

- Airtel is planning to spend US$1.5 billion in FY2013 in Africa[19].
- Vodacom aims to invest between 11% to 13% of revenues over the next four years in South Africa[20].
- Etisalat has pledged US$15 billion in network updates over the next five years to meet expected demand on online data usage across Africa and the Middle East[21].
- France Telecom is on track on its investment plans of US$9.3 billion between 2010 and 2015 in the region.

In addition to network investment, operators are positively contributing to market growth and increasing penetration by providing handset subsidies. These are very important to drive device uptake, given the low GDP per capita in the region, as subsidies help to reduce the upfront cost of device acquisition. In South Africa, low-cost SIM starter packs include additional benefits, and operators also offer highly subsidised prepaid handsets[22]. These investments by mobile operators expand the market and are reflected in their substantial subscriber acquisition costs.

2.5 3G and LTE roll out will drive future investment

3G networks are now available in over 30 countries in SSA compared to only 10 in 2008[23].

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18 Data for 2007 and 2008 does not include Tanzania and Senegal.

19 http://business.myjoyonline.com/pages/news/201202/81332.php

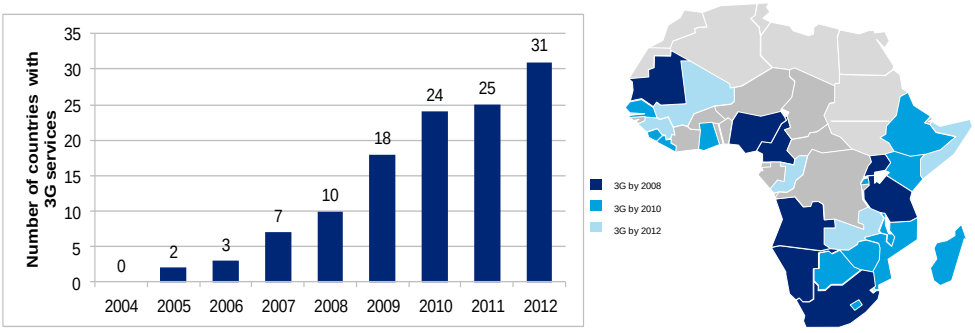
20 http://www.businessweek.com/news/2012-07-19/vodacom-to-boost-sales-contribution-from-outside-south-africa

21 http://www.thenational.ae/featured-content/channel-page/business/middle-teasers-list/etisalat-to-wire-in-15bn-network-upgrades

22 http://www.deltapartnersgroup.com/about_us/media_center/press_releases/south-african-telecoms-cheaper-is-not-always-better

23 These include Angola, Botswana, Cameroon, Republic of Congo, Ethiopia, Gambia, Ghana, Guinea, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Nigeria, Rwanda, Sao Tome, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Swaziland, Tanzania, Uganda, Zambia, and Zimbabwe.

Figure 25: Countries with 3G services (2004–2012)



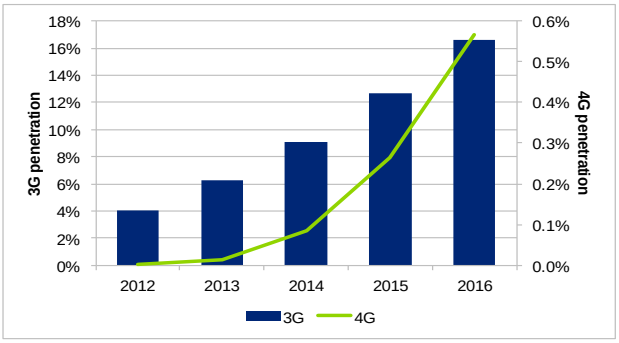
Source: Wireless Intelligence

Investment in 3G network roll-out is expected to continue, driving penetration to 15% in 2016, from 4% in 2012 a 300% growth[24].

LTE networks are currently being introduced, but success in penetration is particularly dependent on spectrum availability, as discussed in more detail in Section 3 of this report. LTE networks currently deployed include:

- Glo Mobile in Nigeria has provided the service to corporate customers since early 2011.
- Angola Telecom (Movicel) has launched initial coverage in two provinces, including the capital[25].
- MTC Namibia deployed "Netman 4G" in May 2012, a service initially available in the capital, but the operator expects to cover 45% of the population within a year[26].
- Millicom Mauritius deployed LTE service in the capital[27] in May 2012.
- Smile, the Tanzanian LTE-only operator, launched the service in Dar-es-Salaam (the largest city in the country)[28].

Figure 26: 3G and 4G penetration in SSA[29] (2012–2016)



Source: Wireless Intelligence

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24 Wireless Intelligence.

25 Wireless intelligence, "*Global cellular market trends and insight Q2 2012*", June 2012.

26 Wireless intelligence, "*Global cellular market trends and insight Q2 2012*", June 2012.

27 Wireless intelligence, "*Global cellular market trends and insight Q2 2012*", June 2012.

28 http://www.itnewsafrica.com/2012/06/smile-telecom-launches-4g-lte-in-tanzania/

29 3G penetration for the 31 countries identified above, 4G penetration for the five key markets, Angola, Mauritius and Namibia.

2.6 Mobile internet will be the key growth area in the next years

Due to the limited coverage of fixed line networks and the associated cost of computers, mobiles are quickly becoming the main platform for internet browsing. For example, a survey showed that in Zimbabwe and Nigeria, mobiles are the preferred platform for internet browsing, with 58.1% and 57.9% of web traffic being mobile-based[30]. These figures put these countries at the top of global mobile web browsing, followed by India and Sudan. Zambia is the country ranked fifth in the sample by mobile-based internet browsing, with 44% of traffic. These figures are well above the world average, currently at 10%, and indicate that Africa is a leader in mobile versus fixed internet browsing. Demand for connectivity and web-based information is very high in the region and can be addressed by accessible and affordable mobile broadband.

Table 3: Internet browsing by platform (2012)

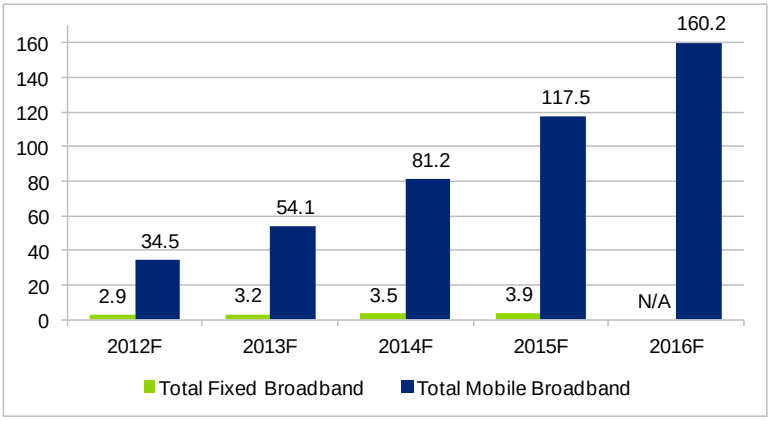
Country	Sub-Region	% Mobile	% Desktop
Zimbabwe	Eastern Africa	58.1	41.9
Nigeria	Western Africa	57.9	42.1
Zambia	Eastern Africa	44.2	55.8
Malawi	Eastern Africa	35.5	64.5
Kenya	Eastern Africa	27.2	72.8
Mozambique	Eastern Africa	24.6	75.4
Ghana	Western Africa	21.8	78.2
Tanzania	Eastern Africa	21.5	78.5
Cote d'Ivoire	Western Africa	19.8	80.2
Uganda	Eastern Africa	18.8	81.2
Namibia	Southern Africa	15.6	84.4
South Africa	Southern Africa	12.6	87.4
Botswana	Southern Africa	8.3	91.7
Angola	Middle Africa	6.6	93.4
Cameroon	Middle Africa	5.9	94.1
North America	-	7.96	92.04
Europe	-	5.13	94.87
Worldwide	-	10.01	89.99

Source: StatCounter Global Stats

Given the low penetration of fixed lines, mobile internet has the potential of driving connectivity in the region at lower costs. Mobile broadband connections are expected to increase almost four times from 2012 to 2016, increasing to over 160 million.

[30] http://royal.pingdom.com/2012/05/08/mobile-web-traffic-asia-tripled/

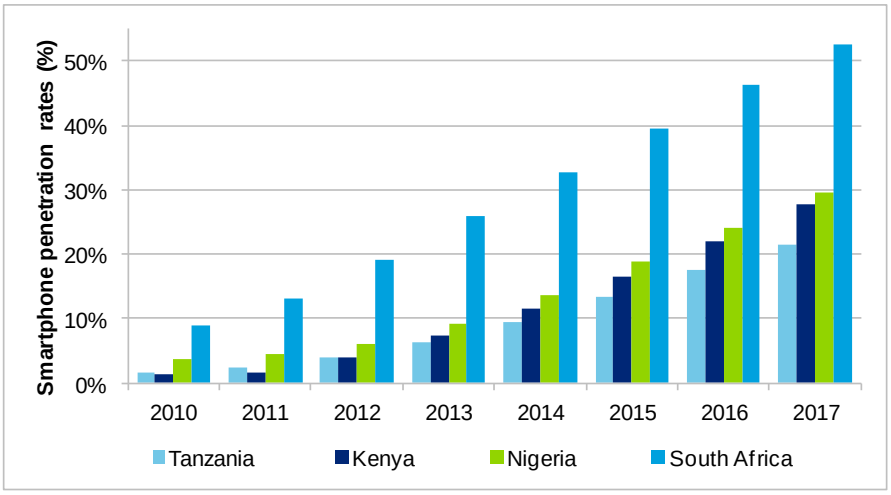
Figure 27: Fixed and mobile broadband subscribers in SSA, million connections (2012–2016)



Source: Wireless Intelligence, Vodafone Public Policy Papers 2011

Mobile broadband uptake will be supported in upcoming years by increased penetration of smartphones. The number of smartphones sold is forecast to grow on average 40% per year up to 2017[31]. In South Africa smartphones are expected to exceed 50% of the subscriber base in 2017, followed by Nigeria and Kenya with 29% and 28% penetration. This will in turn drive up smartphone penetration rates as shown in Figure 28.

Figure 28: Smartphone penetration as a percentage of national population[32] in Tanzania, South Africa, Kenya and Nigeria (2010–2017)



Source: Strategy Analytics, Wireless Device Strategies 2012

An important part of the development of mobile broadband in coming years is expected to be the emergence of the US$50 smartphone, which is expected to become available in early 2013[33], and the uptake of other devices that allow for inexpensive wireless connections such as the OPLC XO-1 or the Raspberry Pi. Already, competition in the smartphone market has prompted a steep decline in smartphone prices, and more powerful devices have halved in cost in just one year[34].

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31 Strategy Analytics, Wireless Device Strategies, 2012.

32 Smartphones per 100 people.

33 Gartner. Market Trends, "*The Emergence of the $50 Smartphone*", September 2012.

34 Gartner. Market Trends, "*The Emergence of the $50 Smartphone*", September 2012.

Following the trend that emerged for handsets, device manufacturers are creating smartphones targeted at Africa. For example, Samsung[35] has recently launched Chief Hero, a low-cost mobile phone. As people in the region use more than one SIM card to take advantage of the different pricing plans of mobile operators, Samsung has also created a dual-SIM phone that allows switching between SIM cards without having to turn off the device. The handset supports 13 languages, including Yoruba, Igbo and Swahili.

The possibility of providing unsubsidised, yet affordable handsets to consumers in SSA has the potential to prompt a considerable change in the way people communicate and socialise, driving an increased pace in demand for mobile broadband.

While uptake of broadband internet in the region is still low today, some of the key barriers that have constrained usage so far are being substantially reduced as a result of a number of factors:

- Improved affordability of smartphones and other internet-enabled devices: volumes of smartphones in South Africa, Tanzania, Nigeria and Kenya are expected to reach 106 million devices[36]. The availability of cheap smartphones will allow entire segments of the population that are currently unconnected, including the youngest, to incorporate internet browsing in their daily experience.

- Increased coverage of 3G networks, driving broadband penetration increases.

- The emergence of local content and applications: local content is an important driver of demand and broadband penetration rates[37].

- Increased exposure to internet content on mobile phones: operators are also innovating with mixed services that aim to bridge the gap between internet and mobile. In Tanzania[38], Tigo has recently launched “Tigo SMS Internet”, which is designed for phones that do not have internet capabilities. The platform gives customers access to the internet via normal text messages, through a free-trial period and then at a cost of US$0.06 per day, with access to all web pages. This innovation helps create demand for internet content on mobile phones, as consumers get used to mobile browsing.

Development of new internet-based services ranging from healthcare and education, to banking and other commercial transactions. Small and Medium Enterprises (SMEs) are likely to increasingly use mobile broadband for e-commerce, and governments are increasingly employing electronic applications requiring broadband. The emergence of Machine-to- Machine (M2M) services, especially in agriculture, is likely to become a further driver for demand for connectivity also in rural areas, requiring an extended coverage for mobile broadband services.

35 http://www.howwemadeitinafrica.com/samsung-launches-phone-aimed-at-cost-sensitive-users-in-africa/19709/

36 Strategy Analytics, Wireless Device Strategies, 2012.

37 Vodafone Policy Paper Series, “*Making Broadband Accessible For All*”, Number 12, May 2011.

38 http://www.balancingact-africa.com/news/en/latest

3 The Benefits from Additional Spectrum for Mobile Broadband in SSA

The future of the mobile sector in SSA, and of the economic and social benefits it delivers, depends on the availability of spectrum. Today, the amount of spectrum allocated to mobile services in Africa is among the lowest worldwide. This creates a number of issues, from traffic congestion to increased service costs, which pose a threat to the development of mobile services and of mobile broadband in particular.

This section discusses the spectrum constraints that operators are subject to, the opportunities for spectrum releases in the region and the economic and social benefits that spectrum releases could trigger. Particular focus is given to the importance of implementing internationally harmonised spectrum allocation plans in SSA to promote affordability and availability of mobile broadband in the region.

3.1 Mobile broadband could be constrained by spectrum scarcity

Spectrum scarcity has been internationally identified as a key constraint on the development of mobile broadband at affordable prices. Spectrum is an essential input into mobile services. The amount of spectrum available and the terms on which it is released are an important part of the cost, range and availability of mobile services and mobile broadband[39].

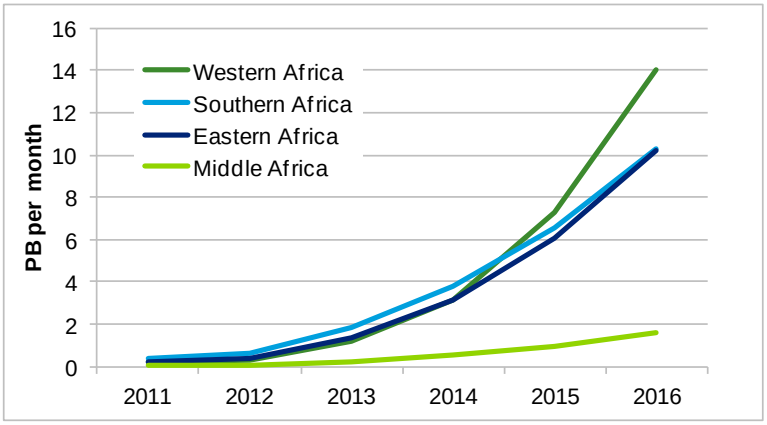
Total mobile data traffic for the region is expected to increase substantially in the next years. In developed markets, mobile data usage, measured in bytes of traffic, has increased at an accelerated rate. According to Cisco Systems[40], in the United States, mobile data usage grew on average by 400% a year between 2005 and 2010, while in Western European countries it grew by 350%. In countries such as India, Brazil and China total usage has also more than doubled every year on average since mobile data was introduced. In South Africa, mobile data usage grew on average by 490% a year between 2007 (when it was introduced) and 2010. Further, usage per each 3G connection has grown over the same period, at an average rate of 280% a year.

In SSA, if up to 50% of 3G mobile connections in the region used mobile broadband and 100% of LTE connections were dedicated to mobile internet, mobile data demand per user could be expected to increase gradually from 0.08GB per month in 2012 to 0.45GB per month in 2016. Based on these parameters, mobile data traffic in SSA could grow from 1.4PB per month to up to 36.2PB per month between 2012 and 2016, an average growth of 119% per year. Western Africa is expected to be the greatest contributor to traffic demand due to considerable growth in 3G connections, which are expected to increase from 8.3 million in 2012 to 62.2 million in 2016.

[39] GSMA, "*Licensing to support the mobile broadband revolution*", CEG, 2012.

[40] Visual Networking Index data.

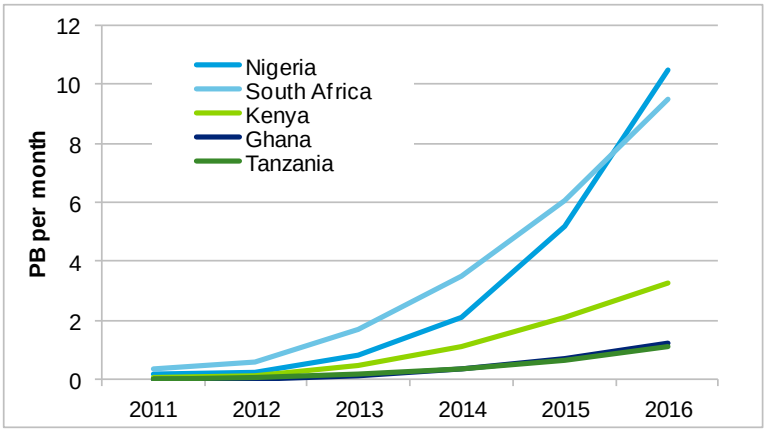
Figure 29: Estimated total mobile internet traffic in SSA, by sub-region (2011–2016)



Source: Wireless Intelligence, Deloitte analysis

Across the five key markets, South Africa and Nigeria are expected to show the highest traffic volumes. Traffic in South Africa is expected to increase from 0.6PB per month in 2012 to 9.5PB per month in 2016, an average yearly growth rate of 99%. Nigeria's mobile traffic is expected to grow 132% per year on average, from 0.2PB per month in 2012 to 10.5PB in 2016.

Figure 30: Estimated total mobile internet traffic in SSA, five key markets (2011–2016)



Source: Wireless Intelligence, Deloitte analysis

As such, mobile networks in SSA could face a 25-fold increase in traffic in the next four years. Clearly, this traffic increase would be unsustainable on current network infrastructure, and operators have already started to experience congestion. Interviews with operators in South Africa have indicated that, while such traffic constraints materialise predominantly in urban areas for 3G services, network congestion for 2G services is also occurring in semi-rural sites. Congestion is expected to increase significantly as mobile services are used as a substitute for fixed internet services due to the high cost of rolling out fixed infrastructure, and mobile operators noted that fixed operators are also making use of wireless technologies. Some operators expressed concern about their lack of access to the low-frequency spectrum that they require to expand coverage, particularly in rural areas.

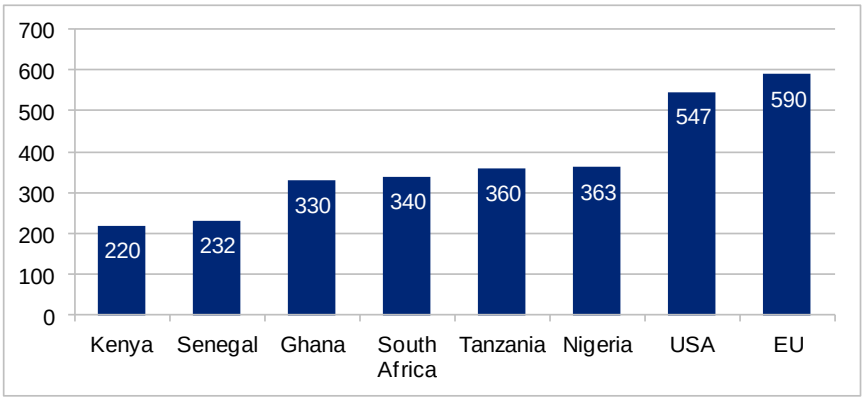
Therefore, while demand for mobile broadband is expected to be strong and forecasts show increasing connections, the extent to which this is realised will depend on resolving these supply-side constraints.

3.2 Mobile spectrum allocations in SSA are low

Recognising the importance of making more spectrum available to mobile services, governments in Europe and the US have made available around 550MHz of spectrum to mobile operators, including the first Digital Dividend (the 800MHz band previously used by broadcasters), and are planning to double this allocation in the medium term[41].

However, spectrum allocations for mobile services remain low in SSA. While the five key markets currently have allocated an average of 320MHz of spectrum to mobile, a typical country in the region only has 80MHz[42] available, compared to 550MHz in high-income economies such as Europe and the US. Currently operators in SSA use the 900MHz and 1800MHz bands, typically licensed for GSM (2G) services, and the 2100MHz band[43], typically licensed for 3G services. Other than in Tanzania, Uganda, South Africa and Botswana[44], where spectrum allocations are fully liberalised and technology-neutral, in all other countries licences are not flexible.

Figure 31: Assigned mobile spectrum in selected countries (in number of MHz)



Source: GSMA, regulators and operators

Limited spectrum availability has numerous negative implications for mobile operators and consumers:

- It increases costs and retail prices: to achieve a given coverage, limited access to spectrum means that operators need to deploy more sites, towers and base stations, driving up operational costs. These are then reflected in retail prices for consumers.

- It reduces coverage: as running a network costs more with limited spectrum, for the same investment spend operators provide lower coverage than if they had more spectrum available.

- It increases network congestion: when traffic increases substantially, as witnessed in SSA in recent years and operators have limited spectrum, their only option to retain quality of service is to deploy more sites, which in turn require more funding. As discussed in more detail in section 5, investment takes a significant time in SSA due to lengthy and complex administrative processes, risking network congestion before new sites can be deployed.

41 GSMA, "*The benefits of releasing spectrum for mobile broadband in Sub-Saharan Africa*", 2011.

42 http://www.bus-ex.com/article/mobile-broadband-africa

43 In Nigeria there is also some use of North American bands at 850MHz and 1900MHz.

44 http://www.ictregulationtoolkit.org/en/Section.3323.html

Limited spectrum availability makes the region highly vulnerable to network congestion and lower service quality as demand for mobile broadband increases. The effects of this limited availability are already being felt by operators who are experiencing quality of service issues in some countries. If no additional spectrum is made available, network congestion may be exacerbated in forthcoming years. Additionally, because the vast majority of broadband traffic in SSA is transmitted over mobile networks, demand for spectrum could be even greater than in high-income countries, where mobile broadband complements fixed line internet access. As such, it may be expected that current capacity will be fully used in urban areas over the next five years due to continued economic growth, further urbanisation and lower costs of broadband services and devices[45].

Furthermore, until the Digital Dividend is released, such operators may be limited in their ability to roll out LTE and provide rural coverage. It was also noted that significant growth in Blackberry use has led to the need to upgrade international backhaul on a monthly basis, with significant cost increases. While operators will continue to invest in network extension, this is unlikely to be sufficient to cover demand and, importantly, operators could reduce costs and retail prices if more spectrum was available.

3.3 New spectrum in the Digital Dividend and liberalised existing spectrum holdings can help provide needed capacity

There are a number of opportunities for governments in SSA to resolve the spectrum scarcity issue that is constraining the development of the sector. These opportunities are provided by the switchover to digital television, by spectrum liberalisation and by the 2.6GHz band.

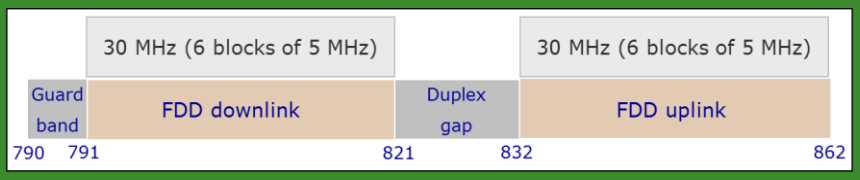
[45] GSMA, "*The benefits of releasing spectrum for mobile broadband in Sub-Saharan Africa"*, 2011.

The Digital Dividend

The digital switchover is the process whereby spectrum used by analogue television broadcasting is switched off and allocated to digital television, which requires significantly less spectrum. This offers positive opportunities for governments, as it releases spectrum, known as the Digital Dividend, that can be used for other purposes such as mobile broadband and greater capacity for digital television. The switchover from analogue to digital television provides a significant improvement in programme choice and picture quality for viewers.

Frequencies that have been or will be allocated to mobile services internationally as a result of the switchover are the 800MHz band (the first Digital Dividend , or DD1) and the 700MHz band (the second Digital Dividend[46], or DD2[47]).

In 2007, the 800MHz band (790–862MHz) was allocated at the international level — by the ITU — to mobile broadband for Africa, Europe and the Middle East. In October 2009, the technical work for the Digital Dividend band (790–862MHz) was completed, resulting in the following band plan:



In February 2012, the 700 MHz band (694–790MHz) was also allocated, in principle, to mobile broadband. This allocation was based on the commitment of all parties to seek harmonisation of the 700MHz and 800MHz bands worldwide; however, allocation of the 700MHz band to mobile does not come into force until end of 2015, giving time for technical studies and for countries to rearrange existing frequency use.

Source: GSMA

- Spectrum liberalisation describes the situation whereby the technology used in a specific frequency band is no longer defined in the licence but determined freely by operators.

- The 2.6GHz band has been internationally harmonised for LTE mobile services (ITU Option 1), and numerous countries have awarded it (and plan to award it in future) in parallel with the DD1.

The technical benefits of these bands and of spectrum liberalisation are discussed below, along with the benefits that standardising of spectrum allocation plans at regional level would deliver to the region.

3.3.1 The Digital Dividend spectrum has ideal propagation characteristics to provide broader coverage of mobile broadband services

First, the Digital Dividend spectrum operates at a lower frequency than other bands used for mobile (900MHz or 1800MHz). Radio signal propagation characteristics mean that in lower frequencies signals suffer lower propagation losses, allowing coverage of larger areas at high quality. This makes the 700MHz and 800MHz

[46] Analysys Mason, "A second digital dividend in Africa: hurry up and slow down", April 2012. http://www.analysysmason.com/About-Us/News/Insight/Digital-dividend-Africa-Apr2012/.

[47] For the purpose of this report, "Digital Dividend" is used to refer to the 800MHz and 700MHz together. Otherwise, DD1 and DD2 will be used.

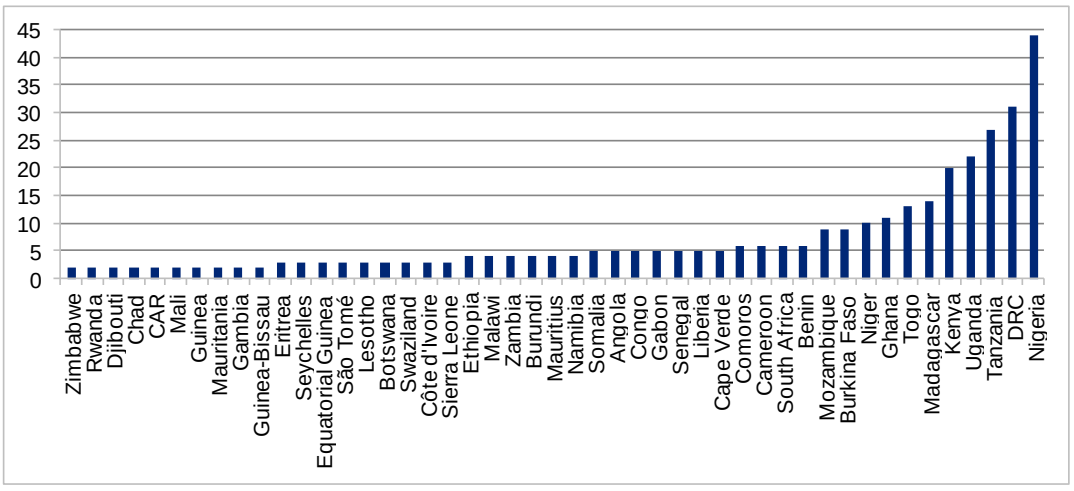
bands ideal for covering rural areas or those with lower population density[48]. Lower frequencies also allow for more effective penetration into buildings, making it ideal for urban areas. Conversely, higher frequency bands, such as the 2.6GHz band, provide large bandwidths, which are suitable for high-capacity services, but more limited coverage and indoor penetration. They are useful complements for LTE and mobile broadband only when coupled with lower frequencies in the Digital Dividend.

Operators using 700MHz and 800MHz bands therefore need fewer radio base stations to achieve similar coverage than with higher frequencies. A GSMA study[49] indicates that, to achieve similar coverage, network that uses spectrum in higher frequencies (900MHz, 1900MHz, 1700MHz and 2600MHz) requires 150% more base stations than a network running on the 700MHz band only, with no significant increase of current coverage, particularly in rural areas.

This has clear and important costing and environmental implications for both operators and consumers as the Digital Dividend allows for more efficient investment. Fewer base stations imply quicker network roll out (allowing for service deployment in a shorter amount of time), as well as lower capital and running costs for operation and maintenance. This has an impact on the cost of providing mobile services: the GSMA has estimated that in Latin America[50] a total cost reduction of up to 10% could be expected if the 700 MHz band is made available. A cost reduction in SSA would contribute positively to the affordability of broadband services in the region, resulting in increased demand and penetration.

In many cases, allocating the Digital Dividend to mobile services requires clearing spectrum of existing uses, which in these bands typically relate to analogue television and legacy CDMA850 networks. While this process can be lengthy, in the majority of SSA countries there is little analogue television. With the exception of countries such as Nigeria and Kenya, there is currently limited use of terrestrial television in the region, furthermore, in most countries less than 40% of households own a television[51].

Figure 32: Number of analogue TV channels, SSA



Source: Balancing Act – Africa

[48] Katz R., Flores-Roux, E., "*Beneficios Económicos dl Dividendo Digital para América Latina"*, Telecom Advisory Services LLC, 2011.

[49] Katz R., Flores-Roux, E., "*Beneficios Económicos dl Dividendo Digital para América Latina"*, Telecom Advisory Services LLC, 2011.

[50] Katz R., Flores-Roux, E., "*Beneficios Económicos dl Dividendo Digital para América Latina"*, Telecom Advisory Services LLC, 2011.

[51] Analysys Mason, "*Global prospects for the 700MHz spectrum band*", 2012.

Given the limited use of analogue TV spectrum in the region, it will be important for governments to speed up transitions to meet the 2015 ITU deadlines.

3.3.2 In the short term, spectrum liberalisation can supplement the provisioning of mobile broadband

An even quicker way to allow operators to ease network congestion and provide mobile broadband is to liberalise spectrum licences.

This trend has been observed in the USA and Europe in recent years, where operators have successfully refarmed spectrum in the 900MHz and 1800MHz bands, previously used for GSM, to provide UMTS and LTE services. This has helped to ease network congestion and increase service quality, as operators can rely on more advanced technology to provide data services using the 3G technology in the 900MHz band and LTE technology in the 1800MHz band.

In SSA, GSM networks will continue to be required to support demand for 2G services for many years. If licenses were liberalised, operators would have the opportunity to refarm part of their 1800MHz allocations to provide LTE (as implemented in countries such as Australia, Hong Kong and the UK), as handsets and equipment that support LTE on this band are being released internationally, with over 400 devices available[52].

Liberalising spectrum also could be an effective short-term solution to address the issue of network congestion while allowing operators to deploy technology for mobile broadband while they wait for the Digital Dividend to be made available. In fact, preliminary estimations[53] indicate that, given the traffic demand increases, 5MHz of re-used spectrum in the 1800MHz band can support traffic increases for between two and three years for each operator.

Positive developments have occurred recently in SSA with regards to spectrum liberalisation. Technology neutral licences have been issued in Tanzania, Uganda, South Africa and Botswana[54]. As a result, Vodacom in South Africa has already deployed LTE services at 70 bases stations in Johannesburg and it is expected to expand to 500 by the end of the year[55]. MTN in South Africa[56] is currently refarming some of its spectrum in the 1800MHz band to cater for LTE technology. By the end of 2012, MTN is planning to have between 400 to 500 base stations in South Africa with LTE-enabled technology.

3.3.3 Spectrum releases should be harmonised with Europe and Middle East based on ITU Region 1

The way in which spectrum is released to mobile operators, and the way in which spectrum allocations are set out, is important for operators' costs and ultimately for service take up. As such, as governments in SSA look to release further spectrum for mobile telephony, international and regional spectrum allocations should be considered to maximise the benefits for consumers.

The specifications for the spectrum bands suitable for mobile telephony are identified and approved at international level by the World Radiocommunications Conference (WRC). Governments across the world are

52 http://www.gsacom.com/lte1800

53 http://www.developingtelecoms.com/spectrum-re-farming-getting-ready-for-the-lte-capacity-crunch.html

54 http://www.ictregulationtoolkit.org/en/Section.3323.html

55 http://www.telecomengine.com/article/vodacom-launches-south-africas-first-lte-service

56 http://www.telegeography.com/products/commsupdate/articles/2012/09/26/mtn-to-launch-lte-in-johannesburg-durban-and-pretoria-cape-town-misses-out/

increasingly liberalising spectrum licence conditions to make sure operators can start to offer LTE and increase capacity to ease network congestion.

In February 2012, the WRC provisioned a decision of harmonising DD2 for mobile broadband services in Africa, Europe and the Middle East from 2015, in order to align it with the remaining ITU regions[57] based on studies under development. The decision opens the unique opportunity for SSA governments to free spectrum that operators need to deliver mobile broadband services. Therefore, it is important for the industry that additional spectrum in SSA is released in line with globally standardised allocation plans for a number of reasons:

- Harmonisation allows scale economies, increased vendor support and interoperability of network equipment, leading to lower costs of network equipment.

- Harmonisation streamlines investment decisions and network deployment: as most of the mobile operators operate in many SSA countries, a single harmonised spectrum plan would greatly simplify procurement and investment strategies.

- Harmonisation minimises interference coordination issues at country borders, as some spectrum could be unusable in border areas of countries which have failed to harmonise their allocations. When this is the case, operators agree to reduce the power of transmission or tilt antennae which are closer to the border[58]. This is a costly operation as it implies reduction in the coverage radius, so this may imply the need of more base stations to provide the same coverage. An alternative method is adding filters, but this could add a cost of up to US$60 million in a country with 15,000 sites[59].

- Harmonisation facilitates international roaming, allowing countries to be more attractive to tourists and international corporations. Given that several SSA operators work across countries in the region, failure to harmonise would limit the economic growth of their operations in the region.

However, the most important advantage of harmonising frequencies relates to increased handset availability for consumers. Low-cost devices are an important part of the penetration strategy of mobile operators in the region. Due to the limited income levels, smartphone prices may represent a barrier to mobile broadband access. Lower prices for smartphones allow long term convergence of the different segments of the population, driving additional demand.

Chipsets are the necessary components of a mobile device; if their standardisation can be achieved, and the same band plans used internationally, then the cost of devices will fall. If frequencies are harmonised, operators can focus on deploying standardised equipment for the vast majority of regions. These significant scale economies lead to reduced retail prices, and higher consumer take up. Without spectrum harmonisation, equipment vendors may not develop customised equipment, or if they do, they may charge higher prices for it, as they would be unable to spread fixed costs over a large enough consumer base. This, ultimately, would lead to higher prices for consumers. Furthermore, it is possible that without harmonisation, customised devices would have less functionality and lower performance, as a result of limited investment in R&D for devices being developed for an individual country[60].

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57 The 780-862MHz band was allocated in WRC 2007.

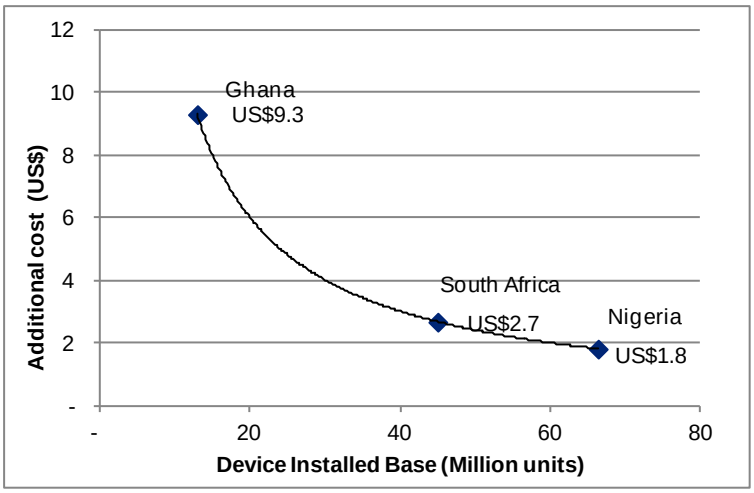
58 GMSA. "*The socio-economic benefit of allocating harmonised mobile broadband spectrum in the United Kingdom of Saudi Arabia",* 2012.

59 GMSA. "*The socio-economic benefit of allocating harmonised mobile broadband spectrum in the United Kingdom of Saudi Arabia",* 2012.

60 GMSA. "*The socio-economic benefit of allocating harmonised mobile broadband spectrum in the United Kingdom of Saudi Arabia",* 2012.

Estimations for the Asia Pacific[61] region show that failure to achieve harmonisation in the region for the Digital Dividend can increase device costs in a range between US$1.5 to US$15, depending on the size of the market. Applying these estimates to current handset levels in Ghana, Nigeria and South Africa suggests that the cost of failing to harmonise spectrum allocations could add up to US$9.30 to handset costs. When considering the case of the US$50 smartphone that will be available to SSA markets next year, the costs of failing to harmonise spectrum could represent up to 18% of the smartphone cost.

Figure 33 Additional device cost in the absence of spectrum harmonisation



Source: Gartner, Forecast: Mobile Devices, Worldwide, 2009–2016, 2Q12, *GSMA/BCG[62], Deloitte Analysis*

Spectrum harmonisation is also important for increasing device choice and availability. A country with harmonised spectrum is automatically part of a globalised market, making it more attractive for handset manufacturers and vendors. It also minimises the time and cost of handset feature development and interoperability, allowing handset manufacturers to go to market sooner, compared to countries which do not follow an internationally harmonised band plan.

Without harmonisation, handsets need a more complex radio design to incorporate extra band capabilities, which can reduce the available range and data rates, increasing the cost of service delivery[63]. Furthermore, handset costs could be set prohibitively high, and the effect would be a significant reduction in the take-up of any mobile service. This has the potential to harm not only consumers and the industry directly, but also the benefits that mobile offers to economies as a vital infrastructure[64]. Complex radio design could lead to reduced battery life, a feature that could affect mobile usage in SSA, given the limited access to electricity in certain locations.

Allocating the Digital Dividend spectrum to mobile, liberalising spectrum conditions and harmonising spectrum allocations across the region create a number of positive conditions that would contribute to spur the development of mobile broadband in the region. The economic and social benefits that countries could gain as a result of allocating spectrum for mobile broadband are discussed below.

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61 Boston Consulting Group, "*The Economic Benefits of Early Harmonisation of the Digital Dividend Spectrum & the Cost of Fragmentation in Asia-Pacific"*, 2010.

62 Boston Consulting Group, "*The Economic Benefits of Early Harmonisation of the Digital Dividend Spectrum & the Cost of Fragmentation in Asia-Pacific"*, 2010.

63 Boston Consulting Group, "*The Economic Benefits of Early Harmonisation of the Digital Dividend Spectrum & the Cost of Fragmentation in Asia-Pacific"*, 2010.

64 GSMA, "*The advantages of common frequency bands for mobile handset production – technical note",* 2012.

3.4 The economic and social benefits of releasing additional spectrum for mobile services

There are numerous positive impacts that could be obtained from increased availability of spectrum for mobile broadband.

- Increased investment on network capacity in the region, which would have a broader effect on the whole mobile ecosystem, due to purchases of network equipment, information systems, energy generation equipment[65], and other infrastructure.

- Efficiencies would occur as a result of savings in network expenditures, which would be likely to be passed on to consumers through lower prices for broadband and mobile services.

- Lower retail prices and lower handset costs as a result of scale economies from spectrum harmonisation would increase market size and its economic impact.

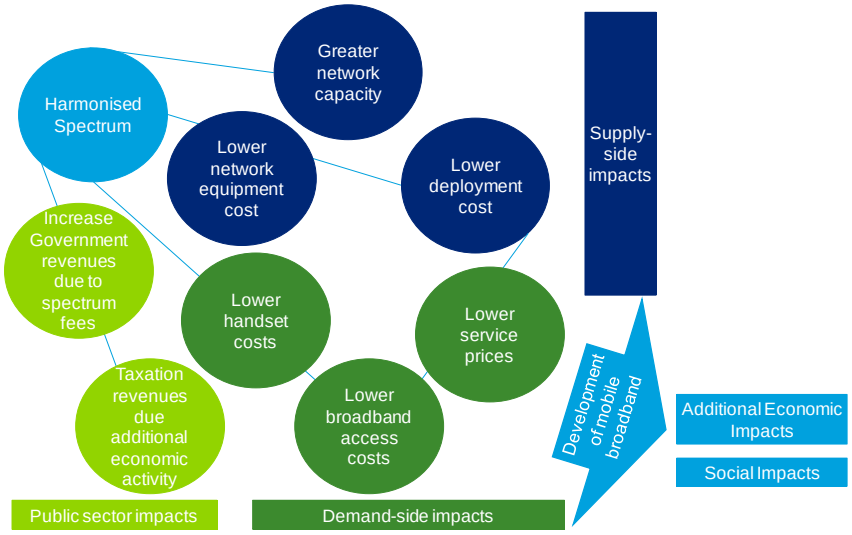
- Governments also benefit from an improved revenue stream from a broader tax base resulting from increased economic activity and employment, as well as other services.

- Other spillover and positive externalities in other economic sectors across the region prompted by mobile broadband. These effects would impact existing businesses that expand their online presence, advertisers and local service firms.

- Second order impacts of higher productivity in the wider economy are also generated as the region becomes more attractive to foreign investors and increased connectivity allows more efficient use of email and electronic file exchanges, as well as rapid access to information, customers and suppliers.

[65] Up to 77% of all base stations in SSA do not have a reliable electricity supply, so operators have made considerable efforts in powering base stations with alternative energy resources. Source: GSMA, "*Community Power: Using Mobile to Extend the Grid"*, 2010.

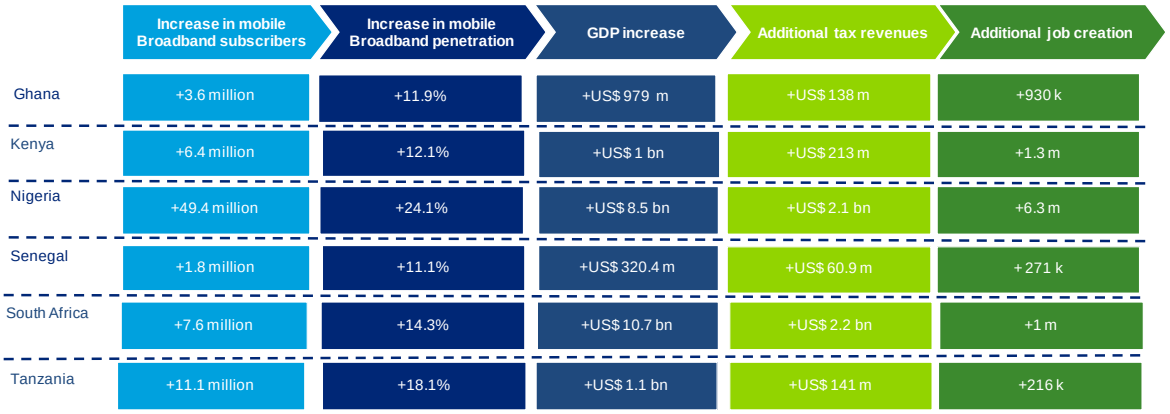
Figure 34 Economic benefits from harmonised spectrum release



These effects can be thought of as having the potential to lead to higher GDP growth and additional employment in the region, and a number of studies have analysed these impacts in more detail.

A recent GSMA study estimates the economic benefits of additional spectrum release[66] in the 800MHz and 2.6GHz. It considers the supply side of effects of spectrum availability using a detailed bottom up analysis in the top five countries and Senegal. Across these countries, releasing spectrum in the 800MHz and 2.6GHz band is estimated to potentially increase GDP by an extra US$22.6 billion between 2015 and 2020, including an additional $US4.9 billion in tax revenue. Additional spectrum is also estimated to increase connections in these countries by approximately 80 million by 2020. Job creation would also be positively affected with an additional 10 million jobs in these countries.

Figure 35: Economic impact of spectrum release (2.6GHz and DD1) in six countries (2015–2020)



*Source: GSMA, "*The benefits of releasing spectrum for mobile broadband in Sub-Saharan Africa*", 2011*

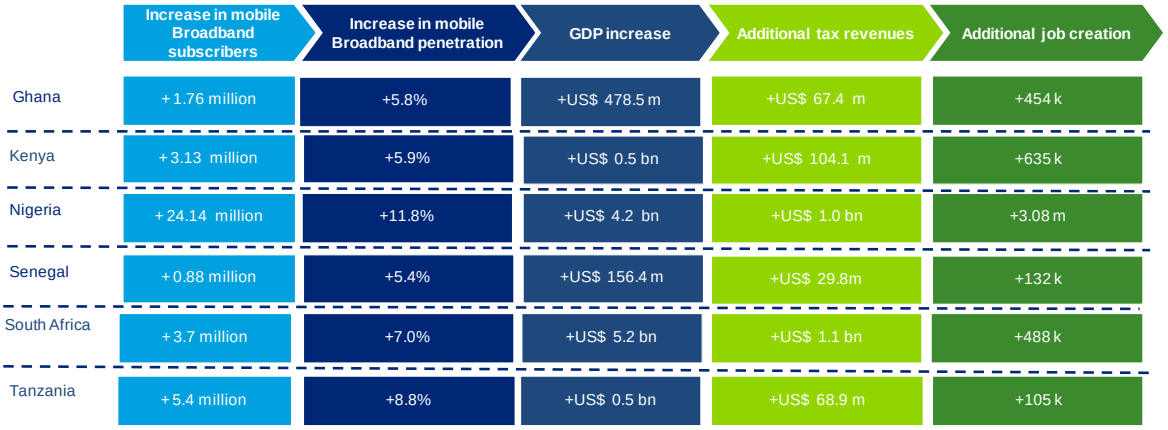
If this analysis were to be extrapolated to the release of spectrum in the DD2 band alongside operators having the opportunity to refarm a proportion of their 1800MHz spectrum allocations for LTE services in the short

66 GSMA, "*The benefits of releasing spectrum for mobile broadband in Sub-Saharan Africa*", 2011.

term[67], further economic benefits could be felt. While strong assumptions are required over traffic levels and the ratio of jobs created to GDP, this spectrum release has the potential to:

- Increase GDP by an extra US$11 billion between 2015 and 2020, including an additional $US 2.3 billion in tax.
- Create an additional 39 million connections, giving an average increase of 7% in mobile broadband penetration across these countries.
- Create additional employment of 4.9 million.

Figure 36: Summary of economic impact of spectrum release (1800MHz and DD2) in six countries, (2015–2020)



*Source: Deloitte extrapolation of methodology adopted in GSMA, "*The benefits of releasing spectrum for mobile broadband in Sub-Saharan Africa*", 2011*

In summary, the combined effect of releasing the Digital Dividend (700MHz and 800MHz) and 2.6GHz bands and refarming the 1800MHz band would have a US$33.6 billion impact on GDP between 2015 and 2020, leading to the creation of 14.9 million jobs in the top six markets.

In addition to these supply-side effects, use of mobile data impacts economic growth in the medium term. A recent Deloitte/GSMA/Cisco study considers the medium term impacts of mobile data consumption on economic growth. Using detailed information provided by Cisco Systems on mobile data usage between 2005 and 2010 in 14 countries for which historical disaggregated data is available, Deloitte has calculated the impact of mobile data usage for each 3G connection on economic growth[68]. The study found that, on average, doubling mobile data use leads to an increase in GDP per capita growth of 0.51 percentage points.

Applying these results to the SSA region[69], the impact of mobile data consumption can be estimated. If sufficient spectrum is made available in a harmonised way, mobile data traffic could grow by approximately 120% in the next 4 years. As a result, GDP in the region could increase by US$40 billion[70], representing 0.54% of total GDP for the region during that period. In Southern and Western Africa, this could lead to an expected GDP increase of US$12.4 billion and US$15 billion respectively.

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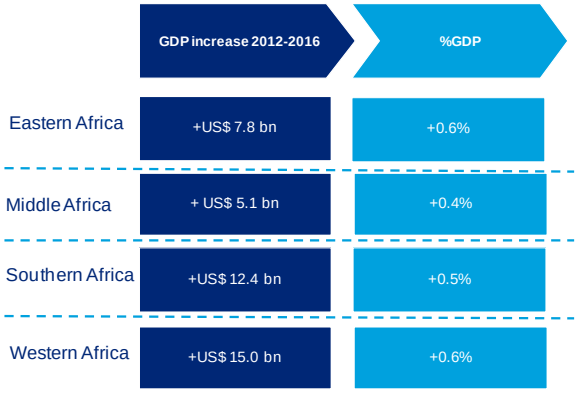
67 This scenario considers the effect of releasing 30MHz of spectrum in the 700MHz band and of refarming 35MHz in the 1800MHz for LTE. This additional spectrum represents approximately 48.8% of the spectrum assumed for release in the 2600MHz and 800MHz bands (103MHz and 30 MHz respectively) in the GSMA study.

68 Deloitte/GSMA/Cisco, "*What is the impact of mobile telephony on economic growth*?", forthcoming.

69 The analysis is based on the traffic projections described in Section 2 and on projections of GDP per capita and projections of population taken from the IMF World Economic Outlook database.

70 No time discount factors have been applied.

Figure 37: GDP impact of increased wireless broadband

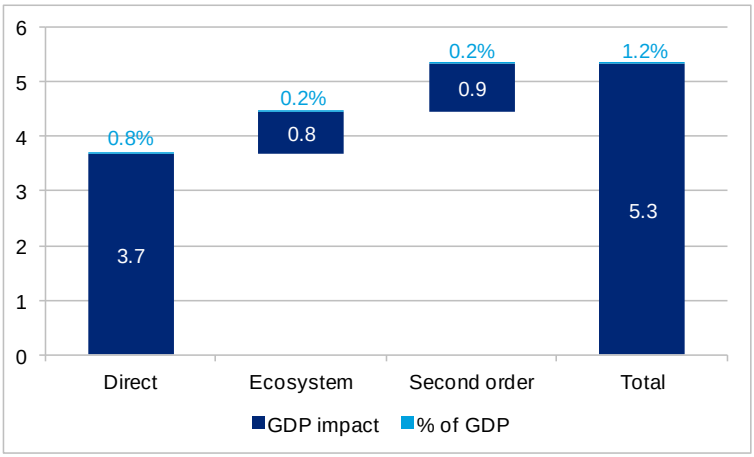


Source: Deloitte

Considering that the original analysis is based on data from developing markets where fixed broadband is widespread, the effect in SSA, where mobile broadband will be the predominant way to access internet, could be even higher.

These results are reinforced by two studies by Analysys Mason that measure the impact of wireless broadband in Nigeria and South Africa[71]. In Nigeria, the overall impact of mobile broadband was found to amount to US$5.3 billion, or approximately 1.2% of GDP by 2015. In the case of South Africa, the impact on the GDP is expected to be US$8.7 billion, 1.8% of total GDP.

Figure 38: Economic Impact of wireless broadband, Nigeria (2015)

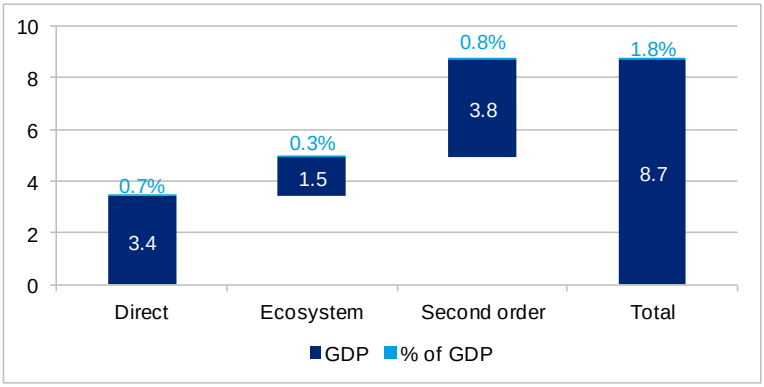


Source: GSMA

Furthermore, for the South African case, it has been estimated that mobile broadband could contribute towards the creation of 28,000 new jobs.

[71] GSMA, "*Assessment of the economic impact of wireless broadband in Nigeria*", 2011. GSMA, "*Assessment of economic impact of wireless broadband in South Africa*", 2010

Figure 39: Economic Impact of wireless broadband, South Africa (2015)



Source: GSMA

The magnitude of these benefits indicates that allocating the Digital Dividend and more generally spectrum below 1GHz to mobile services, could deliver larger economic benefits than if the spectrum remains with broadcasters. In SSA, the importance of terrestrial television in the broadcast market compared to other viewing platforms is low. Considering the significant demand for mobile broadband, and the high level of competition in mobile markets, it is expected that the benefits of making spectrum below 1GHz available for mobile services would outweigh the cost of reconfiguring digital terrestrial television networks.

In addition to the economic effects described above, harmonised spectrum availability could also enable important social benefits. Wider mobile broadband availability has been recognised to have an impact on the UN Millennium Development Goals (MDGs) across all eight areas.

Table 4: Impact of mobile broadband on the MDGs

Goal	Examples
End Poverty & Hunger	Farmerline is a mobile and web-based system that furnishes Ghanaian farmers and investors with relevant agro industry content to improve productivity and increase income. Farmerline bridges the information gap between rural farmers and agro-industry sources by allowing farmers to ask questions via a web interface, as well as SMS alerts on tackling pests or diseases, agricultural techniques, optimum times to plant crops, available subsidies, as well as weather forecasts, local fairs and crop prices[72].
Universal Education	Governments and NGOs are providing schools with PCs to foster a sound primary education. In Senegal, a survey found 27.8% of school pupils reported they had acquired better knowledge, and 6.5% understood lessons better with content from ICTs. High-quality, electronic content curricula can improve educational outcomes, and mobile broadband will be the only means of internet connectivity for most schools.
Gender Equality	Various studies have reported that men and women use ICTs differently, e.g., in Senegal, women use ICTs to access information while men prefer communication with friends and family members. For mobile telephony, GSMA has estimated that closing the mobile gender gap would increase revenues for mobile operators by US$13 billion[73].
Child Health	ChildCount+ is a community health reporting and alerts platform aimed at empowering communities to improve child survival and maternal health. It helps community health extension workers register children under five to monitor their health status, including screening for malnutrition every 90 days, as well as monitoring immunizations, malaria, diarrhoea and pneumonia. It integrates with existing health information systems to help experts analyze data on child health more rapidly to improve treatment.
Maternal health	ChildCount+ registers pregnant mothers and provides support for antenatal care, such as the launch of a software module in Ghana in August 2011 aspiring to reduce mother-to-child transmission of HIV. Hospitals connected via mobile broadband networks are also enabling remote diagnosis and support for maternal health. WE CARE Solar in Nigeria provides healthcare workers and midwives with mobile phones and reliable

[72] http://www.e-agriculture.org/content/farmerline-mobile-and-web-based-system-providing-agricultural-information-ghanaian-farmers

[73] GSM Association, "*Women & Mobile: A Global Opportunity",* 2010.

Goal	Examples
	lighting using solar electricity to facilitate safer deliveries of babies.
HIV/AIDS	Bozza is an online platform which shares content (music, video, poetry etc.) from across Africa. This app uses data-intensive mobile services to raise awareness about AIDS and condom use and create job opportunities in South Africa, Nigeria, Kenya and Tanzania. In South Africa, the Praekelt Foundation uses an open source SMS TxtAlert system to remind HIV patients about appointments and track which patients miss them or ART medication pick-ups. However, the project faces challenges in expanding to clinics without digitized electronic databases outside Johannesburg.
Environment	Smart grids can significantly reduce energy consumption through improved heating, cooling and monitoring technologies. Broadband can reduce energy and water consumption through a range of technologies such as smart transportation and logistics, smart grids and meters, smart buildings, use of video conferencing and dematerialization. Smart use of ICTs can reduce greenhouse gas (GHG) emissions by up to 25%. Mobile technology alone could lower GHGs by 2% by 2020.
Partnership	The benefits of new technologies, especially ICTs, should be made available in cooperation with the private sector. In conjunction with public sector policy leadership, the private sector has driven expansion in the markets for fixed and mobile broadband. The market for mobile broadband has been driven by competition and private sector investment in many countries.

Source: ITU[74], Deloitte

[74] The Broadband Commission, "*The state of Broadband 2012: Achieving digital Inclusion for all*", ITU/Unesco 2012.

4 The Economic and Social Contribution of the Mobile Industry in SSA

Mobile telephony already generates significant economic and social benefits for the countries of SSA. The availability of mobile services in this region has not only transformed the way consumers and businesses communicate and exchange information but also brings significant productivity improvements to public governance, trade, health and education, therefore playing a key role in the socio-economic development of the region.

This section discusses the economic contribution of the mobile telephony ecosystem in the region by considering the impact of revenues and expenditure generated by the mobile ecosystem on the supply side of the SSA economies, on employment and on productivity in the four geographic areas of SSA.

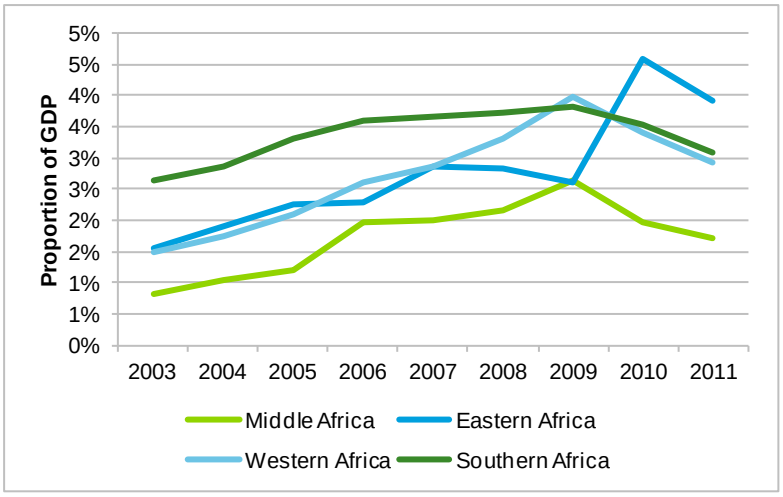
Second, the wider social impacts of mobile telephony are then described, focusing on social and digital inclusion and on innovations and new mobile applications being developed in the region.

4.1 The economic contribution of mobile services

Mobile telephony has a positive effect on the supply side of an economy through the operations undertaken by mobile operators and the related industries. As a result of mobile, significant investment in networks, operations and training is generated, often resulting in foreign direct investment and knowledge transfer. SSA mobile operators invest in civil works to extend their networks to rural areas, building access roads and bringing electricity to remote areas.

The rapid growth of mobile communication in SSA continues to increase revenues for mobile operators[75].y7 In 2011, mobile revenues in SSA amounted to over US$35 billion, which represents a contribution to the GDP in SSA of almost 3%.

Figure 40: Mobile operators' revenues as a proportion of GDP in SSA



Source: Wireless Intelligence and IMF

As discussed in Section 2, mobile revenues have been growing steadily. However, the significant GDP growth experienced in the region, especially in Middle, Eastern and Western Africa where GDP growth rates have

[75] See Section 2.3 for details on this estimation.

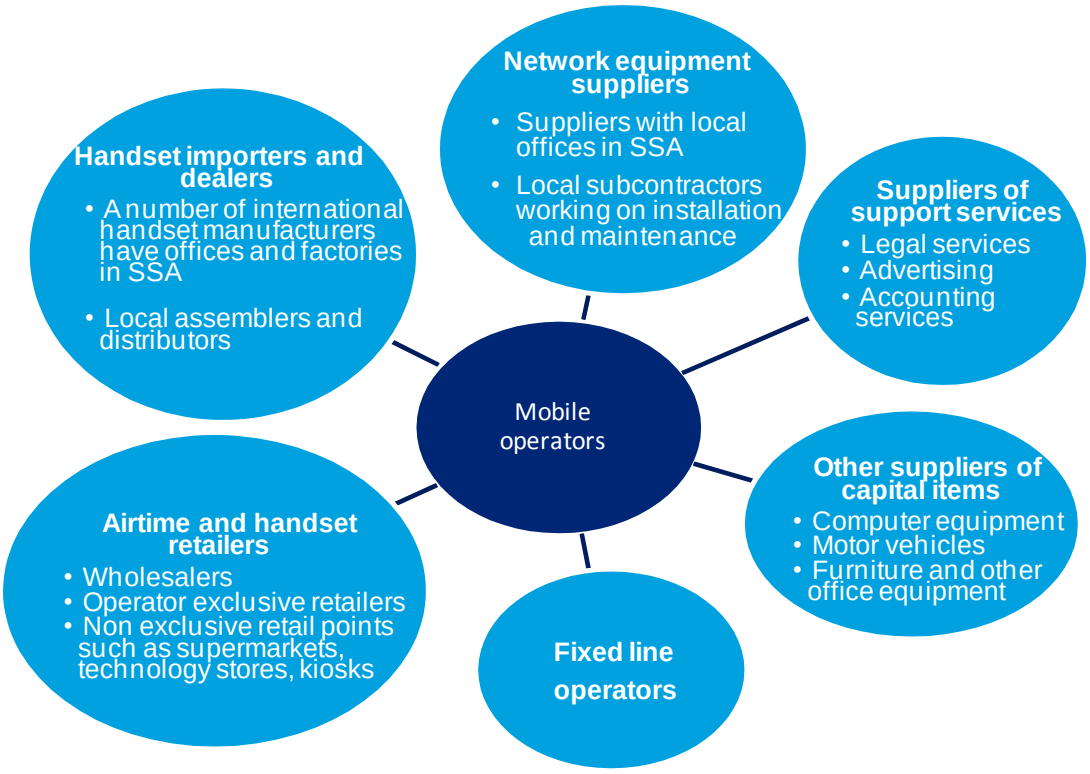
exceeded 10% since 2010, has outpaced revenue growth. As such, mobile revenues as a proportion of GDP contracted in the last two years.

The increase in revenues affects the wider economy through additional expenditures by the mobile operators. The supply side contribution of mobile telephony to the economy is therefore estimated by calculating the value add generated as a proportion of market revenues, throughout the entire mobile value chain. Significant local employment in a number of professions, from engineering and accounting to advertising and sales, is also generated.

In addition to the analysis of value add, the impact of mobile telephony on the demand side of the economy has also been estimated, through the positive impact that access to mobile telephony has on the labour force as a result of increased business productivity. [76]

To estimate the value add and employment generated by mobile telephony in the economy, the expenditure and value generated by mobile operators has been considered in relation to the other parties that operate in the mobile communications industry of SSA.

Figure 41: Mobile communications ecosystem considered for the analysis



These include a variety of players in SSA. For example, international equipment providers such as Ericsson, NSN and Alcatel-Lucent have established their offices throughout SSA and rely on a number of local contractors and technical companies offering services such as network installation and maintenance. In SSA, the mobile ecosystem also includes distributors and sellers of handsets and airtime, suppliers of other support services, such as advertising, to mobile operators and a number of other local operators, such as local content providers, that have also thrived as a result of mobile telephony as discussed in more detail later in this report.

[76] The framework for the supply side and demand side estimation is provided in the appendix.

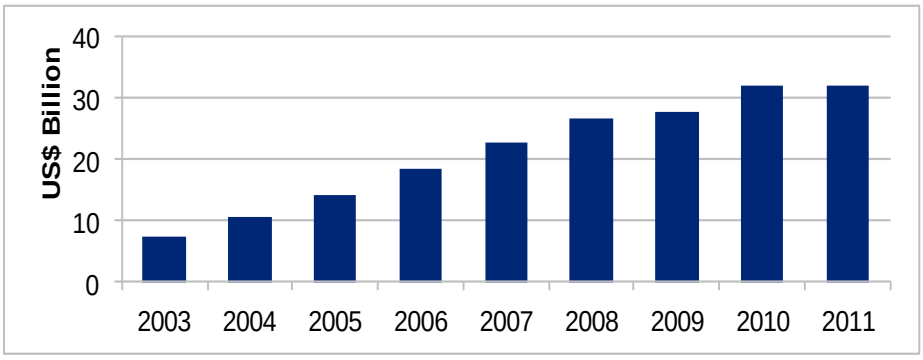
4.1.1 Impact on the supply side of the economy

The impact of mobile telephony on the supply side of the economy is generated by the direct effect of mobile operators' expenditure, and these benefits are then transmitted to related industries in the mobile ecosystem and more widely across the economy.

The direct contribution of the mobile operators consists of the value created by their expenditure on wages, dividends paid by mobile operators, and taxes recovered as a result of the operators' operations. The indirect economic contributions of the entire mobile industry are the effects of the activities on a variety of local players in the wider mobile ecosystem, which include revenues from international equipment providers, providers of network services, providers of other support and commercial services, and the network of formal and informal points of sale throughout the country, such as distributors and sellers of handsets and airtime.

In 2011 the total supply side impacts to the economy of SSA amounted to approximately US$32 billion, an increase of over 300% with respect to 2003. Of these, the mobile operators have provided a direct contribution of US$10.6 billion, close to 1% of GDP. The indirect impacts amounted to US$15.9 billion, while the multiplier effect from the wider economy consisted of US$5.3 billion and US$12 billion were paid in taxes.

Figure 42: Supply side value add of mobile communications in SSA



Source: Deloitte analysis

4.1.2 Demand side impacts on productivity

In addition to the benefits to the supply side of the economy, mobile telephony generates productivity increases through the use of mobile technologies for business purposes, especially in SSA where mobile services have surpassed fixed line services and act as a universal provider of telecommunication services.

Significant economic and social research has been undertaken over the last ten years on the numerous ways in which mobile services can improve productivity in African countries. These include:

- **Improving information flows**: mobile services allow certain occupations (such as commodities and agriculture, both prominent in SSA) to cut out the middle-man as traders can obtain information on prices, quality and quantities directly. This improves the incomes of producers, and helps reduce wastage.

- **Providing greater information pool for farmers and food chain intermediaries**: allowing them to find the best market price for their crops, increasing their income; tracking the latest weather information to protect crops and raise yields; tracking the movement of important food sources, e.g. fish stocks or herds of wild deer or horses[77].

[77] The Broadband Commission, "*The state of Broadband 2012: Achieving digital Inclusion for all*", ITU/Unesco 2012.

- **Improving efficiency by minimizing the duplication of data, ensuring consistency, improving the integrity of data**: for example DrumNet in Kenya, a common information system/platform for businesses, farmers, researchers and governments, enables them to connect and access information remotely[78].

- **Reducing travel time and costs**[79]: similarly, mobile services allow workers to trade and share information without travelling. Analysis conducted in Tanzania and South Africa found that 67% of users thought mobile services allowed them to reduce travel time[80] in their business.

- **Improving agricultural efficiency**: mobile telephony had a substantial impact on agriculture in SSA, improving pricing, reducing wastage and increasing efficiencies. For example, the introduction of mobile phones reduced dispersion of grain prices across markets by 10% in Niger[81]. In Uganda, **'**Farmer's Friend' was piloted by Grameen Foundation's AppLabs with support of Google SMS. Farmers can search for agricultural tips through an SMS-based database, covering crop and livestock prices, pest disease control information, planting, storage and harvesting tips, as well as regional weather forecasts. Keywords in the query are matched against the database and the farmer receives a reply with a tip to the query terms[82]. Mobile phones also allow households to obtain information about potential supply shocks (such as drought), allowing them to use such information to make planting and harvesting decisions, which can have important effects on yields.

- **Improving job search**: mobile services improve the chances of finding employment through enabling people to call for opportunities rather than relying on word of mouth and providing access to internet based job boards, professional networks and email addresses. Further to this, owning a mobile phone makes workers more employable as they are contactable while absent from their place of work.

- **Encouraging entrepreneurialism**: mobile has encouraged the growth of small business, has increased their efficiency and has enabled many to work remotely, producing income even from home. For example, there are few taxi firms in Kenya and taxi drivers print business cards with their mobile number, and several drivers are able to share a taxi, using mobile phones to agree arrangements. Additionally, mobile telephony has driven the creation of 'innovation hubs' that foster the development of local products and content; these will be discussed later in more detail.

- **Modernising government**: more transparent and integrated management and governance systems are being introduced by governments throughout SSA; for example, Kenya launched an open government data portal, whereby all internet users can access information on census, government expenditure and key public services.

The impact of the productivity improvements on the overall economy can be estimated as a lower bound by considering the productivity improvements that will be experienced by high-mobility employees within the economy. High-mobility workers are those who undertake a moderate to high degree of travel in the course of their employment, including taxi drivers, agricultural workers selling produce in town, salespeople and transport workers.

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78 The World Bank and the African Development Bank, "*The transformational use of information and communication technologies in Africa"*, 2012.

79 Kiondo, E, et at., "*Contribution of mobile phones to rural livelihoods and poverty reduction in Morogoro region, Tanzania",* The Electronic Journal on Information Systems in Developing, 2010.

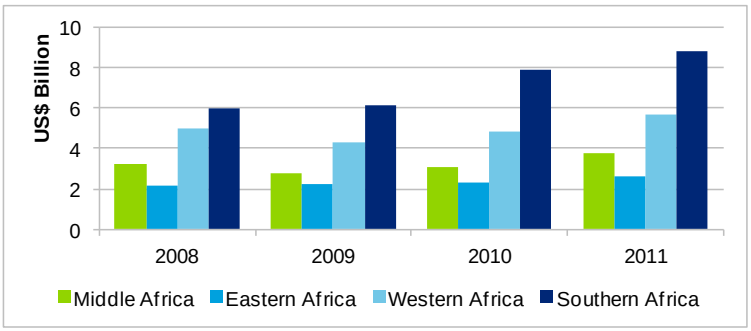
80 Vodafone, "*Africa: The Impact of Mobile Phones"*, Vodafone Policy Paper Series, No.3, March 2005.

81 Aker, Jenny C. 2008, "*Does Digital Divide or Provide? The Impact of Mobile Phones on Grain Markets in Niger*", BREAD Working Paper 177.

82 Syngenta Foundation, "*mAgriculture- Mobile applications in Agriculture",* 2011. http://www.syngentafoundation.org/__temp/Report_on_mAgriculture_abridged_web_version.pdf

According to this methodology, the productivity impacts from the mobile ecosystem in the entire SSA amounted to over US$21 billion, an increase of 30% since 2008. This contribution represented 1.74% of the region's GDP in 2011.

Figure 43: Economic impact of increased productivity among high-mobility workers (2008–2011)



Source: Deloitte analysis

4.1.3 Contribution to employment

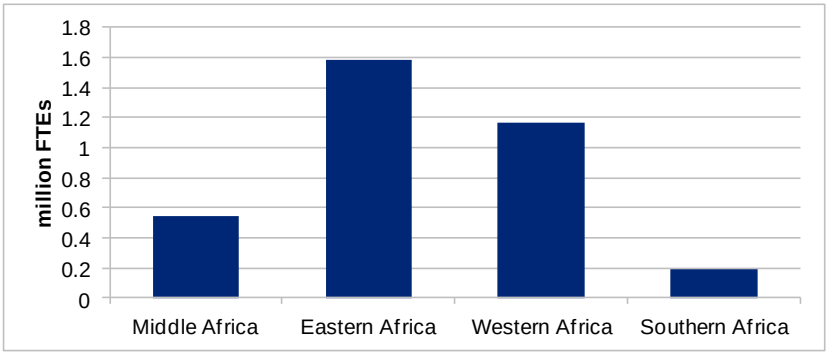
Mobile services contribute to local employment in several ways, including direct employment by the mobile operators, employment in related industries, and the support employment created by outsourced work.

In a number of countries in the SSA region, the distinction between formal and informal employment remains blurred. However, mobile operators provide a stable source of employment for skilled workers, and, through significant training and skill transfer programmes, successfully train local employees. Further, skilled employment opportunities are generated in support of the wider ecosystem.

It is estimated that, across the ecosystem, in 2011 the mobile communication industry employed more than 2.9 million Full Time Equivalents (FTEs) in SSA. A further 570,000 FTEs are estimated to be generated in the wider economy as a result of interactions with mobile operators, such that the total contribution to employment in SSA is approximately 3.5 million FTEs.[83]

[83] Contribution to employment is estimated by assuming a fixed proportion of mobile to total employment using the Kenya benchmark calculated in Deloitte/GSMA, "Mobile telephony and taxation in Kenya", 2011. A multiplier of 20% is then applied to the indirect employment to capture the support and induced employment.

Figure 44: Industry contribution to employment, including multiplier effect in 2011 (million FTEs)



Source: African Development Bank data on total workforce[84] and Deloitte analysis

These employment opportunities reflect the wider mobile ecosystem. In addition to direct employment by the mobile operators, significant employment was also generated in network support services, and in a host of other professional services supporting the mobile operators, such as advertising and auditing.

The mobile phone sector has also spurred a variety of business and entrepreneurship opportunities in the informal sector, some directly generated as a result of mobile operators business strategies[85]. As the majority of consumers use pre-pay cards, mobile operators rely on extensive phone credit distribution networks in partnership with the formal and informal sector[86]. As such, a key contribution to employment is generated by formal and informal airtime and handset sellers. Small shops that have traditionally sold a variety of household goods also sell mobile phone airtime, particularly in small denominations. Young men and women are often found selling airtime cards in the streets. Numerous small-scale businesses have also opened shops to sell, repair, and charge mobile phones, either using car batteries or small generators. In the early years of mobile phone usage, entrepreneurial individuals started businesses to rent mobile phones, especially in rural areas.

4.1.4 Contribution to public funding

A key contribution of mobile telephony in SSA is given by the taxes and regulatory fees that mobile operators pay to governments, thus contributing to funding public expenditure in the region.

As economies in the region often rely on informal businesses and employment, collecting taxation in SSA is complex and a number of activities are not taxed directly. Mobile operators, through their sophisticated billing systems and advanced reporting, are one of the industries that can be more easily controlled by governments for the purpose of collecting taxation. Taxation proceeds from mobile operators have increased significantly over time in SSA, reaching in the order of US$12 billion in taxes and other fees to governments in 2011.[87]

A detailed analysis on taxation for mobile operators and consumers is reported in Section 5.

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84 Total workforce data is up to 2008; a growth rate equal to GDP growth was applied to the total workforce of each country to estimate 2011 figures.

85 Jenny C Aker and Isaac M Mbiti, "*Mobile Phones and Economic Development in Africa*", 2010

86 Mohammed Ibrahim, the Sudanese businessman who established Celtel, a pan-African mobile group now owned by Airtel, stated: "Mobile phones could not work in Africa without prepaid because it's a cash society" (The Economist, 2009)

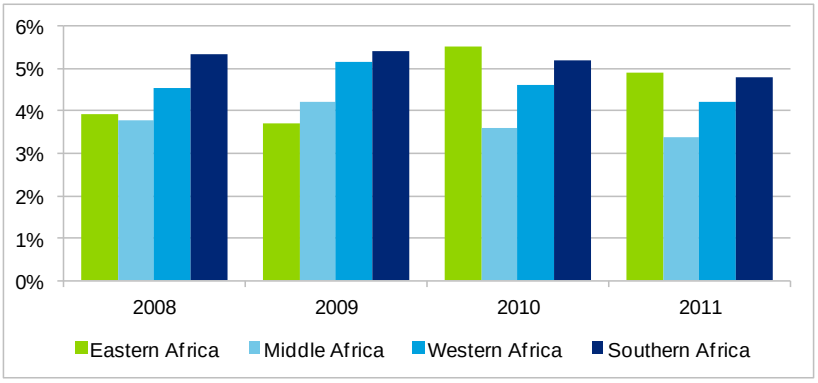
87 The results in Deloitte/GSMA, "Mobile telephony and taxation in Kenya", 2011 are used as a benchmark for this estimation and are reported in the appendix.

4.1.5 Total Impacts

Overall, this study finds that in 2011 the mobile communications industry contributed US$53 billion to the economy of SSA, with an increase of 27% since 2008.

A contribution of 2.7% of GDP is associated with the supply side impact, while 1.7% of GDP is associated with increased productivity, highlighting the importance of mobile telephony to the productivity of economies in the region.

Figure 45: Total economic impact in SSA as a proportion of GDP



Source: Deloitte analysis

In addition, it is estimated that in 2011 the mobile ecosystem contributed approximately 3.5 million FTEs to employment in the region and approximately US$12 billion to government funding through taxes and fees.

4.2 The long term relationship between mobile penetration and economic growth

In addition to the direct and indirect impacts of mobile services illustrated above, a long term relationship exists between mobile telephony and economic growth. As total mobile penetration in SSA has increased from only 1% to 54% in twelve years and as the fixed line network often remains undeveloped and unavailable to the majority of the population, mobile services have become the universal provider of communications services. These significant penetration increases have made basic mobile services available to millions of people across all income levels and have affected greatly the economy as a whole.

The combination of supply side and productivity effects together with the impact of social and digital inclusion, literacy and education, generates long term impacts on economic development and GDP growth. These effects can be particularly evident in rural Africa, where in many places mobile services have represented the first modern telecommunications infrastructure of any kind.

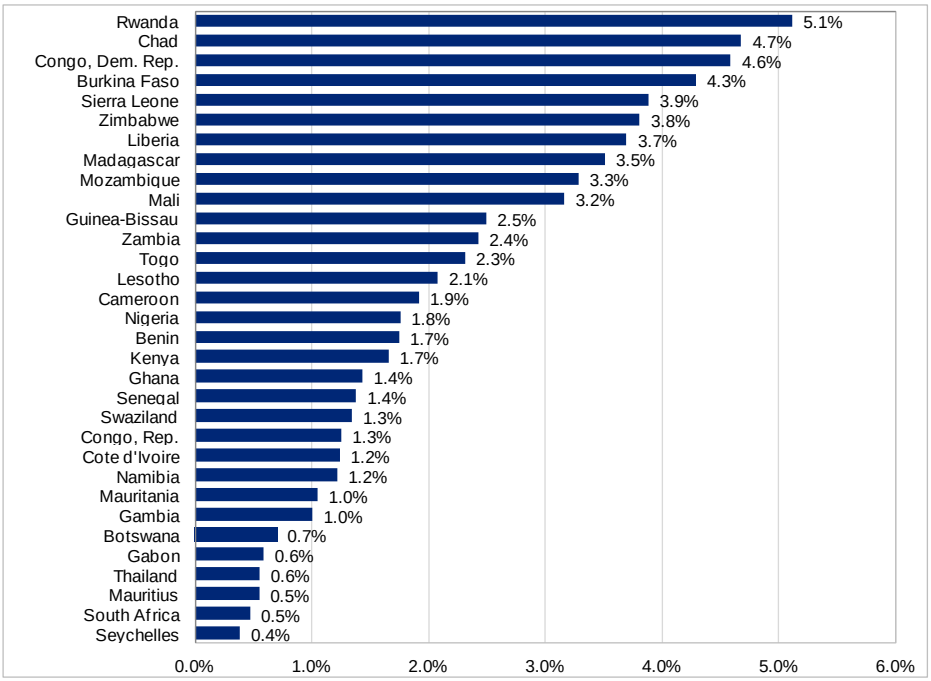
Extensive research has been conducted on the relationship that exists between penetration rates and GDP growth, and for its importance to developing countries. A recent study[88] conducted by Deloitte for the GSMA specifically explored the benefits of mobile telephony in developing markets using econometric techniques. Updating previous analysis with more recent figures on penetration and expanding the sample of developing countries considered, this study finds that a 10% increase in mobile penetration increases the long run GDP per capita growth by 1.1%.

[88] Deloitte/GSMA/Cisco, “What is the impact of mobile telephony on economic growth?”, 2012.

In Africa, which contributes to half of the study's panel of 89 countries, the effect of a hypothetical increase in penetration is higher than for the sample average: the study finds that if mobile penetration were to increase by 10%, the average annual growth of GDP per capita would be 1.4 percentage points higher.

The positive effect of increases in mobile penetration varies across countries depending on the level of mobile penetration in each and that mobile penetration increases have a higher impact on GDP growth per capita and business productivity in countries with low levels of penetration than in countries with higher levels of penetration. The effect on the GDP growth rate of a 10% increase in penetration for the SSA countries that were included in the sample is shown in Figure 46.

Figure 46: Effect of a 10% increase in mobile penetration on GDP per capita growth in each country[89]



Source: Deloitte/GSMA/Cisco, "What is the impact of mobile telephony on economic growth?", 2012

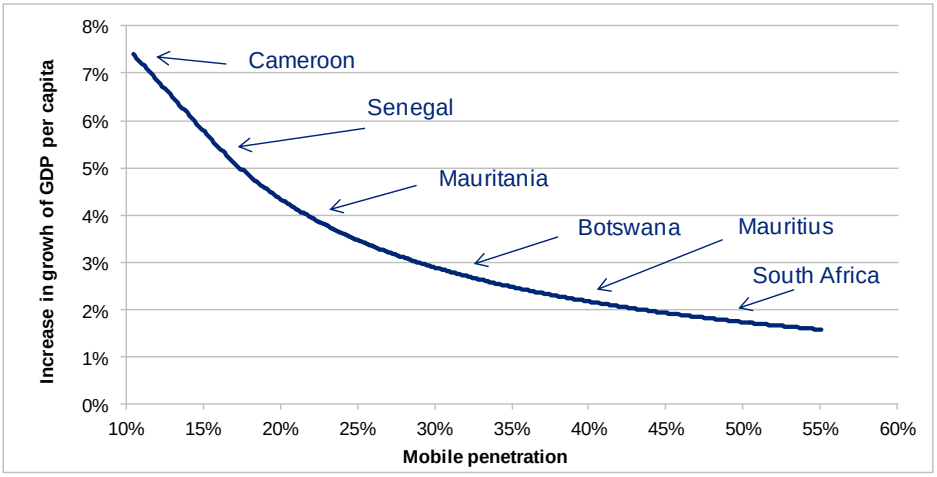
The positive impacts of higher penetration rates on business productivity have also been considered as part of the study, in particular the study considered the positive effects of mobile penetration on a country's Total Factor Productivity (TPF). This is a measure of economic productivity which accounts for effects in total output not caused by traditionally measured inputs such as capital and labour and that often measures a country's long term technological dynamism.

The study found that marginal effect of mobile phone penetration on TPF varies across countries with the average level of mobile penetration. Countries with lower penetration rates experience higher TPF gains as a result of productivity increases.

Overall, across the whole sample of countries considered, if countries had a 10% higher mobile penetration between 1995 and 2010, they would have experienced a TFP increase of 4.2 percentage points in the long run. Figure 47 links the level of mobile penetration to growth of GDP per capita for selected countries of SSA. The relationship also holds for the rest of the SSA economies included in the study.

[89] This figure includes only countries with average penetration above 15% during the period 1996 to 2009.

Figure 47: Marginal effect of a 10% increase in mobile penetration on total factor productivity



Source: Deloitte/GSMA/Cisco, "What is the impact of mobile telephony on economic growth?", 2012

4.3 The social contribution of mobile telephony

> *"Can Africa reach its 2015 Millennium Development Goals? If countries embrace the unique power of mobile broadband technology, I believe many have a good chance[90]".*
>
> Dr Hamadoun Touré, Secretary-general of the International Telecommunication Union, 2012

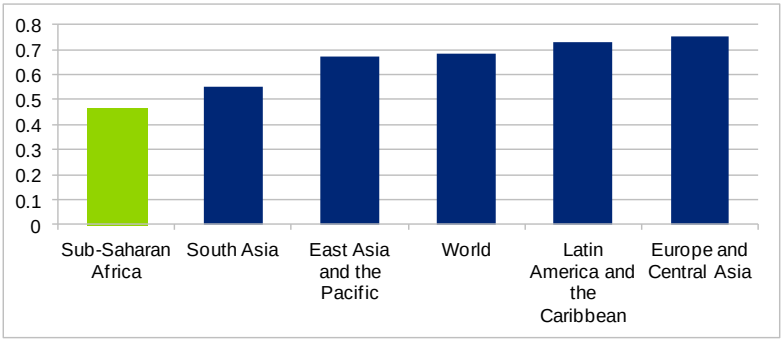
> *"Regardless of social class, almost everyone [in Africa] has a mobile phone, or two or three. Even in remote villages, mobile phones have replaced the bicycle or radio as prized assets[91]".*
>
> Elsie Kanza, Head of Africa for the World Economic Forum, 2012

In addition to the economic benefits discussed above, one of the main effects of mobile phones is their impact on wider societal issues. Economic and social development, including social inclusion, remains a key challenge in SSA. While numerous economies in the area have experienced significant economic growth, economic, political and social crises continue to affect the lives of local populations. As such, SSA scores well below the world average in the United Nations Human Development Index, which combines health, education and income variables.

[90] Hamadoun Touré, special for the CNN. "How mobile broadband can transform Africa", 2012. http://edition.cnn.com/2012/02/27/opinion/technology-toure-africa-mobile/index.html

[91] Elsie Kanza for the Guardian, *"Forget the usual tired debates about Africa, it's changing – for the better"*, 2012. http://www.guardian.co.uk/global-development/poverty-matters/2012/may/10/africa-changing-for-the-better?INTCMP=SRCH

Figure 48: Human Development Index (2011)



Source: United Nations Development Programme

Mobile telephony, by providing access to a reliable form of communication, has connected the previously unconnected and transformed the way in which African people live their lives. While a decade ago mobile telephony was perceived as a luxury good or as a business tool, increased affordability and coverage have shifted rural people's attitude to the service.

Mobile services impact positively on the living standards of people in rural communities and low-income areas in a practical manner, increasing social capital and cohesion through several mechanisms:

- **Promotion of social cohesion and development of communities**: Reduced feelings of isolation and improved relationships are key to overcoming vulnerabilities related to social exclusion; mobile phone users in the isolated Morogoro region in Tanzania[92] reported that mobile phones had greatly improved their ability to keep relationships with friends and relatives. Mobile services also promote higher levels of altruism and trust, through mobile sharing in rural communities, as well as people making and receiving calls and texts on behalf of others[93].

- **Extension of communications**: especially to users with low education and literacy, particularly through the use of text messages. Mobile phones require only basic literacy, so are therefore accessible to a larger segment of the population. The ABC project, a mobile-based adult literacy project in Niger, has led to improved scores in literacy and numeracy tests[94].

- **Promotion of active citizenship**: mobile telephony ensures greater participation of marginalised groups in the development process, by giving a voice to segments of the population that previously lacked access to the media. The programme Voices of Africa has trained young reporters from Zimbabwe, RDC, Malawi, Uganda and South Africa to create video news reports using mobile phones[95], allowing them to report on the issues they consider more relevant to their communities.

- **Assisting in disaster relief:** mobile services allow families and friends to stay in touch in the event of a natural disaster, which can also ensure that they obtain more rapid relief. They also provide greater ability to survive emergencies and natural disasters, as mobile phones allow users to seek assistance, get critical support and coordinate relief efforts; they also can help in finding and contacting the nearest

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92 Kiondo, E, et at, "*Contribution of mobile phones to rural livelihoods and poverty reduction in Morogoro region, Tanzania*", The Electronic Journal on Information Systems in Developing, 2010.

93 Vodafone, "*Africa: The Impact of Mobile Phones*", The Vodafone Policy Paper Series, March 2005.

94 https://edutechdebate.org/meducation-initiatives/lets-get-informal-mobile-phones-for-adult-basic-education-in-west-africa/

95 http://mobileactive.org/voices-africa-citizen-journalists-africa-use-mobile-phones-report-their-communities

relief centre, clinic, or field hospital; and tracing, finding, or contacting relatives[96]. The case of a refugee in Kenya who texted two United Nations officials from his mobile phone to request additional food rations for a refugee camp in Dadaab is an example of this[97].

- **Reducing family and business risks:** SSA remains a region of heightened risk. Natural disasters, conflicts, and epidemics routinely affect households and small and family businesses. By promoting communication between families and communities, mobile services act as informal insurance networks.

- **Promotion of digital inclusion**: mobile services universalise the use of computer and communication technologies to boost autonomous and continuous learning and enable citizens to operate computers, to use common applications (text editors, spreadsheets, etc.) and access the internet.

While impacts on productivity have been discussed above, mobile services, by changing how people work, impact societies in numerous other ways by:

- **Stimulating local content**: this can be particularly useful for allowing users to learn about local services such as healthcare or education.

- **Creating low-carbon economies** through the introduction of more energy-efficient infrastructure; higher crop yields and reduced food wastage; reduced carbon consumption through more efficient communication and travel.

- **Changing the way in which healthcare, education and financial services are provided** in SSA, as discussed in greater detail below.

To track social development, the UN has established a set of Millennium Development Goals (MDG), which are eight international development objectives and specific targets to be achieved by 2015. Based on the commitment of all UN member states and several international organisations, the MDG are aimed at encouraging development by improving social and economic conditions in the world's poorest countries. The World Bank has recognised that mobile telephony in SSA has made a positive and significant contribution to achieving the MDG across all eight areas, as summarised in Table 5.

[96] The Broadband Commission, "*The state of Broadband 2012: Achieving digital Inclusion for all*", ITU/Unesco, 2012.

[97] The Economist, *"Flood, famine and mobile phones",* 2007.

Table 5: Impact of mobile telephony on the Millennium Development Goals

Goal	Examples of mobile impact
Poverty and hunger	CocoaLink in Ghana uses mobile technology to connect cocoa farmers with useful information about improving farming practices, farm safety, crop disease prevention, post-harvest production and crop marketing. Through voice and SMS messages delivered in their local language or English, cocoa farmers will receive the information at no charge[98].
Universal Education	According to a survey of teachers in villages in four African countries, one-quarter reported that the use of mobile phones helped increase student attendance. A main factor was that teachers could contact parents to enquire about their child's whereabouts. Mobile phones have also been used in Uganda to track school attendance so that school administrators can see patterns in attendance, for instance by village, by day of the week, and by season. Tracking attendance for pupils indirectly also tracks absenteeism among teachers.[99]
Gender Equality	A study looking at gender differences in the availability and use of mobile phones in developing countries reported that 93 % of the women who had mobiles felt safer because of the phone, 85 % felt more independent, and 41 % had increased income or professional opportunities.[100] The report found that closing the mobile gender gap would increase revenues for mobile operators by US$13 billion.
Child health	A program using text messaging to identify malnutrition among rural children in Malawi is notable for its impact on the speed and quality of the data flows. Using a system called RapidSMS, health workers in rural areas were able to transmit weight and height information in two minutes instead of the two months needed under the previous system. The data entry error rate was significantly improved to just 2.8 % from 14.2 % in the old system. The improved information flow enabled experts to analyse data more quickly and accurately, identify children at risk, and provide treatment information to the health staff in the field[101].
Maternal Health	One of the earliest uses of mobile technology to improve maternal health took place in rural districts of Uganda in the late 1990s. Traditional birth attendants were provided walkie-talkies, allowing them to stay in contact with health centres and obtain advice. An assessment of the program found that it led to roughly a 50 % reduction in the maternal mortality rate[102].
HIV/AIDS	In Kenya weekly text messages were sent to AIDS patients to remind them to take their antiretroviral drugs[103]. Those who received the text messages had significantly higher rates of taking the drugs than those who did not receive them. The study noted that SMS intervention was less expensive than in person community adherence interventions on the basis of travel costs alone and could theoretically translate into huge health and economic benefits if scaled up.
Environment	According to one forecast, mobile technology could lower greenhouse gas emissions 2 % by the year 2020.[104] This reduction can be met through, among other things, widespread adoption of various mobile-enabled technologies such as smart transportation and logistics, smart grids and meters, smart buildings, and "dematerialization" (replacing the physical movement of goods and services with online transmission). Mobile phones can also be used as tools for environmental monitoring. In Ghana, for example, cab drivers in Accra were outfitted with mobile phones with GPS and a tube containing a carbon monoxide sensor to test pollution levels.
Partnership	Mobile penetration in low-income countries has grown from less than one per 100 people in 2000 to one per every three in 2010, largely as a result of private sector investment. Of some 800 telecommunications projects in developing countries with private sector participation between 1900 and 2009, almost three quarters involved Greenfield operations primarily in mobile telephony[105].

Source: World Bank, Information and Communications for Development. Maximizing Mobile, 2012.

98 http://www.howwemadeitinafrica.com/how-mobile-phones-are-transforming-african-agriculture/8704/

99 Twaweza, *CU, "Tracking School Attendance in Uganda", 2010.* http://twaweza.org/index.php?i=221

100 GSMA, "*Women & Mobile: A Global Opportunity", 2011.* http://www.vitalwaveconsulting.com/pdf/Women-Mobile.pdf.

101 World Bank, "*Information and Communications for Development. Maximizing Mobile*", 2012.

102 Musoke, M., "*Maternal Health Care in Uganda: Leveraging Traditional and Modern Knowledge Systems"*, IK Notes, January 2002.

103 Lester, R. Et al., "*Effects of a Mobile Phone Short Message Service on Antiretroviral Treatment Adherence in Kenya (WelTel Kenya1): A Randomised Trial*", The Lancet 376, no. 9755 , November 2010.

104 GSM Association, "*Mobile's Green Manifesto",* November 2009. http://www.gsmworld.com/our-work/mobile_planet/mobile_environment/green_manifesto.htm.

105 World Bank and PPIAF, PPI Project Database. http://ppi.worldbank.org

However, as technology develops, mobile services have the potential to further impact economic and social development through the provision of high value 3G and 4G data services accessed via smartphones, tablets and dongles that deliver mobile data services to businesses and consumers. As telecommunication markets mature, mobile phones in Africa are evolving from simple communication tools into service delivery platforms. This has shifted the development paradigm surrounding mobile phones from one that simply reduces communication and coordination costs to one that could transform lives through innovative applications and services[106].

As such, when mobile broadband becomes available to a proportion of the population, these social effects will be amplified. In particular, digital services and mobile broadband reinforce education and people's digital technology knowledge. Mobile broadband and mobile phone-based applications will generate a host of social and commercial services in areas such as financial services, agriculture, healthcare, and education.

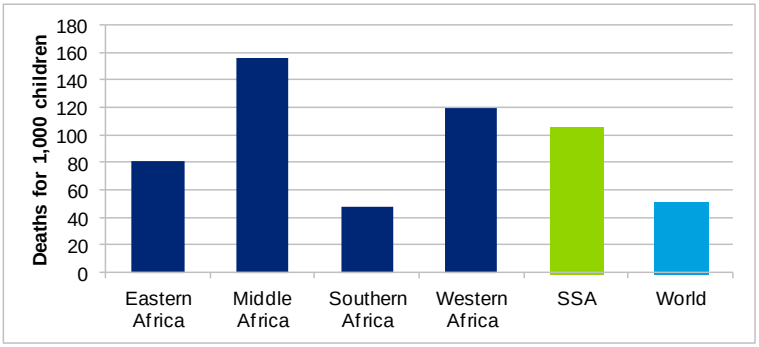
Figure 49: Areas of social and economic inclusion that will be enhanced by mobile broadband

The rest of this section discusses examples of how mobile impacts healthcare, education, financial services and local content/innovation in SSA.

4.3.1 mHealth

Healthcare provision remains a significant issue in SSA. In particular, mortality for under-five children and maternal mortality rates remain a significant problem in the region as most of the top 40 countries with highest maternal mortality rates worldwide are in SSA, with an average of 500 women deaths per 100,000 births[107] in 2011.

Figure 50: Under-five mortality rates (2011)



Source: World Health Organisation, Deloitte Analysis

[106] Aker et al, "*Mobile phones and economic development in Africa*", Journal of Economic Perspectives, 2010.

[107] World Health Organisation, "*World health statistics. A snapshot of global health*", 2012.

Mobile telephony and mobile broadband provide a significant contribution to ease these issues and a World Health Organisation[108] review of mHealth programmes worldwide found that SSA has a number of established programmes in several categories, ranging from emergency toll-free telephone service, appointment reminders and patient records, among others.

Table 6: Established mHealth initiatives, by type

Categories	Sub categories	Established initiatives*
Communication between individuals and health services	Health call centres/Health care telephone help line	18
	Emergency toll-free telephone services	25
Communication between health services and individuals	Treatment compliance	10
	Appointment reminders	18
	Community mobilization	15
	Awareness raising over health issues	5
Consultation between health care professionals	Mobile telemedicine	5
Intersectoral communication in emergencies	Emergencies	30
Health monitoring and surveillance	Mobile surveys (surveys by mobile phone)	18
	Surveillance	18
	Patient monitoring	5 (pilot stage)
Access to information for health care professionals at point of care	Information and decision support systems	15
	Patient records	12

Source: WHO[109], includes Northern Africa.

Examples of initiatives in the region include mobile applications for child mortality, information on family planning, disease surveillance and medicine verification:

- **Child mortality**: countries such as Kenya and Rwanda are prioritising broadband as a platform for health service delivery, using telemedicine to reduce child mortality[110]. In Tanzania and Nigeria, **'**Mobile-baby' is the result of a partnership between Etisalat, Qualcomm, D-Tree international and Great Connection. The service is aimed at reducing mother and child mortality by helping pregnant women in rural areas reach hospital. 'Mobile-baby' allows medical practitioners to send ultrasound images, video clips and 3D scans directly from ultrasound machines to mobile phones via SMS, MMS and email, providing real-time remote medical diagnostics.

- **Community health events reporting, feedback, and illness alert system in 'Millennium Villages' in Ethiopia, Ghana, Kenya, Malawi, Mali and other countries in SSA.** ChildCount+, part of the Millennium Villages Project[111], is an SMS based mobile phone system that enables point-of-care decision support, data collection, reporting, and feedback for Community Health Workers to facilitate their community-based services and enable real-time monitoring. Data covers children malnutrition, malaria, and other childhood illnesses. Its aim is to reduce child and maternal mortality, contributing to the achievement of the Millennium development goals.

[108] World Health Organisation, "*mHealth: New horizons for health through mobile technologies"*, 2011.

[109] World Health Organisation, "*mHealth: New horizons for health through mobile technologies"*, 2011.

[110] ITU, Unesco, "*A 2010 leadership imperative: The future built on broadband"*, report by the Broadband Commission, 2010.

[111] The Millennium Villages Project is a project of the Earth Institute at Columbia University, the United Nations Development Programme. It provides an integrated approach to sustainable rural development with the aim of meeting the Millennium Development Goals. Countries included in the project are Ethiopia, Ghana, Kenya, Malawi, Mali, Nigeria, Rwanda, Senegal, Tanzania, and Uganda.

- **Better information on family planning in DRC.** In partnership with Vodacom, Population Services International (PSI) established 'The Ligne Verte', a toll-free hotline aimed at complementing family planning initiatives in the country. Trained operators answer calls and provide confidential information on family planning. If needed, they refer patients to local clinics to access contraceptives and other commodities.

- **Disease surveillance and medicine tracking in villages in Uganda.** UNICEF Uganda is supporting the Ministry of Health in a nationwide roll-out of mTrac, an SMS-based disease surveillance and medicine tracking system available at all 5,000 health facilities and for all 8,000 medicine-distributing village health workers. The objective is to provide key health sector stakeholders with timely and accurate data, while monitoring health service delivery performance. This mobile phone based initiative will also link in citizen feedback through an anonymous hotline, and will integrate a strong governance and accountability angle through public dialogue sessions. The project is already being rolled out in 28 Central Ugandan Districts, and expects to have national coverage by the end of 2012.

- **SMS medicine verification service in Ghana and Nigeria.** mPedigree is a toll-free medicine verification based in Ghana and Nigeria. The system allows consumers to use basic text messaging to verify the authenticity and origin of their medicine. The consumer can send a barcode, found after scratching off a coating on the packaging[112], via SMS to mPedigree's free number and receive an SMS back stating whether or not the drug is genuine. Besides the obvious health benefits for consumers, it allows legitimate pharmaceutical companies to recover losses by tracking drugs and collecting data on counterfeit drugs[113].

As mobile broadband expands, further help can be provided through tablets and smartphones, in particular for doctors and practitioners.

4.3.2 mEducation

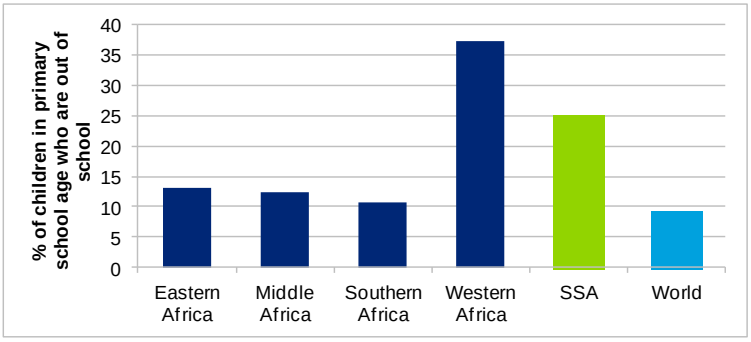
Levels of education in SSA have shown considerable improvements in the past decade, with enrolment rates growing five times faster than they did in 1990s[114], as well as reduced gender disparities in education. However the region still lags behind the rest of the world in primary enrolment levels, and the proportion of children out of school is still 2.5 times higher than in the rest of the world.

[112] Madanmohan, R., "*Mobile Africa Report 2011, Regional Hubs of Excellence and Innovation"*, Mobile Monday, March 2011.

[113] Smertnik, H, "*M4D: How the mobile phone becomes a tool for development. Focus on the Republic of Kenya*", University Paris 1 - Pantheon Sorbonne, 2012.

[114] Unesco, "*Mobile learning week report", 2011.* *http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/ED/ICT/pdf/UNESCO%20MLW%20report%20final%2019jan.pdf*

Figure 51: Proportion of children in primary school age who are out of school (2011)



Source: Unesco, Deloitte Analysis

Mobile technologies are especially good at increasing education and achieving the MDG of 'education for all', as they can enable literacy development, promote student motivation, enhance access to teacher development opportunities and improve communication between parents, teachers and principals[115]. The higher rate of mobile uptake compared to desktop computers or laptops provides an important opportunity to leverage the use of mobile broadband in the classrooms. Mobile broadband can act as a step change in the way education is provided in SSA. Examples of mEducation programmes in SSA include:

- **Mobiles for mathematics in South Africa (MoMaths).** Nokia, MTN and Cell C have partnered to enable teenagers access to short math courses and a database of 10,000 questions. Students receive immediate feedback on multiple choice practice tests for free, as data transfer costs have been paid by mobile operators. By 2011 the project had targeted 18,000 learners, reaching 150 schools in South Africa[116]. As part of the programme results, teachers have cited improvements in learners' attitudes towards mathematics leading to better test results.

- **Video content and teacher support in Tanzania.** The 'Bridge-it' project in Tanzania[117] currently operating in 150 schools, uses mobile phones to support teachers. It promotes request and delivery of video content entirely over local 2.5G or 3G mobile networks, for display on a television in the classroom. Most of the project's efforts have been aimed at providing teacher professional development and on-going pedagogical support, including the development of learner-centred lesson plans and teacher's guides.

- **Literacy improvements in South Africa.** The Yoza Project sets out to explore the viability of using mobile phones to support reading and writing by youth in South Africa. In the pilot phase of the project an episodic mobile novel, written in English and isiXhosa, was published on a mobisite and on MXit. Readers were invited to interact with it as it unfolded, through discussions around the evolving plot, voting in polls, leaving comments and submitting a written piece as part of a competition for story sequel ideas. A few months later, a second novel was published, with very high uptake rates. In just seven months the two stories were read over 34,000 times on mobile phones, considerably above the "best-seller" rates in South Africa currently at 4,000 copies. The project has now over 28 novels, five Shakespeare plays and 11 poems[118].

[115] Unesco 2012, UNESCO Mobile Learning Week Report.

[116] http://www.un.org/en/ecosoc/innovfair2011/docs/nokia.pdf

[117] The Broadband Commission, "*The state of Broadband 2012: Achieving digital Inclusion for all"*, ITU/Unesco 2012.

[118] GSMA, "*mEducation has the power to transform lives"*, 2012. http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/images/wsis/WSIS_Forum_2012/55515-M-education%20GSMA.pdf

A recent report on eLearning in Africa highlights that the most significant constraint factor for ICT-enhanced learning and training is limited bandwidth, as remarked by 17% of survey respondents[119], particularly in Zambia. In this context, mobile phone networks are the catalyst of broadband availability in the region, also contributing to the development of e-learning initiatives:

- **Intel netbooks and broadband in Kenya, Nigeria and Ghana**. An initiative of Intel in Kenya has delivered entry-level prepaid netbooks including educational content, such as the British Council's 'Learn English' software, education applications, safety apps and 1.5GB of free data download to enhance learning. After partnering with mobile operator MTN for prepaid broadband packages, this initiative was extended to Nigeria and Ghana. Netbooks for these countries had applications with local folk stories, and additional educational content[120].

- **Teacher professional development and female education as part of the 'Millennium Villages' project in Ghana.** The Millennium Village Project places education at the core of integrated rural development across sub-Saharan Africa. 'Connect to Learn' is part of this initiative and identifies strategies to integrate teacher professional development with 21st century ICT-based teaching, tools and practices in classrooms. It also puts particular emphasis on improving access to quality secondary education for girls. Ericsson is providing the connectivity and fixed wireless terminal devices for schools Ghana while Airtel is providing the 3G SIM cards. The aim is to strengthen teachers' and students' skills in science, math, technology and reading[121].

4.3.3 mMoney

A key constraint on economic development in SSA is the limited availability of financial services, particularly in rural areas. Exclusion from the formal financial system is one of the most significant barriers to poverty eradication, as the lack of financial instruments limits businesses and consumers' ability to save, repay debts and manage risk.

Consequently, 'mobile money' is widely seen as an effective way to provide access to finance to millions of people world-wide. It is also a valuable platform and critical piece of infrastructure underpinning other economic sectors, such as commerce, health insurance, agricultural banking, among others.

Mobile payments and mobile banking help with transfer remittances and transfers of money, which can improve lower income worker's ability to contract micro-loans, enabling them to withstand financial shocks. Mobile payments can also contribute to promoting transparency and combating corruption, as electronic payments are easier to trace[122].

Mobile platforms have evolved to include services such as mobile finance (credit, insurance, savings), mobile banking (transactional and informational), and mobile payments (including person to person, government to person and business to business) [123]. A number of initiatives in the region have already proven how this can be driven through the increased use of mobile phones, making SSA the world leader in mMoney. The region had over 50 initiatives in 2011, and countries such as Kenya, Rwanda and Tanzania have more than one provider, fostering competition in the market.

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119 Various, "*eLearning Africa Report 2012"*. http://www.elearning-africa.com/pdf/report/ela_report_2012.pdf

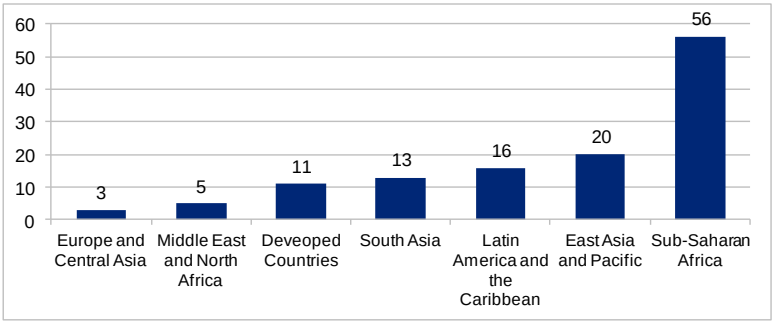
120 The Broadband Commission, "*The state of Broadband 2012: Achieving digital Inclusion for all"*, ITU/Unesco 2012.

121 http://www.ericsson.com/thecompany/sustainability_corporateresponsibility/enabling_communication_for_all/connectto learn

122 The Broadband Commission, "*The state of Broadband 2012: Achieving digital Inclusion for all*", ITU/Unesco 2012.

123 World Bank, "*Information and Communications for Development. Maximizing Mobile"*, 2012.

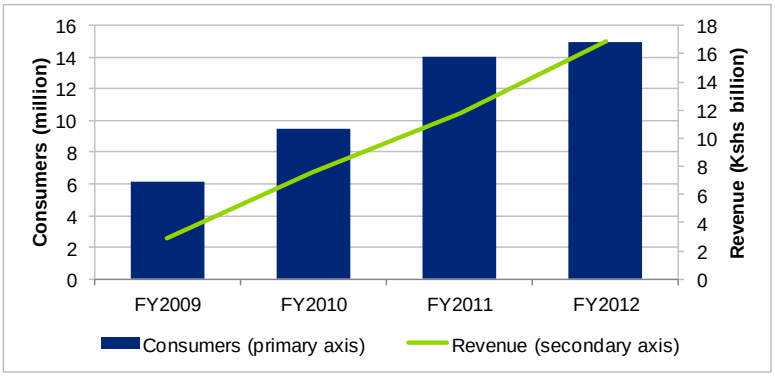
Figure 52: Number of mMoney initiatives, by region (2011)



Source: GSMA, Mobile Money tracker 2012

Two examples stand out, both in Kenya. M-PESA was introduced by Safaricom in Kenya in 2007. It is a mobile payment system based on accounts held by the operator, with transactions authorised and recorded in real time using secure SMS. Retail stores are paid for converting cash into electronic value, and vice versa. After two years of operation, the amount of retail outlets had surpassed the number of post offices in the country[124] and currently represents a network of 39,000 retail stores. At present, M-PESA has approximately 15 million customers and contributes with 15.8% of Safaricom's revenues[125].

Figure 53: M-PESA customers and revenues (FY2009-FY2012)



Source: Safaricom

M-PESA currently provides several services beyond person to person payments. This includes interface with banking institutions (over 25 banks allow customers to transfer money to their bank accounts to their M-PESA accounts), utility bill payments, payroll payment by enterprises, payment for goods in selected partner retail outlets, a prepaid visa card and mobile ticketing services[126].

The M-PESA platform evolved in 2010 to also offer saving products, through a product called M-KESHO, a partnership between Safaricom and Equity Bank. The offering includes a savings account, a short-term loan facility and a micro insurance product, all of which can be accessed through the M-PESA interface, after an account opening process at an agent. In November 2010, four months after launching the service, M-KESHO had a reported 650,000 customers, with deposits of approximately US$7.5 million[127].

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[124] I. Mas and A. Ng'weno, "*Three keys to M-PESA's success: Branding, channel management and pricing",* 2010.

[125] http://www.gsma.com/developmentfund/insights-on-the-economics-of-mobile-money-m-pesa-key-revenue-driver-for-safaricom

[126] Safaricom, 2012. Annual Report & Group Accounts for the year ended 31st March 2012.

[127] N. Davidson, "*Mapping and Effectively Structuring Operator-Bank Relationships to Offer Mobile Money for the Unbanked*", 2011.

The rapid uptake and success of M-PESA and similar mMoney services was driven by the fact that less than 30% of the population in East and Southern African had a formal bank account, ranging from 9% in Tanzania to 63% in South Africa in 2008.[128]

Mobile money appears likely to continue to expand to other countries, due to strong demand for person to person transfers as well as opportunities for business to business mobile payments, which could also be extended to government employees, as is the case of Nigeria, which recently released the e-tranzact service[129]. mMoney platforms will continue to evolve with technological developments, such as Near Field communications (NFC), a technology that allows devices to communicate through mere proximity.

4.3.4 Local content and innovation

As shown in Section 2.6, Africa is a leader in mobile internet browsing, due to the limited coverage of fixed line networks and the associated cost of computers. Mobile Web Content (MWC) is an important driver of mobile demand and as such, the World Bank recommends that policy makers foster the development of mobile broadband apps and content, through the creation of a 'mobile broadband innovation ecosystem'[130].

Critical mass is needed to sustain local content on local platforms, which highlights the role government organisations and large corporations play in promoting local content creation, as well as capital investment in new local content-focused companies[131]. This institutional support allows MWC to move from a preliminary phase, characterised by international content on global internet platforms, to localising content available on these platforms, finally leading to the development of local content on local platforms.

As more local content is generated, revenues remain in the local ecosystem and the sector can become more developed and formalised. However, the development of local content on international platforms is an important step as it contributes to promote usage while driving down costs.

The potential of the development of creative and local content industries in the SSA region is significant. As smartphone and mobile broadband penetration increases, this will drive demand for local relevant content and applications. Low barriers to entry, as well as the ability to supply apps directly to the market, promote entrepreneurship in local content and applications. An example of this is the growth of the creative industries in Kenya, now the fifth largest contributor to the national economy, with over 62,000 jobs[132].

Countries with need to develop online directories, maps, mixed media (films, music games and applications) to fulfil this demand for content will provide a boost to local industries:

- **Infotainment in Nigeria:** MTN Nigeria's Afrinolly is an application that aggregates the latest information on African film entertainment, allowing access to the latest film trailers, music videos and comedy sketches. This service is free to Blackberry, Android and Nokia phone users. MTN Nigeria has expressed its commitment to support the development of the local mobile app industry.

- **Locally relevant video in Kenya and South Africa:** Google has recently launched a localised website for the YouTube video sharing service, offering Kenyans a site that presents locally relevant videos easily accessible for viewers. A similar site was launched in South Africa earlier in the year.

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128 FinMark Trust, "*FinScope in Africa: Supporting Financial Access"*, 2008. http://www.finscope.co.za/documents/2008/FSAfricaBrochure08.pdf

129 IFC Mobile Money Study, Nigeria 2011.

130 World Bank, "*Information and Communications for Development. Maximizing Mobile"*, 2012.

131 Vodafone, "*Making Broadband accessible to all*. Policy Paper Series", May 2011.

132 Africa Creative Hub, "*Position paper on the Kenya Creative industries and job creation potential*", 2012.

- **Local music and entertainment in Tanzania:** Millicom gives subscribers a one-stop shop where they can access Tanzanian Kiswahili entertainment services. They also have a portal called “Cheza Games” where subscribers can download games for free[133].

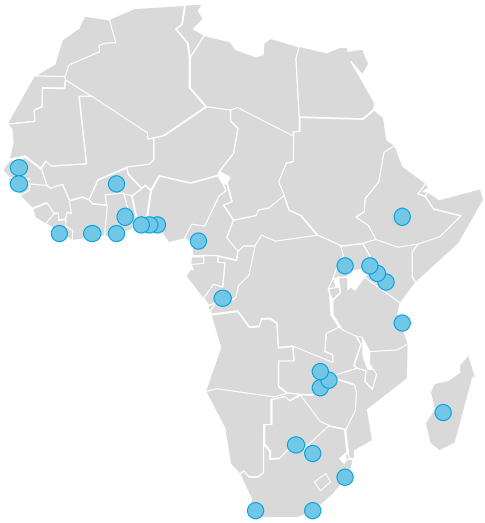
- **Seychelles and Mauritius leaders in eGovernment in Africa:** Government portals are important contributors to local content. According to the UN’s e-government development index, both Seychelles’ and Mauritius’ are above the world average, due to consolidation of the government portal and a broad service offering (such as vehicle inspections, scholarships and work permits, in the case of Mauritius)[134].

Operators and device manufacturers have provided additional support to the development of the app ecosystem by hosting app development workshops (such as Vodacom in South Africa[135]) and competitions (such as Huawei’s Android Application Challenge in Uganda[136]).

4.3.5 Mobile service and innovation hubs

Mobile telephony in the region drives the creation of ‘innovations hubs’ that develop local skills and content in the field of ICT services.

Figure 54: Technology hubs in SSA



Source: africahubs.crowdmap.com

Kenya has become a regional leader in innovation hubs. Nokia has recently established a dedicated research centre in Nairobi, focused on understanding the needs of African mobile users, in order to develop regionally specific products and content. Conscious of the role of mobile communications in social and economic development in the region, the Nokia research centre works with Non-Governmental Organisations and the UN to develop devices and services that can further contribute to this aim.

According to Mobile Monday[137] in the last two years, more than 50 mobile tech hubs have emerged in African capitals, including tech incubators and co-working spaces like the Hive Colab in Uganda, the iHub in Kenya,

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133 Vodafone, “*Making Broadband accessible to all”*, Policy Paper Series, May 2011.

134 United Nations, “E-government Survey 2012, E-government for the people”,2012

135 http://www.itnewsafrica.com/2012/09/vodacom-to-launch-app-development-workshop/

136 http://www.observer.ug/index.php?option=com_content&view=article&id=19826&catid=85

137 Madanmohan, R., “*Mobile Africa Report 2011, Regional Hubs of Excellence and Innovation*”, MobileMonday, March 2011.

and Limbe Labs in Cameroon. In these hubs, technology entrepreneurs and investors can meet and develop innovative solutions for the most pressing issues in the region[138].

[138] Smertnik, H. "*M4D: How the mobile phone becomes a tool for development. Focus on the Republic of Kenya*", University Paris 1 - Pantheon Sorbonne, 2012.

5 Public Policy Support for Mobile Broadband Growth

Despite being a highly competitive sector, and despite the economic and social benefits it delivers, the mobile sector is strictly regulated and taxed in SSA. As mobile-specific taxation and regulations often act to constrain consumer affordability and increase the cost of doing business in the region, they effectively impair the improvements in productivity, trade and job creation that are generated from the development of mobile services.

This section discusses the main taxation and regulatory issues that characterise the mobile telecommunications sector in SSA, and provides a set of regulatory and public policy suggestions that could contribute to the growth of mobile broadband in SSA.

5.1 Taxation on mobile consumers and operators reduces service affordability

Many African countries tax mobile telecommunications, at rates that are among the highest in the world, imposing a variety of mobile-specific taxes to mobile consumers and network operators. These are discussed in more detail below[139].

5.1.1 Consumer taxes

Consumer taxation in SSA affects both handset and usage cost components of mobile consumers' expenditure through sales taxes and other taxes that apply specifically to mobile telephony.

Special taxes levied on usage and handsets are particularly concerning in the region. These typically include custom excises and luxury taxes imposed on imported handsets, as well as a host of mobile-specific taxes ranging from airtime excises applied to mobile telephony usage to fixed contributions on connections, handsets and rental. These taxes fail to recognise the economic and social spill-over effects that mobile services generate, and that, due its transformational role, mobile telephony has become a necessity rather than a luxury in SSA. Additionally, these taxes discriminate against mobile telephony with respect to other services and limit access/penetration and usage by restricting the affordability of mobile services for the poorer sectors of the population that governments intend to benefit.

As a result of these mobile-specific charges, which are applied in addition to sales taxes, tax as a proportion of a user's total cost of mobile ownership (TCMO)[140] in numerous SSA countries was among the highest worldwide in 2011.

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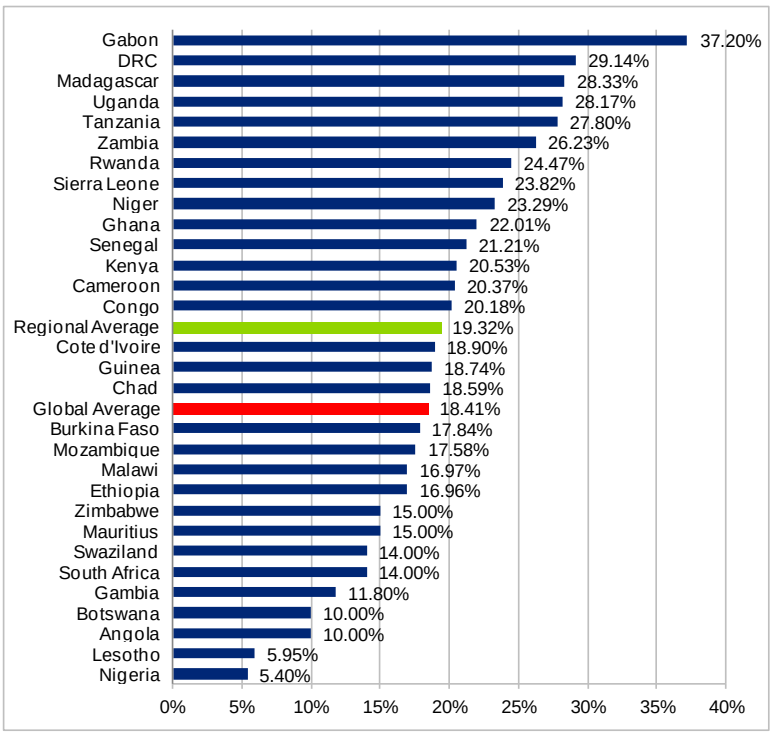
[139] This analysis is based on the Deloitte/GSMA paper entitled "*Global Mobile Tax Review 2011*"and therefore reflects tax rates applying in 2011, when the analysis was undertaken. This study includes 30 SSA countries: Angola, Botswana, Burkina Faso, Cameroon, Chad, Congo, Cote d'Ivoire, DRC, Ethiopia, Gabon, Gambia, Ghana, Guinea, Kenya, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Swaziland, Tanzania, Uganda, Zambia, Zimbabwe. Other sources to this section include the Deloitte/GSMA paper entitled "*Mobile taxation: Surtaxes on International incoming traffic"*, 2011and the Deloitte/GSMA paper entitled *"Mobile telephony and taxation in Kenya"*, 2011.

[140] TCMO includes handset costs, connection costs, rental costs (typically for post-pay services), and call and SMS usage costs.

Figure 55: Mobile taxation as a proportion of TCMO in SSA, 2011[141]



Source: Deloitte/GSMA, "Global Mobile Tax Review", 2011

Not only is tax as a proportion of TCMO higher than the global average for 17 countries in SSA, it has increased from an average of 18.1% in 2007 to 19.3% in 2011.

Gabon had the highest taxation burden, with an incidence of 37.2% due to:

- a VAT rate of 18%;
- A customs duty of 30% imposed on imported handsets, plus an additional $5 fixed tax applied on each handset; and
- An airtime excise of 18%.

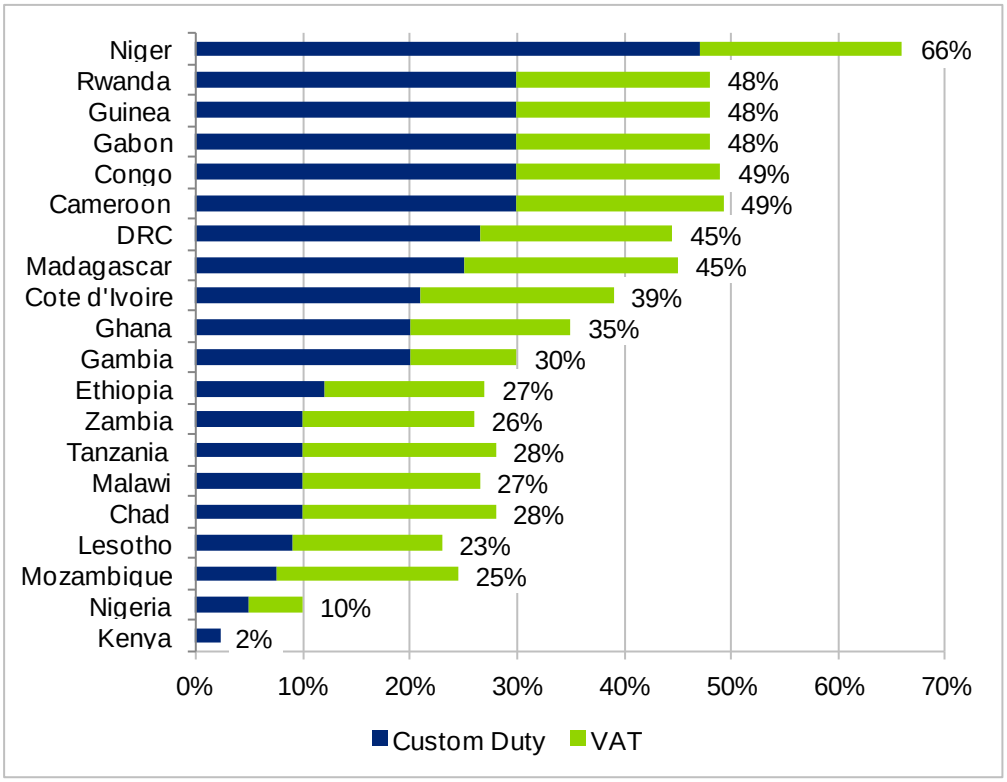
Tax represented over 30% of handset costs in 13 countries in SSA in 2011. Compared to the rest of the world, handsets are cheapest in Africa but, with almost a third of the handset cost composed of taxes, they are taxed at the highest level globally. Given that handset affordability is the largest barrier to mobile penetration in this developing region, the high incidence of tax plays a significant role in increasing this barrier. Also, since handsets and smartphones may represent the only access to wireless broadband in the developing world, handset taxes may also lead to underconsumption of internet services.

In 2011, custom duties applied to handset imports in 20 African countries[142]. Out of these 20, six imposed import duties of 30% or higher. In Niger, a 46.9% custom duty applied on all handsets imported into the country.

[141] Taxation includes VAT where it applies.

[142] Out of the 30 in the study used as a reference for this analysis

Figure 56: African countries imposing a custom duty on imported handsets, 2011



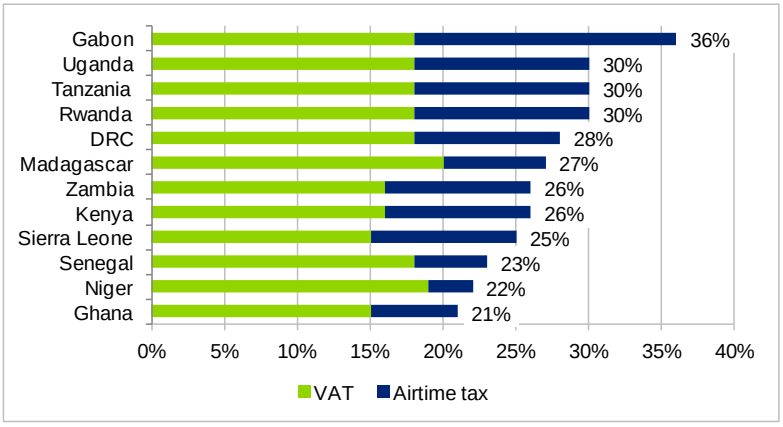
Source: Deloitte/GSMA, "Global Mobile Tax Review", 2011

As well as taxes on handsets, taxes on the cost of usage can represent a barrier to development of services, as they act to reduce usage by consumers, especially in SSA where consumers have lower income levels and the majority of consumers of mobile services are prepaid service users. The incidence of taxation on usage on the total cost of mobile ranged from 5% to 36% in SSA in 2011, with a regional average of 18.9%. This compared with a global average of 17.9%.

The number of countries affected by taxation on mobile usage is increasing; in 2007, only six African countries[143] levied such taxes, but in the last five years, DRC, Gabon, Madagascar, Sierra Leone and Senegal have introduced airtime excises. In Rwanda, the government rapidly increased this from 3% in 2007 to 12% in 2012. In Tanzania, the government increased this airtime tax to 12% in 2012.

[143] Out of the 30 in the study used as a reference for this analysis.

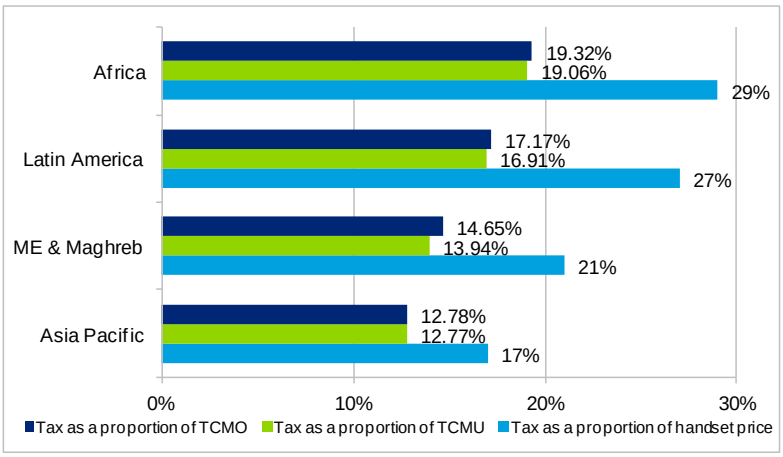
Figure 57: African countries where an airtime tax applies, 2011



Source: Deloitte/GSMA, "Global Mobile Tax Review", 2011; rates for Tanzania and Rwanda are updated for 2012

As a result of these taxes, Africa has the highest taxation as a proportion of TCMO of the developing regions worldwide. Africa, in contrast, shows the lowest mobile penetration worldwide along with the lowest TCMO levels, as usage is lower and handsets cheaper.

Figure 58: Mobile taxes in developing regions, 2011



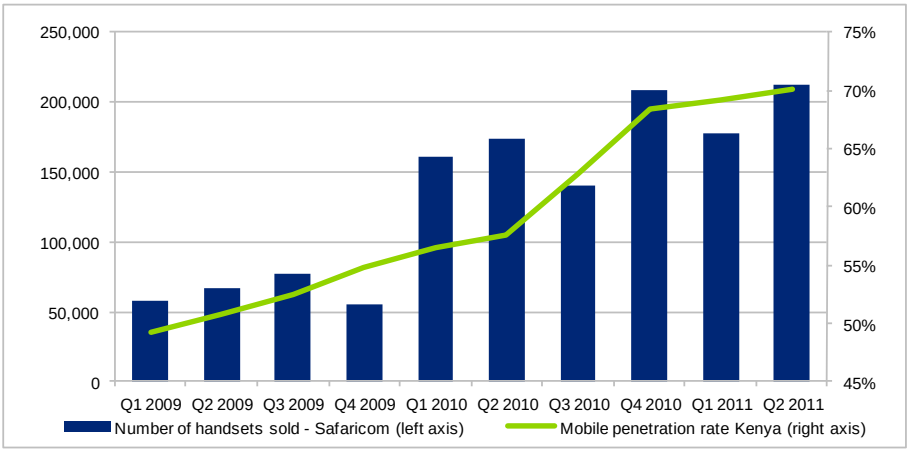
Source: Deloitte/GSMA, "Global Mobile Tax Review", 2011

Governments have a major role to play in supporting mobile communications and wireless data developments. In particular, taxation policies have a significant impact on the value societies derive from mobile services, as they affect the key factors that determine the success of telecommunications and can enhance the evolution from basic mobile consumption, such as access and usage, to more advanced services driven by the potential of wireless data and internet through mobile devices.

For example, the Kenyan government recognised that handset prices represented a barrier to the development of the sector and, in August 2009, the 16% VAT tax on mobile handsets was removed, bringing the tax as a proportion of the cost of mobile from 25% to 21%[144]. Handset purchases have increased by more than 200% since the removal of VAT in Kenya and mobile connection penetration has increased from 50% to 70% of the population in Kenya between 2009 and 2011. These effects will in turn generate an increase in government tax revenues through the positive impact on MNOs revenues and the overall economy, as discussed in Section 4.

[144] Deloitte/GSMA, "*Mobile telephony and taxation in Kenya*", 2011

Figure 59: Increase in handset sales and penetration after the removal of VAT on handsets in Kenya



Source: Deloitte/GSMA, "Mobile telephony and taxation in Kenya", 2011

Removal of taxation on usage may also have a deep impact on consumers' behaviour and the benefits they receive. A study by Deloitte on East Africa[145] estimated that a decrease of airtime taxes in Kenya, Tanzania and Uganda from existing levels to 3% would produce an increase in the number of subscribers between 5% and 8% and on usage per subscriber between 7.4% and 11.6% in ten years. Importantly, increased penetration would boost traffic volumes, thereby expanding the tax base for the government. The study found that in the medium term tax reductions can be tax-neutral for the government, in consideration of the additional economic activity generated by increases in mobile penetration and traffic.

Nonetheless, in addition to high mobile-specific taxes on usage, the Kenyan government has recently announced a 10% tax on the revenues that operators gain from money transaction services such as M-PESA[146], further extending mobile specific taxation.

5.1.2 Corporate taxes

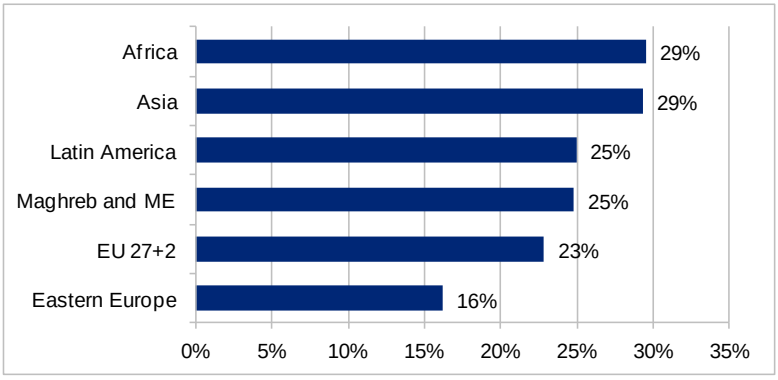
The mobile ecosystem is also taxed through the corporation tax and other taxes and regulatory fees that apply to mobile operators. Businesses in Africa[147] face an average corporate tax rate of 29%. Although it has decreased slightly since 2007 from 32%, it remains one of the highest globally, as shown in Figure 60.

[145] Deloitte/GSMA, *"Taxation and the Growth of Mobile in East Africa", 2007*

[146] http://www.textually.org/textually/archives/cat_sms_and_micro_payments.htm

[147] Including Northern Africa

Figure 60: Global corporate taxation in 2011



Source: Deloitte/GSMA, "Global Mobile Tax Review", 2011

Additionally, mobile operators are subject to a variety of additional taxes and fees that they pay directly to governments or to regulators. These include spectrum fees, which represent a de facto tax on an essential resource for mobile operators; numbering fees; Universal Service Fund contributions, such as technology taxes, investment funds or funding for public broadcasters; and other special fees such as the Health Insurance Tax in Ghana[148].

Table 7: Examples of taxes and fees applying to mobile operators in SSA, 2011

Country	Charges
Burkina Faso	• 2% of revenue paid as a universal service fee • 1% of revenue is paid to the government in regulatory fees • 0.5% of revenue is paid to the government's Research and Training Fund
Cameroon	• Contribution to special telecommunications fund set at 3% of turnover • Licence fee payable to the regulator stands at 1.5% of turnover • Mobile operators have reported that often variations in licence fees are received without a fore notice from the regulator
Chad	• 3% of annual revenue paid as regulatory fees
Congo B.	• 3% of domestic revenue paid as regulatory fees • 6% of international revenue paid as regulatory fees
Democratic Republic of Congo	• 2% of mobile operator revenue paid as an annual licence fee • 2.4% of mobile operator revenue paid as an annual spectrum frequency fee • 2% of mobile operator revenue paid as an annual numbering fee • Airtime purchased by the customer is first booked on the deferred revenue account and then accounted progressively in the revenue account when the consumption is made • This results in a distortion with other sectors for which ICA tax (equivalent to GST) is calculated on the revenue account, while for telecommunications companies it is based on the deferred revenue account • The tax authorities claim ICA on airtime discounts from both the mobile operators and indirectly also from the dealers

[148] More detail is provided in the appendix.

Country	Charges
Gabon	• 0.5% of mobile operator revenue is paid towards Frequency and Spectrum fees • 0.5% of mobile operator revenue is paid towards Numbering fees • 2% of mobile operator revenue is paid towards Universal/Service Fees • 2% of mobile operator revenue is paid towards Technology taxes • 5% of mobile operator revenue paid as an annual licence fee
Ghana	• As discussed above, mobile operators by law are obliged to pay 2.5% of their revenues to the government as a Health Insurance tax which is used by the government to fund investment in and development of Ghana's health services. • 2% of revenue is also paid in regulatory fees to the government.
Kenya	• 0.5% of mobile operator revenue paid as regulatory fees • 0.5% of mobile operator revenue paid as universal service fee to the government
Lesotho	• Universal access fee is set at 1% of Net Operating Income • This is expected to rise to 2%
Nigeria	• mobile operators pay 0.14% of revenues in Frequency/Spectrum fee tax • 0.15% of revenue is paid in Numbering fee tax by mobile operators • 0.04% of revenue is paid as a Technology tax or R&D contribution • 2.9% of mobile operator revenue is paid as regulatory fees
Niger	• 2% of revenue paid as regulatory fees to the government • 4% of revenue paid as USO (Universal Service Obligation) to the government
Tanzania	• Overseas providers of communications (e.g., roaming partners) with no presence or physical assets in Tanzania providing mobile communications services to Tanzanian customers (e.g., mobile phone operator) will now be subject to Tanzania withholding tax (to be deducted by his customer). The overseas provider will normally not be able to claim credit for such tax in his home jurisdiction. • VAT: Each of the two sides of the Union (Mainland Tanzania and the Isles - Zanzibar) has its own VAT legislation (i.e. VAT is not a union tax). • The two legislations have not been properly aligned between themselves and with other legislations.
Uganda	• 2.5% of mobile operator revenue paid as regulatory fees to the government
Zambia	• 1.5% of mobile operator revenue paid as regulatory fees to the government

Source: Source: Deloitte/GSMA, "Global Mobile Tax Review", 2011, based on information provided directly by mobile operators

5.1.3 Surtaxes on International Incoming Traffic

Liberalisation of international gateways and competition has resulted in a dramatic fall in the price of international call termination. However, international 'gateway operator' companies have pressured governments in the region to establish controls on gateway traffic and prices through centrally set surcharges.

In recent years, governments and regulators of several SSA countries (Congo, Senegal[149], Ghana and Gabon[150], Liberia[151], Central African Republic, Guinea, Rwanda) have introduced another telecommunications specific tax, the Surtax on International Incoming Traffic (SIIT), as a way of imposing controls on international gateways through third-party gateway operators.

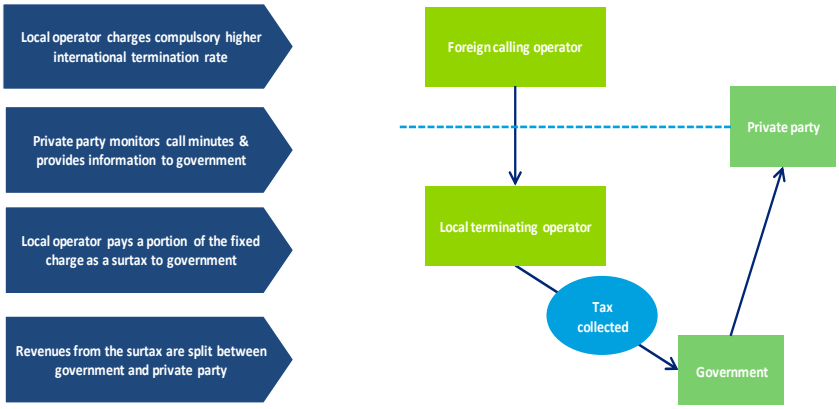
[149] Cancelled in May 2012.

[150] Cancelled in 2011.

[151] http://www.lta.gov.lr

The SIIT takes the form of an imposed fixed price that operators must charge for international inbound termination, of which the government takes a set amount. This fixed price is set above the negotiated rates which were present prior to the policy implementation, and the difference (or a portion of the difference) is collected by the government. The governments use a private party to measure the number of international inbound minutes terminated by each operator and bill the operators according to the results. The tax charges collected in this way are then shared with the private party that carries out the measuring function.

Figure 61: Structure of surtax on inbound international call termination

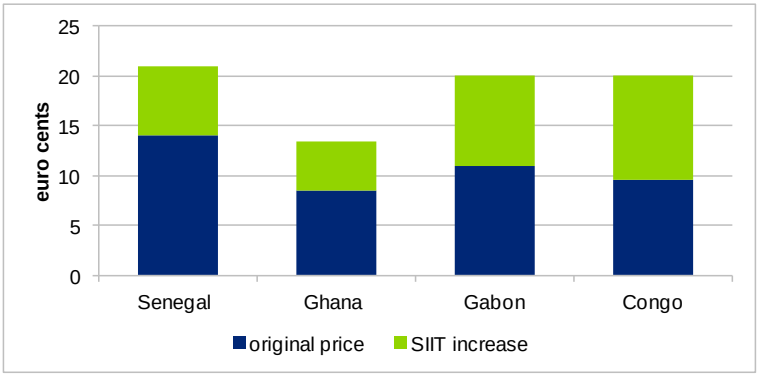


Source: Deloitte analysis based on interviews with operators

In addition to the distortionary effects common to all mobile-specific taxes, the SIIT presents other negative effects for consumers, businesses and ultimately for the governments that chose to adopt it.

- A reduction in inbound call minutes due to increased prices: operators have reported decreases in incoming international calls, including against their forecasts, and as such SIIT has reduced the communication local citizens have with other countries.
- Further price increases in the medium term: the full impact of SIIT may fully realize only in the medium term, as international prices are often based on regional averages and advertised in advance, so are likely to be sticky in the short term.
- The risks of reciprocation of the increased termination price by operators in other African countries: there is a risk of blanket increases in international termination charges throughout Africa since 60% to 80% of outbound international calls from African countries are to other countries within Africa. This will imply higher prices for calls by local consumers to friends and family in the region and to local businesses.
- An increase in illegal traffic termination: the SIIT introduces a greater incentive for arbitrage and adds an unnecessary layer of monitoring due to the third-party intermediaries used to measure call volumes; in addition to reducing revenues for operators, this will congest spectrum and thus lower service quality.

Figure 62 Impact of SIIT on inbound international prices



Source: Deloitte analysis based on interviews with operators

Although the main objective of this taxation is to raise revenues for governments by taxing users calling from abroad into the country, the government transfers approximately 50% of the revenue from the SIIT to the external call-monitoring party, so this leakage should be taken into account when assessing the effectiveness and net benefit of this tax.

The SIIT may affect a great proportion of intra-African traffic and risks a domino effect in African countries. In the medium term, the flow on impacts could damage employment opportunities, social cohesion, investment international competitiveness, terms of trade and government tax revenues. Certain governments, such as Senegal, have recognised these wider impacts and have withdrawn this tax.

5.2 Uncoordinated regulations impact investment in coverage and mobile broadband

Network investment in SSA is constrained by numerous logistical and regulatory pressures.

The complex geography of most countries in SSA often means that the costs involved in expanding the network into rural areas include ancillary infrastructure such as access roads, which then become available to local communities and other business. Mobile operators are rarely compensated for this valuable investment and although this is a positive outcome for communities, it means that the expansion of mobile services in SSA is more expensive than in many other countries of the world. These costs often combine with unequal treatment compared to other industries with regards to input costs: for example, in Kenya[152] the fuel used to power generators for network sites is not tax-exempt for mobile operators, while other industries are allowed certain exemptions. In Nigeria, the National Electric Power Authority ruled that mobile operators must pay extra tax to generate their own power[153], despite their significant investment. In addition, the lack of significant fixed networks across the region, especially in more rural but still populous areas, means that mobile operators in SSA are increasingly investing in fibre for backhaul and core networks to support increasing traffic, including for mobile broadband.

Significant regulatory and public policy pressures also risk constraining network investment in the region. These barriers include the administrative obstacles to site and fibre deployment, as well as concerns about regulatory certainty relating to public policies adopted in the region. In particular, the issue of rights of ways and governments' recent policies on next generation networks may act as significant constraints on market investment. These issues are discussed in more detail below.

[152] Deloitte/GSMA, "*Mobile telephony and taxation in Kenya*", 2011

[153] Telegeography, 2012

5.2.1 Rights of way increase administration costs and slow network deployment

In addition to investment in sites and towers, investment in fibre to support backhaul and core services for mobile networks is key to the deployment of effective mobile broadband and to ease network congestion. Considering the limited wholesale markets for capacity on fixed networks that can be used for backhaul, mobile operators in SSA often have to invest in fibre if they intend to support traffic growth while maintaining quality of service to ensure a smooth transition to mobile broadband.

A key administrative barrier to the installation of towers and fibre is given by legislation and administrative procedures surrounding the rights of way, and the associated legal and regulatory difficulties in obtaining permits for access to streets, roads and other public land.

Traditionally, a right of way is an easement granted by a land owner that gives reasonable use of land to others. This applies in this context to works that are required to install towers, and to fibre installation along a country's main roads, which in SSA is often the typical way of installing fibre[154]. As most of the roads along which fibre ducts can be installed along are state owned, local or national governments have an explicit reservation right. Mobile operators have to deal with a number of different administrations to obtain the rights of way required to install fibre in their networks. Complex legal, managerial, and technological issues can arise. Municipalities in some countries consider access to rights of way as a revenue opportunity, resulting in fees which can be over and above the costs incurred.

Operators have indicated that dealing with a multitude of different permissions for rights of way represents one of the most severe barriers to network deployment. Operators in Nigeria have reported that, in order to deploy network infrastructure, they typically have to negotiate different rights-of-way agreements with every municipality, county and local and state government. These negotiations can be lengthy and complex and, as each organisation seeks to extract as much revenue from the operators as possible, in some cases they will each put different conditions on how and where towers can be constructed or fibre installed. In Ghana, network deployment regulations have recently become more complex: new guidelines published in June 2012 include operational and structural requirements, colocation and penalties for breach of guidelines. Mast construction now requires approval from the Environmental Protection Agency, the Ghana Civil Aviation Authority, the Radiation Protection Institute, the Town and Country Planning Department and finally the Metropolitan, Municipal and District Assemblies[155].

In addition to increasing costs and delaying investment, this framework reduces investment certainty, as operators may invest in a location to subsequently discover that the conditions for building towers or fibre are different elsewhere. The threat to charge administrative fees and payments also creates an unfavourable investment climate.

The OECD has reviewed the issue of rights of way in the context of next generation networks and has indicated a number of policies that could support mobile network investment. Ultimately these require a standardisation of rights of way access within countries and regionally. According to the OECD, improved access to rights of way and reduced access costs can be achieved by[156]:

- Reducing barriers associated with obtaining authorisation for access to and use of rights of way
- Ensuring clarification of jurisdiction for both granting rights of way and settling disputes and coordination among the public authorities involved

[154] While fibre deployment along railways, electricity networks and pipes is more common in developed markets, this is more limited in SSA

[155] Telegeography, 2012

[156] Organisation for Economic Co-operation and Development, "*Public rights of way for fibre deployment to the home*", 04-Apr-2008

- Harmonising administrative procedures for access to rights of way and ensuring consistency in the application of these procedures across a country

- Developing a reasonable system of compensation for access to and use of municipal public rights of way

5.2.2 Investment in mobile networks requires higher regulatory certainty and stability

Mobile broadband requires significant investment from operators to acquire spectrum and upgrade and extend their existing networks. To make the best use of LTE technology, new high-specification equipment and supporting fibre networks must be installed. However, as a result of the economic crisis, investment funding has been harder to obtain, including for Africa, and a key factor that global investors consider when deciding to invest in telecommunications is whether a modern, transparent and predictable regulatory regime is in place.

A concern for international investors and operators is the unpredictable nature of telecommunications regulation in SSA. A number of unexpected changes and unpredictable policies that have been implemented recently have increased regional regulatory risks, and may contribute to deter further investment in the region. For example, precedents on sudden licence revocation have created negative expectations. In 2007, the new government of Benin decided to review all telecommunications licensing arrangements when it came into office. As a result, two mobile operators (Areeba and Moov) were ordered to pay a substantially larger licence fee. The regulator subsequently revoked both operators' licences and blocked both networks to induce the operators to pay a new licence fee[157].

In addition, when investing in the region, investors require a premium related to risk of infrastructure destruction. In numerous countries across the region, fibre lines are dug up by vandals mistaking them for copper lines. This has been reported to occur along the whole network, severely impacting service quality and investment returns.

5.2.2.1 Licence renewal procedures

Numerous mobile spectrum and operating licenses in SSA were awarded for periods of 15 to 20 years in the late 1990s and will be expiring in the next few years, for example in Niger and Chad. Governments in SSA increasingly see these licenses as valuable assets, and some governments have indicated that they intend to resell them when they expire. As such, mobile operators may be required to reapply for their licenses. As regulators have indicated they expect the licence to have a high value, operators are concerned that governments may set unrealistic reserve prices, such as in South Sudan, or speculative bidders may win an award process. Speculative bidding has occurred previously in SSA, leading to instances where licence winners have subsequently never launched services, as in Malawi, or failed to raise the required cash to support operations, as in the case of the privatization of Nitel. This has the potential to significantly impact the value of existing investment, and may deter further investments in mobile networks until licence renewal procedures are clarified.

This issue is particularly important in SSA, as many countries have not defined a stable and transparent framework that provides predictability for existing operators to take licence renewal investment decisions. It is therefore useful to increase investment certainty that governments provide transparent notifications on the next usage right term in due time, ideally three to five years before expiry of the existing usage right term. Clarity on what bandwidth will be available in each mobile band, on the terms and conditions that will

[157] http://www.balancingact-africa.com/news/en/issue-no-363/top-story/benin-regulator-play/en

technically define the usage rights in any mobile band, and on the cost of holding a spectrum usage right in various mobile bands could also be provided to reduce investment uncertainty.

While recognising the importance of competitive allocations of licenses through transparent, efficient and fair processes, there are a number of advantages for governments to consider if existing licences are rolled over or maintained. Firstly, extending licenses will ensure network investment is maintained and that any deployments undertaken so far are retained for mobile service provision. Extending current licenses would also ensure continuity of service and continuity of supply. Additionally, rolling licences over would ensure that operators can retain their on-going customer relationships, including for value-added services such as mobile banking.

5.2.2.2 Government intervention in mobile broadband networks

Governments in the region are intervening heavily in the design of next-generation broadband networks. In a number of instances, they have used LTE spectrum allocation as an opportunity to intervene directly in the telecommunications market, either through direct intervention, whereby publicly owned telecommunications operators or public-private partnerships (PPPs) between governments and telecommunications operators have been tasked to install and run fibre networks, or through spectrum award designs that exclude existing mobile operators from the acquisition of LTE licences.

At one extreme, governments such as Tanzania have created a state controlled monopoly over the national fibre optic backbone networks. Mobile operators are prevented from using their own and have to rely on the single state-owned fibre network.

In Kenya[158] in November 2010, the government announced it did not intend to provide the country's mobile operators access to LTE spectrum. Instead it called for the implementation of a public-private partnership, with a view to creating a Universal Access System (UAS) for all of the country's telecommunications operators[159].

To fund this network, the Kenyan government proposed in 2011 to employ the funds paid largely by mobile operators into the country's Universal Service Fund. However, a lack of transparency has characterised the establishment of the USF. The mobile operators are concerned about representation on its board and that the government was intervening in infrastructure investment without considering the wider impacts of their intervention on the existing mobile and fixed networks[160].

Regional governments are also seeking to attempt to use the LTE awards to intervene heavily in the mobile market structure, for example by excluding existing licence owners from the spectrum award processes. In South Africa, recent proposals by ICASA[161], the local regulator, on the award of the 800MHz and 2.6GHz bands contained conditions that constrained the participation of existing MNOs in developing LTE networks.

Furthermore, in Kenya and South Africa, regulators have introduced ownership conditions to participate in the licence award. In Kenya, it was proposed that any participants wishing to enter the PPP scheme must be at least 20% Kenyan-owned, which ruled out Indian-owned operators Airtel and Essar. In South Africa, it was

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158 http://www.developingtelecoms.com/kenyan-lte-venture-in-trouble-following-frequency-band-dispute.html http://www.cio.co.ke/news/main-stories/safaricom-still-keen-on-own-4g-lte-despite-government-ppp http://www.balancingact-africa.com/news/en/issue-no-624/Internet/safaricom-still-keen/en http://www.telegeography.com/products/commsupdate/articles/2012/05/21/minister-eyes-2013-launch-for-open-access-lte-network/

159 The PPP is expected to involve operators and network equipment providers, including Telkom Kenya, Safaricom, Airtel Kenya, Essar Telecom Kenya, MTN Business Kenya, Alcatel-Lucent, Nokia Siemens Networks, Kenya Data Networks and Epesi Technologies.

160 Deloitte/GSMA, "*Mobile telephony and taxation in Kenya*", 2011.

161 ICASA, 15 December 2011, Document No. 34872

proposed that potential licensees must have a minimum 30% ownership by Historically Disadvantaged Individuals, and this criterion is not met by most of the larger mobile operators.

These policies have the potential to create a number of negative implications for mobile operators existing and future investment:

- Investors are concerned that local governments are abandoning the successful liberalisation policies that in SSA have successfully led to sector growth and increased competition.
- Creating wholesale monopolies for the provision of fibre access may have negative consequences on service prices and on service innovation.
- Forced sharing of fibre or requirements to use State Owned Entity (SOE) fibre networks may raise costs for operators, creates dependency on other operators, including potentially unreliable SOEs, and ultimately affects investment.
- Government-led operators may lack the skills and technical knowledge to undertake these complex operations. This risks raising issues with operational inefficiencies and ability to meet the requirements of competitive retail markets.
- Previous local experience with state-owned companies further creates concerns to local operators that inefficiencies may reduce service delivery.

It should be noted that local ownership requirements are not unique to Africa, and in some cases, as in South Africa, it has been contained in legislation (the Electronic Communications Act) since 2006. In South Africa, local ownership requirements were originally conceived to help redress a legacy of racial discrimination and disenfranchisement.

5.2.3 International roaming should not be regulated[162]

The roaming market in SSA is nascent and highly competitive. Though it accounts for only 5% of global roaming revenues, the expansion of regional economies and tourism has increased the number of incoming and outgoing mobile consumers travelling for business and leisure.

The region has seen positive roaming initiatives driven by operators[163]. For example, Airtel's One Network[164] proactively abolished roaming rates to offer local prices across its African operators. Similar initiatives, including Kama Kawaida, an alliance of major East African operators[165], MTN One World & Seamless Roaming, UNI World Glo Mobile and Orange Zone have contributed reduced roaming prices.

Nonetheless, as the SSA mobile market develops, a number of structural and technical challenges arise that will require considerable investment to develop international mobile services:

- Although there has been much improvement in the level of competition, international gateway monopolies still exist in at least 20% of African countries. Where international gateways are not

[162] This section is based on the GSMA paper entitled "*Roaming in Sub Saharan Africa*", 2012

[163] GSMA, "*Roaming in Sub Saharan Africa*", 2012

[164] Airtel's One Network abolished roaming rates to offer local prices across its African operators; prepaid customers can top-up with local or home cards and are billed in local currency. Other operators have introduced innovations or alliances across different SSA countries, for example Kawa Kawaida, MTN One World, Orange Zone and Uni World of Glo Mobile.

[165] Vodacom Tanzania, Safaricom Kenya, MTN and UTL Uganda, MTN Rwanda, UCOM Burundi

liberalised, their costs make up a significant portion of total roaming costs. Even with volume growth, the bargaining power for operators working across monopolised gateways remains low.

- With prepaid services remaining predominant in SSA, operators have invested to enable prepaid roaming but there are still more prepaid and many postpaid routes to invest in, which will increase the availability of roaming. Prepaid platforms such as CAMEL[166] are generally very expensive to implement.

- Different GSM/3G spectrum allocations prevent many low-cost handsets from roaming and pose challenges for interoperability.

- Network coverage is still in development as operators continue to build out their networks. Also, 3G coverage and mobile broadband is emerging in many countries within SSA.

- Fraud remains a major financial concern for operators despite increased eradication efforts, which require high enforcement and monitoring costs.

These issues require significant investment from operators to resolve:

- Technical implementation and maintenance costs, including system upgrades and expansion of prepaid roaming, which are likely to burden smaller operators most severely

- Enforcement and monitoring costs, such as for fraud and diagnostics, which may disproportionately burden the least developed countries

- Consumer communication and marketing costs, to promote roaming and ensure transparency

Combating these barriers should take precedence over any implementation of roaming regulation, as price regulation could increase domestic prices, drive down innovation efforts and, through the reduction of roaming revenues, hamper the technological and network investment. Regulating roaming prices may also be interpreted as a move away from successful liberalisation policies the industry has experienced in the region and would present additional risks for consumers and the industry through unintended consequences:

- A price cap in a fixed currency, such as US$, would not consider economic market differences such as inflation and exchange rate variability and could cause distortions over time and impact the industry's ability to implement fair mark-ups.

- Investment in network development could be hampered if roaming revenues are reduced.

- Reducing revenues may reduce taxes from the telecommunications industry, which could impact state investment in less developed economies.

- Reducing roaming revenues could drive increases in domestic prices, especially if there is a peg between international rates and Inter Operator Tariffs, or it could impact national mobile broadband.

- Competition and innovation in roaming tariffs are likely to suffer as the result of regulation. The industry is taking steps to increase the transparency of roaming tariffs and to address the likelihood of 'bill shock' by mobile customers. In SSA, as part of the GSMA's Data Roaming Transparency Initiative, Bharti Airtel, France Telecom-Orange and Vodafone have agreed to adopt these measures locally to help customers manage their roaming charges — implementing a 'welcome' SMS message with roaming tariff

[166] Customised Applications for Mobile networks Enhanced Logic.

information, establishing monthly financial or usage-based roaming limits, and temporarily cutting off service when limits are exceeded.

5.3 A roadmap to deliver mobile broadband and economic and social development

As set out above, the SSA mobile market appears set for continued growth in the near future, especially as it prepares for the delivery of mobile broadband to an increasing amount of people in all geographic areas in the region. As mobile markets in SSA undergo a set of significant changes, mobile broadband will establish a new standard that will transform economies and societies in the region. Affordable smartphones and tablets and new social and business services driven by the mobile technology will increase opportunities for economic growth and for social development.

In recognition of these increasing social and economic effects, governments and regulators worldwide see mobile services, and in particular mobile broadband, as an opportunity for social and digital inclusion, and realise that mobile telephony is a key enabler for the whole economy. Public broadband policies are sometimes framed in the context of a national vision document or broader information society strategy.

Against this background, the International Telecommunication Union (ITU) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) have created the Broadband Commission, with the objective to monitor progress on broadband development and to identify a set of guidelines to foster the development of broadband. In their more recent progress update review[167], they set out two key 'advocacy targets':

- 'Making broadband policy universal by 2015', whereby supportive broadband regulatory strategies should be put in place
- 'Making broadband affordable by 2015', whereby broadband costs should amount to less than 5% of average monthly income in developing countries

For these opportunities to materialise in SSA, governments and regulators need to ensure that hurdles for mobile operators and mobile consumers are minimised. Below is a set of suggestions on how these barriers could be reduced.

5.3.1 Reducing inefficient taxation to increase access and usage

The Broadband Commission indicates that 'governments can promote broadband deployment by reducing taxes and import duties on broadband services and terminals', as 'there is significant evidence to suggest that reducing taxes and import duties on telecommunication/ ICT equipment and services could significantly boost levels of uptake'[168].

As shown in section 5.1, the proportion of total cost of mobile ownership made up of taxation is higher than in any other developing region worldwide. In particular, taxes on handset and mobile devices are higher than other developing regions within Africa. Taxation of the mobile sector in SSA significantly increases the cost of mobile ownership for consumers, particularly affecting those on lower incomes — that is, those who stand to benefit the most from access to mobile telephony and mobile broadband. Mobile terminals and usage are

[167] ITU/UNESCO, Broadband Commission, "The State of Broadband 2012: Achieving Digital Inclusion for All", September 2012.

[168] ITU/UNESCO, Broadband Commission, "The State of Broadband 2012: Achieving Digital Inclusion for All", September 2012.

affected by a number of sector-specific taxes, and special taxes on mobile usage have increased notably in recent years.

To ensure that taxation does not become an obstacle to further growth and universal access to mobile broadband services, targeted tax reductions could be considered in cases where mobile is more heavily taxed than other goods within the economy. There is a danger that the success of mobile technology leads to discriminatory taxation as governments seek to increase their tax base. However, such taxation discourages mobile penetration and usage and as such may potentially reduce the tax base in the medium term relative to the position where mobile was taxed as any other good.

5.3.2 Harmonising spectrum allocation plans across the region, allocating the Digital Dividend to mobile services and liberalising spectrum licences

Rapid access to sufficient and regionally standardised allocations of radio spectrum is critical for economic growth in SSA and for the development of mobile broadband. Considering the large economic benefits generated by mobile spectrum in SSA, regional governments could consider a set of common actions to enhance spectrum availability and standardisation in the region, as shown in section 3:

- Band plan harmonisation across the region remains the key objective, as this provides scale economies, leading to reduced smartphones and service prices and thus extending service affordability.
- The Digital Dividend band should be allocated for mobile broadband service after sufficient progress has been made situation of incumbent systems.
- Liberalised spectrum licensing, allowing operators to determine the technology that best suits a particular market, helps to maximise the efficiency of spectrum use. This could, for example, allow operators in the most congested markets to start offering LTE in the 1800MHz band.

Mechanisms for spectrum allocation should also be reconsidered to provide regulatory certainty and boost investment:

- Spectrum award procedures should be efficient and transparent, as an efficient, fair and transparent award design contributes to a successful outcome for consumers.
- Coverage obligations should be framed in the context of the country and recognising the increasing competition that exists within the sector.
- Spectrum prices could be considered with a view to promoting service demand and operators' investment in the network and to sustaining long term revenue generation.

5.3.3 Simplifying rights of way regulation across the region

Approvals for tower and fibre deployment have been identified as the single biggest obstacle to investment by the mobile community in SSA. As capacity increases are urgently required to cope with substantial traffic rises, complex and uncoordinated national and local regulations and approval processes, especially with regards to rights of way, could be simplified.

The Broadband Commission recommends that governments 'expedite rights of way and construction permits'[169], to coordinate investment projects in new roads, as well as power transmission, gas, oil, water, and sewer lines to include fibre optic cables or ducts to provide broadband.

Following this recommendation, to boost investment, governments in SSA could consider standardising rights-of-way access within each country as well as regionally, and creating centralised information points where network investors can access information on rights-of-way procedures and permissions. This would allow coordinated network planning and scale economies in investment, especially from the larger mobile groups.

5.3.4 Implementing a transparent, predictable and supportive regulatory regime

Mobile broadband requires significant investment from operators to acquire spectrum, upgrade and extend their existing networks and potentially support customer device acquisition. However, as a result of the economic crisis, investment funding has been harder to obtain, and a key factor that global investors consider when deciding to invest in telecommunications is whether a modern, transparent and predictable regulatory regime is in place. To ensure investment in the sector continues and foreign investment is attracted, increased transparency and certainty in regulatory frameworks is vital.

5.4 A collaborative approach can maximise the benefits from growth

The mobile industry in sub-Saharan Africa is an enabler of substantial economic and social development, and helps to lift populations out of poverty and to extend social and digital inclusion.

In a similar fashion to mobile services surpassing fixed telecommunications in SSA, there is an opportunity for mobile broadband to overtake basic mobile services for sectors of the population that remain unconnected. Crucial to extending mobile broadband to all regions and all sectors of population is the allocation of mobile spectrum, and in particular the Digital Dividend, to mobile operators. In the short run, refarming of existing spectrum could be considered to ensure the advantages of LTE can be reaped from today. As affordable smartphones, including models tailored for the African market, are expected to be available in the coming years, mobile broadband provision could be further supported by reconsidering consumer taxation and by promoting and protecting mobile operators' network investments.

Affordable mobile broadband has the potential to bring significant advantages to African citizens of all income and education levels. A host of new services in all areas, from banking to health and education, has the potential to transform the way African people communicate and live their lives. This is likely to trigger further social and economic development in the region. By working in partnership, mobile operators and governments can continue the remarkable success story of this industry in the region and extend its unique benefits to all African citizens.

[169] ITU/UNESCO, Broadband Commission, "The State of Broadband 2012: Achieving Digital Inclusion for All", September 2012.

Appendix A About this study

The sub-Saharan Africa Mobile Observatory is a joint research study between the GSMA, Deloitte and Wireless Intelligence. Any questions about the content of this document can be directed to the authors of the study.

About the GSMA
The GSMA represents the interests of mobile operators worldwide. Spanning more than 220 countries, the GSMA unites nearly 800 of the world's mobile operators, as well as more than 200 companies in the broader mobile ecosystem, including handset makers, software companies, equipment providers, internet companies, and media and entertainment organisations. The GSMA also produces industry-leading events such as the Mobile World Congress and Mobile Asia Congress.

For more information, please visit GSMA's corporate website, **www.gsma.com**.

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Appendix B Mobile penetration and population by country

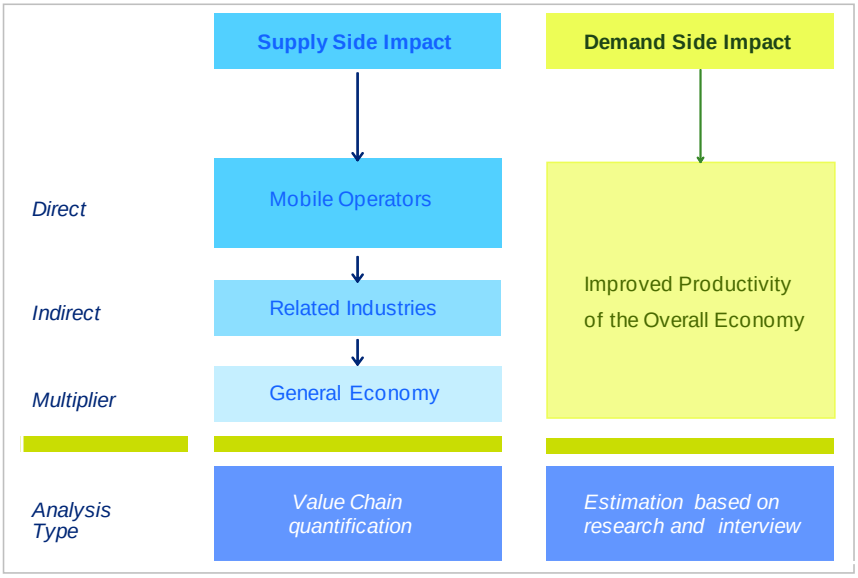
Country	Penetration 2012	Population 2012
Eritrea	6%	5,539,466
Ethiopia	17%	86,087,466
Djibouti	23%	918,422
DRC	23%	69,120,939
Burundi	24%	8,705,833
Malawi	28%	15,757,333
Niger	29%	16,500,502
Madagascar	32%	21,775,172
Mozambique	33%	24,338,816
Comoros	33%	768,493
CAR	33%	4,553,398
Somalia	35%	9,737,302
Chad	36%	11,754,303
Rwanda	37%	11,189,577
Uganda	42%	35,343,034
Burkina Faso	43%	17,353,449
Lesotho	46%	2,211,098
Guinea	47%	10,415,984
Togo	48%	6,251,022
Sierra Leone	48%	6,094,209
Tanzania	50%	47,296,896
Liberia	52%	4,215,656
Cameroon	56%	20,359,297
Nigeria	59%	165,589,721
Zambia	63%	13,781,422
Angola	63%	20,026,495
Guinea Bissau	64%	1,571,489
Swaziland	65%	1,216,138
Kenya	69%	42,464,495
Mali	70%	16,199,057
Sao Tome	74%	171,040
Zimbabwe	75%	12,948,853
Equatorial Guinea	75%	735,406
Senegal	79%	13,022,847
Ghana	84%	25,400,908
Benin	85%	9,288,859
Mauritania	88%	3,602,605

Congo	93%	4,209,734
Cote d'Ivoire	94%	20,484,184
Mauritius	98%	1,312,000
Seychelles	103%	87,096
Cape Verde	104%	504,147
Namibia	114%	2,354,325
Gambia	120%	1,812,608
South Africa	123%	50,668,685
Botswana	149%	2,047,612
Gabon	164%	1,556,470

Appendix C Economic impact assessment methodology

Detailed bottom-up analyses of the value-add generated by mobile telephony has recently been undertaken by Deloitte for Kenya and for East Africa[170]. Based on publicly available statistics, company accounts and interviews with operators such as Safaricom, Airtel and MTN, benchmarks on the value-add generated by the mobile ecosystem as a proportion of market revenues have been determined. These benchmarks have been applied to the present analysis to obtain an estimation of the economic contribution of the mobile industry in the rest of SSA. The following figure illustrates the framework for the estimation.

Figure 63: Framework for the estimation of the economic impact of mobile telephony

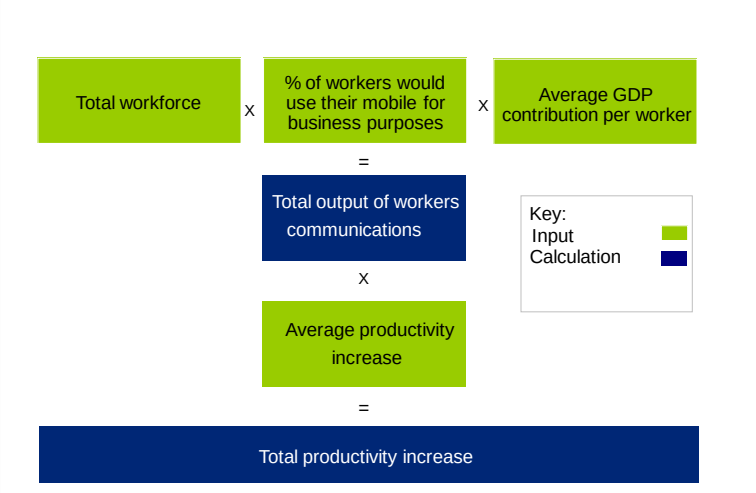


To calculate the economic contribution generated by the industry, first the value-add as a proportion of total revenues is used to estimate the direct and indirect economic effects for each country. Then, a multiplier of 20% is applied to both effects to capture the impact on the wider economy.

The demand-side impact was estimated by calculating the improved productivity of the overall economy. This was estimated by reference to the previous studies and also reflects the different income levels of the SSA economies. The figure below exemplifies the steps for the calculation.

[170] Deloitte/GSMA, "*Mobile telephony and taxation in Kenya*", 2011 and "*Taxation and the growth of mobile in East Africa*", 2008.

Figure 64: Calculation of economic impact of productivity improvements[171]



In particular, the number of high-mobility workers — that is, the number of workers who would use their mobile phones for business purposes — was estimated based on a country's income levels and with reference to data from the national statistics and international labour databases[172]. The productivity gain of high-mobility workers with access to a mobile phone was based on recent analysis from Kenya[173].

[171] In the figure: Total workforce is the total employed population aged 15+ taken from the African Development Bank, Average GDP is GDP per capita and the % of workers using mobile for business vary by income levels as explained below.

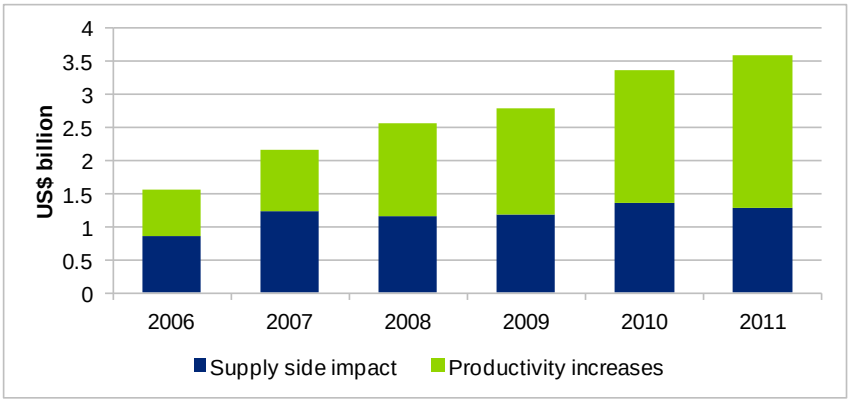
[172] The proportion of high-mobility workers is assumed to be 20% for high income economies, 16% for medium income economies and 12% for low income economies. Economies are categorised by income based on the World Bank Atlas methodology (Low income, $1,025 or less; middle income, $1,026 - $4,035; high income, $4,036 or more).

[173] This is assumed to be homogeneous across the region and equal to 10%.

Appendix D Kenya case study[174]

In Kenya, the mobile communications industry contributed a total of US$3.6 million in 2011; US$1.3 million from the supply-side impact plus US$2.3 million from the productivity impact. This contribution represented 5.6% of GDP in 2011. In total, this contribution has increased substantially in the five years up to 2011, at a rate of over 0.5% per year.

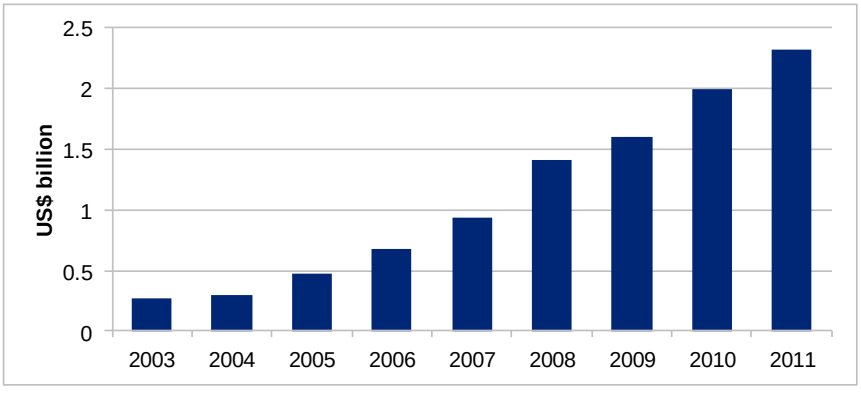
Figure 65: Economic impact of mobile telephony in Kenya



Source: Deloitte analysis

The mobile ecosystem in Kenya was responsible for large increases in productivity between 2003 and 2011, as shown in Figure 66. These were driven both by the increase in population coverage which has allowed a greater proportion of high-mobility workers to access mobile technology, the increasing number of high-mobility workers using mobile telephony and the increase in value-add services provided by mobile operators such as 3G data services and the services mentioned above. As a result, the productivity impact of mobile telephony on the Kenyan economy has increased by over 300% in the five years up to 2011.

Figure 66: Economic value from increases in productivity in Kenya, 2003 to 2011

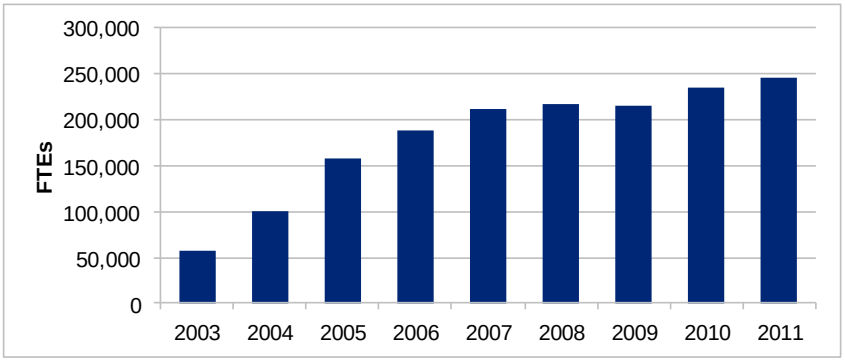


Source: Deloitte analysis

Mobile telephony's contribution to employment has also grown considerably over time, from just under 60,000 FTEs in 2003 to almost 250,000 in 2011.

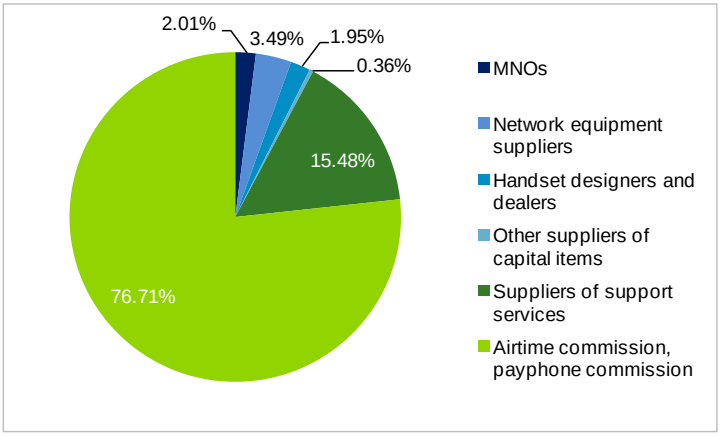
[174] The analysis is taken from Deloitte/GSMA, "*Mobile telephony and taxation in Kenya*", 2011.

Figure 67: Industry contribution to employment in Kenya, including multiplier effect (FTEs)



Source: Deloitte/GSMA, "Mobile telephony and taxation in Kenya", 2011

Figure 68: Breakdown of employment generated by mobile services in Kenya, 2011



Source: Deloitte/GSMA, "Mobile telephony and taxation in Kenya", 2011

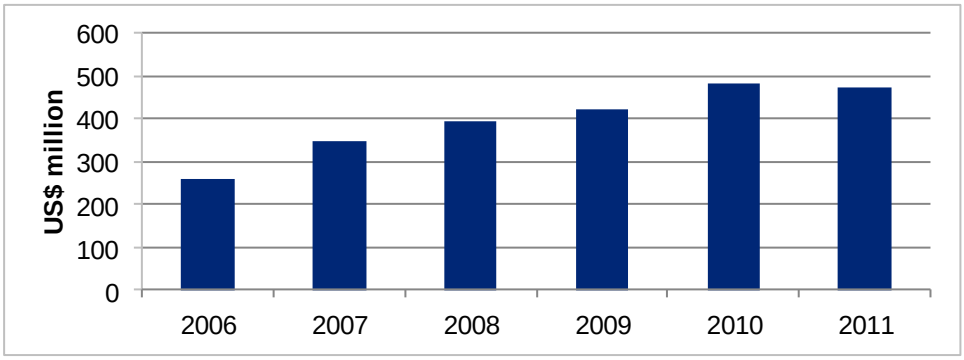
There were an estimated 280,000 points of sale for mobile services in 2011, including dukas, kiosks, phone and electrical goods stores, hotels and restaurants, street hawkers, pharmacies and photo studios. This has grown significantly from 80,000 in 2008, and it is estimated that together these points of sale employed in 2011 over 150,000 FTEs related to mobile services, out of the almost 250,000 FTEs in total, for the purpose of airtime sales alone.

In 2011, mobile operators in Kenya paid approximately US$474 million to the government in taxes and regulatory fees, which represents an increase of 33% from the US$394 million paid by mobile operators in 2008.

Tax and regulatory fees represented 34% of company revenues for Kenyan mobile operators in 2011. The largest proportion of tax revenue was raised through mobile-specific consumer sales taxes, which accounted for 65%[175] of taxes and regulatory fees paid by mobile operators in 2011.

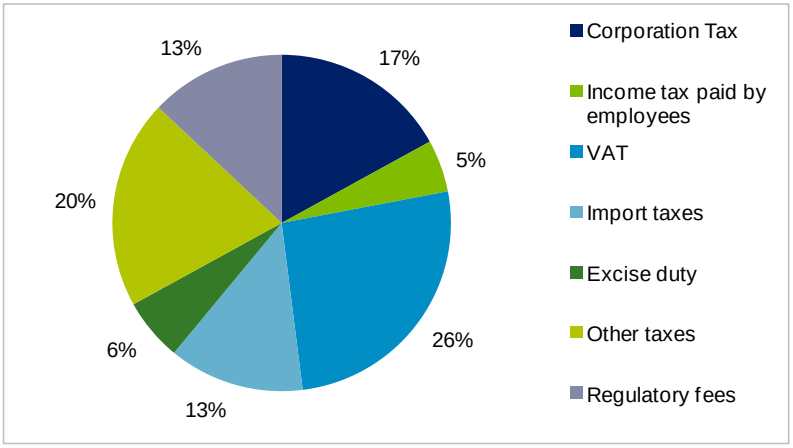
[175] VAT, import taxes, excise duty and "other".

Figure 69: Tax and regulatory payments in Kenya from mobile operators, US$ million



Source: Deloitte analysis based on operator data

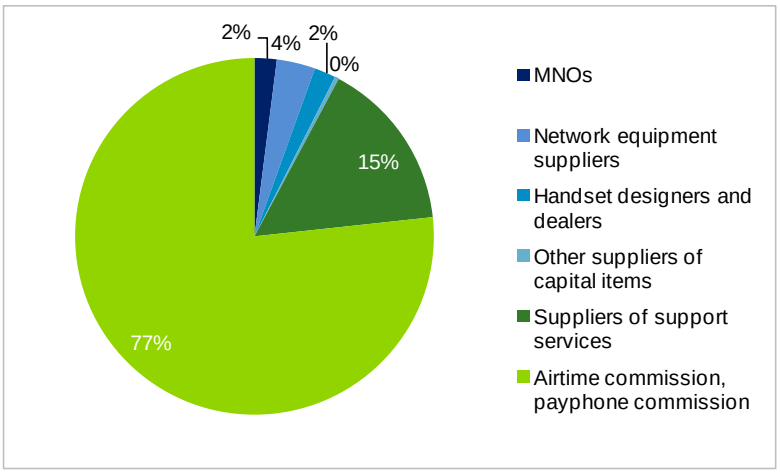
Figure 70: Breakdown of 2011 tax revenues from mobile operators in Kenya by source



Source: Deloitte analysis based on operator data

In addition to the direct tax revenue received from mobile operators, when considering the tax revenue received from other players in the value chain, the mobile industry value chain generates another US$162 million for the government in 2011. The largest payers of tax in the mobile supply chain, aside from the mobile operators, are the suppliers of support services and handset and airtime retailers.

Figure 71: Breakdown of 2011 tax revenues from the mobile value chain in Kenya



Source: Deloitte analysis based on Deloitte tax data, analysis of company accounts and interviews. This represents tax revenues directly created by revenue flows from mobile services and not total tax revenues from the businesses.

Appendix E Taxes and fees applied to MNOs

Table 8: Examples of taxes and fees applying to mobile operators in SSA, 2011

Country	Charges
Burkina Faso	• 2% of revenue is paid as a universal service fee • 1% of revenue is paid to the government in regulatory fees • 0.5% of revenue is paid to the government's Research and Training Fund
Cameroon	• Contribution to special telecommunications fund set at 3% of turnover • Licence fee payable to the regulator stands at 1.5% of turnover • Mobile operators have reported that often variations in licence fees are received without a fore notice from the regulator
Chad	• 3% of annual revenue paid as regulatory fees
Congo B.	• 3% of domestic revenue paid as regulatory fees • 6% of international revenue paid as regulatory fees
Democratic Republic of Congo	• 2% of mobile operator revenue paid as an annual licence fee • 2.4% of mobile operator revenue paid as an annual spectrum frequency fee • 2% of mobile operator revenue paid as an annual numbering fee • Airtime purchased by the customer is first booked on the deferred revenue account and then accounted progressively in the revenue account when the consumption is made • This results in a distortion with other sectors for which ICA tax (equivalent to GST) is calculated on the revenue account, while for telecommunications companies it is based on the deferred revenue account • The tax authorities claim ICA on airtime discounts from both the mobile operators and indirectly also from the dealers
Gabon	• 0.5% of mobile operator revenue is paid towards Frequency and Spectrum fees • 0.5% of mobile operator revenue is paid towards Numbering fees • 2% of mobile operator revenue is paid towards Universal/Service Fees • 2% of mobile operator revenue is paid towards Technology taxes • 5% of mobile operator revenue paid as an annual licence fee
Ghana	• As discussed above, mobile operators by law are obliged to pay 2.5% of their revenues to the government as a Health Insurance tax which is used by the government to fund investment in and development of Ghana's health services • 2% of revenue is also paid in regulatory fees to the government
Kenya	• 0.5% of mobile operator revenue paid as regulatory fees • 0.5% of mobile operator revenue paid as universal service fee to the government
Lesotho	• Universal access fee is set at 1% of Net Operating Income • This is expected to rise to 2%
Nigeria	• mobile operators pay 0.14% of revenues in Frequency/Spectrum fee tax • 0.15% of revenue is paid in Numbering fee tax by mobile operators • 0.04% of revenue is paid as a Technology tax or R&D contribution • 2.9% of mobile operator revenue is paid as regulatory fees
Niger	• 2% of revenue paid as regulatory fees to the government • 4% of revenue paid as USO (Universal Service Obligation) to the government

Country	Charges
Tanzania	• Overseas providers of communications (e.g., roaming partners) with no presence or physical assets in Tanzania providing mobile communications services to Tanzanian customers (e.g., mobile phone operator) will now be subject to Tanzania withholding tax (to be deducted by his customer). The overseas provider will normally not be able to claim credit for such tax in his home jurisdiction • VAT: Each of the two sides of the Union (Mainland Tanzania and the Isles — Zanzibar) has its own VAT legislation (i.e., VAT is not a union tax) • The two legislations have not been properly aligned between themselves and with other legislations
Uganda	• 2.5% of mobile operator revenue paid as regulatory fees to the government
Zambia	• 1.5% of mobile operator revenue paid as regulatory fees to the government

Source: Source: Deloitte/GSMA, "Global Mobile Tax Review", 2011, based on information provided directly by mobile operators //

Appendix F Acronyms and abbreviations

Acronym /Abbreviation	Meaning
3G	Third-generation mobile telephony
4G	Fourth-generation mobile telephony
APT plan	Asia-Pacific Telecommunity plan
ARPU	Average revenue per user
CAMEL	Customised Applications for Mobile networks Enhanced Logic
Capex	Capital expenditure
CAR	Central African Republic
DRC	Democratic Republic of Congo
FDI	Foreign direct investment
FTE	Full-time equivalent
GB	Gigabyte
GHG	Greenhouse gas
GPS	Global positioning system
GSM	Global System for Mobile
GST	Goods and Services Tax
ICT	Information and communication technology
ITU	International Telecommunication Union
LTE	Long-Term Evolution Mobile Telephony
MDG	United Nations Millennium Development Goals
MENA	Middle East and North Africa
MNO	Mobile network operator
MOU	Minutes of use
MWC	Mobile web content
NFC	Near field communications
NGO	Nongovernmental organization
PB	Petabyte
PPP	Public-private partnership
SIIT	Surtax on International Incoming Traffic
SIM	Subscriber Identity Module
SMS	Short Message Service
SOE	State-owned entity
SSA	Sub-Saharan Africa
TCMO	Total cost of mobile ownership
TFP	Total Factor Productivity
USO	Universal Service Obligation
VAT	Value-added tax
WHO	World Health Organization
WRC	World Radiocommunication Conference

Appendix G Important notice from Deloitte

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