



Spectrum Management in Africa

The challenges faced by regulators and operators

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Introduction

The role of spectrum in Africa



The importance of spectrum in Africa

The telecommunications industry in Africa epitomises the continent's rapid growth and innovation. Although currently comprising only 8% of the global total, the number of connections in sub-Saharan Africa has grown by 30% CAGR since 2000, a rate that is expected to rise to 44% in the coming years (see Figure 1). Not only are the number of connections expanding rapidly but many markets are still far from saturated (see Figure 3). The type of usage is also broadening. African usage of mobiles for internet browsing, for example, is amongst the highest globally (see Figure 2). Given the key role played by telecommunications on the continent, the effective management of mobile infrastructures is crucial, in particular the way in which spectrum is managed and made available to telecommunications companies (telcos).

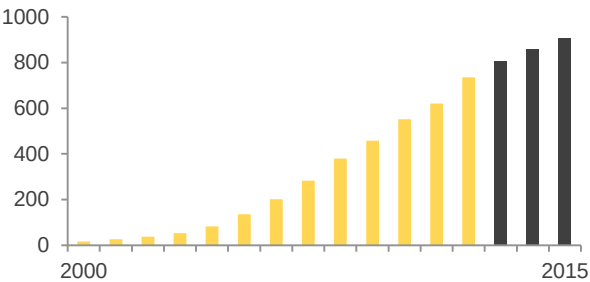


Figure 1: Connections (millions), Source: Sub-Saharan Africa Mobile Observatory 2012 (GSMA – Nov 2012)

Why is spectrum scarce?

Spectrum is the range of useable frequencies (bandwidth) over which telecommunications-related products and services are provided. As each range of frequencies can only be allocated to one type of service provider (such as mobile), the useable range of frequencies is, in effect, limited. As particular frequencies are preferred by operators due to their higher performance in built up areas for example, this further limits the availability of useable frequencies.

Together with an increase in the sophistication of mobile devices, which is driving exponential consumption of data, this is leading to further 'congestion' of bandwidth that has been allocated. As a result across much of Africa the telecommunications market is faced by a looming capacity and coverage 'crunch', as allocated spectrum fails to keep pace with the on-going rapid pace of mobile adoption.

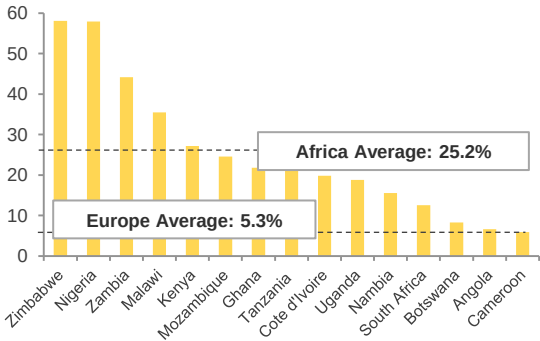


Figure 2: % of internet browsing on mobile platform, Source: Sub-Saharan Africa Mobile Observatory 2012 (GSMA – Nov 2012)

The role of the regulator / government agency

Spectrum management is the responsibility of the respective national regulator or government agency and is achieved through the granting of licences to service providers. Spectrum is usually released via an auction or is allocated based on predetermined criteria.

As spectrum plays such a crucial role in telecommunications, the criteria for allocation and the allocation process itself must not only ensure transparency and fair competition but also support national economic and social development objectives.

The role of the telcos

Irrespective of how spectrum is allocated, telcos must demonstrate to stakeholders (regulators, investors and customers) that they are making (or will make) responsible usage of the allocated bandwidth. Responsible usage, in this context, means not only setting out business models with the appropriate levels of investment, but also demonstrating alignment with broader social and economic development imperatives.

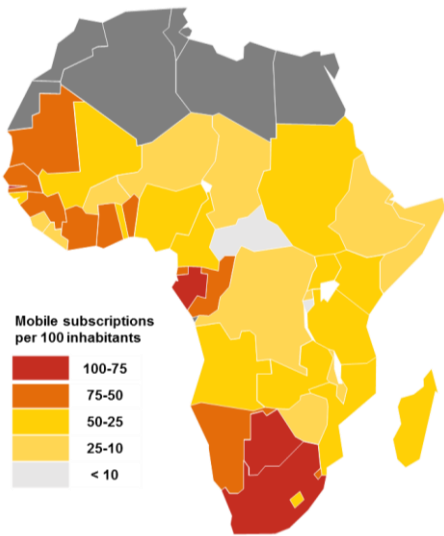


Figure 3: Mobile penetration in sub-Saharan Africa
Source: MIT Technology Review, 2010

Why is Africa different?



Telecommunications in Africa

The wave of liberalisation and privatisation that swept across Africa in the 1990s paved the way for much greater foreign direct investment in the telecommunications sector. Given the lack of alternative infrastructure, telecommunications now play a pivotal role in socio-economic development across the continent.

This importance will continue to grow as the volume and types of usage expand. The impact is already significant - if the effects on worker productivity are included, the current impact on sub-Saharan Africa (SSA) GDP of mobile technology alone is estimated at 4.4%¹. From a social development perspective mobile communications are being seen as the best way to reduce the “digital divide” between those with access to online resources and those without.

The rapid growth and the importance of mobile services in Africa is explained, in the main, by the lack of competition from reliable and affordable fixed line services. For the vast majority of African users, mobile broadband is the only way of accessing the internet.

Also contributing to economic growth is the use of mobile services in a variety of innovative ways to service both the formal and informal sectors of the economy. Applications include Mobile Money (m-money) initiatives, phone credit distribution, informal selling of airtime cards and servicing of mobile devices.

Telecommunications in Africa are essentially a leapfrog technology, and play a unique and increasingly important role in the on-going economic and social development of the continent.

The challenge of spectrum allocation

If the growth rate of mobile usage in general (and mobile broadband in particular) is not to be constrained, it is vital that the spectrum required to support this growth be made available when needed. Despite having one of the the highest rates of growth in mobile usage worldwide, Africa has amongst the lowest allocation of spectrum to mobile services (see Figures 4 and 5). Many African countries allocate between 200MHz and 300MHz, whereas in developed markets, allocations typically exceed 500MHz².

The potential impact

A lack of allocated spectrum creates, in effect, an artificial scarcity of resource, and poses a significant challenge for telcos operating in Africa.

The lack of available spectrum is likely to lead to increased costs, increased retail prices, reduced competition and coverage and, inevitably, increased network congestion. This in turn places at risk the positive impact that telecommunications could have on economic and social development in Africa.

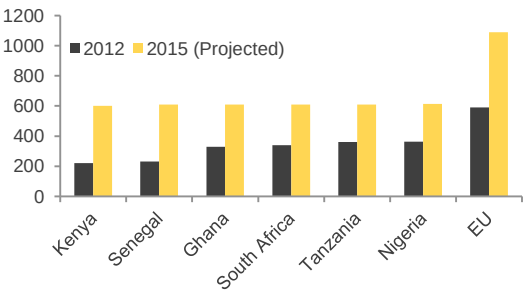


Figure 4: Number of MHz Allocated to Mobile
Source: The benefits of releasing spectrum for mobile broadband in Sub-Saharan Africa Mobile (Plum Consulting for GSMA – Dec 2011)

The stakes are significant. The GSM Association (GSMA) estimates that the release of additional spectrum would support an increase of up to 300 million broadband subscribers by 2025. The additional annual GDP generated by 2025 as a result of spectrum release is estimated at \$82 billion³.

Delaying spectrum release could have a significant impact. The NPV of additional GDP over the period 2015 to 2025 is estimated at \$230 billion – a five year delay (to 2020) would reduce this to \$50 billion³.

Key Conclusions

Africa is experiencing the highest rate of expansion in mobile services globally.

The lack of a fixed line alternative, combined with increasing opportunities in Value Added Services (VAS), make mobile services a crucial catalyst for economic growth.

Africa has amongst the lowest allocation of spectrum to mobile services worldwide, creating an artificial scarcity.

The lack of available spectrum may lead to increased costs and prices, reduced competition and network congestion.

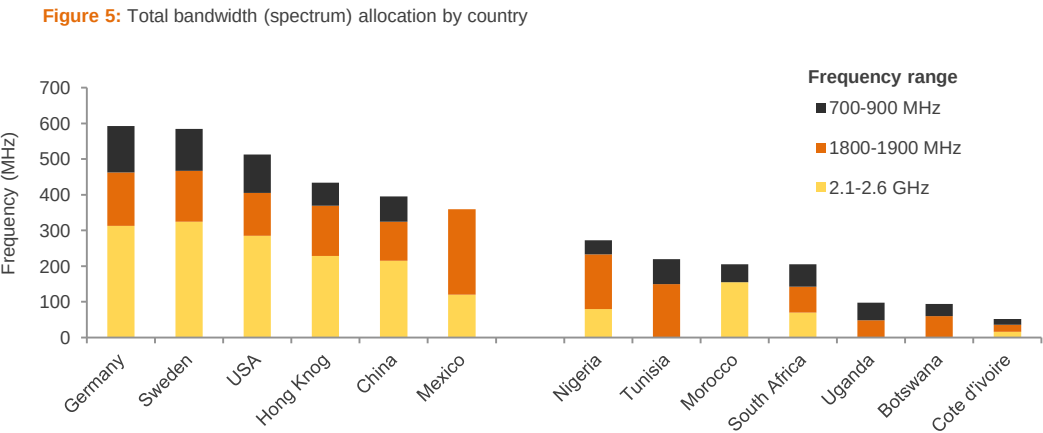


Figure 5: Total bandwidth (spectrum) allocation by country
Source: The Benefits of Releasing Spectrum for Mobile Broadband in sub-Saharan Africa – a report for the GSMA Dec 2011

How is spectrum managed in Africa?



Spectrum allocation in Africa

Spectrum is a scarce and valuable resource and needs to be managed as such. To ensure that the spectrum allocated provides the greatest possible benefit to its citizens, African governments and regulators have to consider, with some urgency, the relevant regulatory, commercial and technical aspects of the allocation process:

Regulatory considerations

- Having in place efficient, transparent and stable spectrum award procedures.
- Promoting a stable regulatory environment within which telcos can plan and invest for the long term with confidence.

Commercial considerations

- Balancing the fees received from spectrum licences with the need to encourage telcos to bid for licences and invest in infrastructure.
- Achieving an appropriate balance between the need for competition and the need for the economic scale required to support viable telecoms.
- Developing pricing models that promote service demand and ensure long term revenue generation.

Technical considerations

- Making the most efficient use of spectrum, ensuring spectrum is allocated in commercially viable amounts to those that will make best use of it.
- Harmonising with internationally recognised frequency bands to significantly lower the cost of networks and devices and facilitate international roaming.
- Liberalising spectrum allocation to ensure operators have the flexibility to make the most

efficient use of allocated bandwidth. For example, the bandwidth made available by the switch from analogue to digital TV (the 'Digital Dividend') is in a spectrum best suited for use in rural areas.

Methods of spectrum allocation

There are a number of ways in which spectrum is allocated, two of the most frequently used being Direct Licencing and Auction:

- Direct Licencing – where the regulator assigns frequencies to operators. This is a traditional method used for allocating bandwidth for radio and TV. It can result in inefficiencies and inflexibility, particularly if the regulator is not in touch with market needs and is unable to respond quickly and appropriately.
- Spectrum Auction – where the regulator sells, to the highest bidder(s), a licence to use specific frequencies. Although auctions have been successful in generating revenue, they can lead to increased prices for customers, especially where the playing field is not level for all bidders. An important consideration in Africa is that spectrum auctions often do not consider the interests of non-commercial users, such as educational bodies.

There are other methods of allocating spectrum, such as lotteries, and there is a growing body of support, particularly in Latin America, for a blended option, where some bandwidth is auctioned and some assigned.

In Africa many governments have opted for open and competitive spectrum auctions, but the process is vulnerable to vested interests and political interference, particularly given the significant levels of capital involved.

What does this mean for Africa?

At present, the looming spectrum crunch is in danger of choking Africa's most dynamic industry. Mobile internet traffic is expected to increase several fold in the coming years, fuelled by the rise of value-added mobile services and the reality that mobile broadband often represents the only viable way to deliver internet to the mass market in Africa.

This makes network congestion a certainty unless African governments act quickly to release new spectrum. Regulators and operators must therefore explore opportunities for innovative solutions, recognising that the status quo may not continue to work, or not work fast enough. Examples of innovative solutions include the creation of a pooled funding model – backed by robust transparency and accountability mechanisms – whereby telcos collectively sponsor key technical capacity-building programs for regulatory bodies in Africa. This would help to build the expertise necessary for effective spectrum auctioning, public private partnerships and other initiatives designed to reduce regulatory uncertainty.

Key Conclusions

The allocation of spectrum is a key consideration for operators.

The emergence of a range of innovative mobile services in Africa places greater importance on the need to support ever larger flows of data.

Efficient and innovative approaches to the utilisation of spectrum are required.

Regional hubs in focus

Nigeria



Nigeria: West Africa's powerhouse

Africa's most populous country, Nigeria forms around 15% of the African mobile subscriber base with approximately 95m mobile subscribers – allowing for the multiple phones and SIM cards used by many Nigerians. Voice provides around 85% of revenues but mobile data is fast gaining ground. The country's 4m-user smartphone market is expanding as Blackberry handsets – which account for 50% of the market – and other devices emerge as key status symbols for an aspiring class of young, urban Nigerians.

The regulator, the National Communications Commission (NCC), allocates spectrum throughout the country. Whilst the market is liberalised, with over 12 operators in mobile alone, the tender process remains opaque. According to local observers, parts of the lower ends of the spectrum have been sold off without a competitive bid process – and sometimes at prices as little as 10% of market value – to organisations controlled by politically-connected individuals.

A lack of clarity in spectrum allocation has also led large operators like Mobitel to take the NCC to court, successfully overturning the seemingly arbitrary decision to suspend their 2.3 GHz licence in 2010. Nevertheless, despite these disputes, Nigeria has released over 363 MHz to mobile services, the largest amount on the continent.

Expansion of mobile broadband and other services is hampered by a lack of infrastructure: for instance, only 40% of Nigerians are linked to the national electricity grid and the telecoms infrastructure is, as a result, based on costly

diesel generators. Those fortunate enough to have access to the grid receive an average of 5 hours of power per day.

The relationship between the NCC and operators can be fractious. The NCC recently fined several operators for not meeting ambitious KPIs, ignoring the underlying infrastructure issues. It is clear that successfully capitalising on the Digital Dividend, and the increased appetite for data will require operators and the regulator to improve their levels of collaboration in future. This will be especially important in relation to developing infrastructure and ensuring the transparent award of further mobile spectrum to those operators best positioned to make use thereof (in particular, global operators providing valuable foreign investment).

Key statistics

Aspect	Nigeria	Kenya
Population (m)	162.4	41.6
No. of Subscribers (m)	99	29.2
Mobile penetration	60%	74%
No. of mobile operators (GSM)	5	4
Spectrum allocated to mobile (frequencies)	363 MHz (900/1800 MHz)	220MHz (800/1200 MHz)

Source: World Bank, Business Monitor International, NCC, CCK

Regional hubs in focus

Kenya

Kenya: leading East Africa's telecoms revolution

The Kenyan mobile telecommunications market is Sub-Saharan Africa's third largest, boasting 29.2m subscribers and reaching an estimated 74% of the population. Kenya also stands at the leading edge of mobile technology innovation: the country's 'M-PESA' mobile money transfer service, through which four out of five adult Kenyans now possess access to a mobile money account, is the world's most advanced.

The sector is regulated by the Communications Commission of Kenya (CCK), an independent regulatory body funded from licensing and spectrum fees. The CCK adopts a 'command and control' approach when allocating spectrum, specifying rules and requirements that affect how, when and to whom spectrum can be allocated. For instance, wireless operators seeking to secure spectrum need to meet two criteria of eligibility: they have to be locally registered and have a rate of national ownership above 20%.

However, this approach creates distortions, for example by favouring state-owned operators. These distortions are exacerbated by a lack of transparency in the selection of eligibility criteria by the CCK's internal committee. Whilst both the government and the CCK claim to be considering the introduction of market-based auction procedures for spectrum allocation, these have yet to be put in practice.

To release much-needed extra spectrum for Mobile Broadband the CCK has proposed an analogue to digital switch-over. The target migration date was initially set for June 2012, but this was later pushed back to September 2013. The allocation of the ensuing Digital Dividend spectrum should benefit operators seeking to increase mobile network capacity, but the CCK has so far remained silent on its intentions, thus preventing telcos from planning effectively.

The Director General of the CCK recently dismissed as 'premature' a request from one of Kenya's most successful operators, Safaricom, for

the extra spectrum freed up by the switch-over – despite the fact that Safaricom met all eligibility criteria. Faced with the CCK's evasive response, the operator threatened to pull out of the Long Term Evolution (LTE) Investment network, a public-private partnership involving the government and co-investors Nokia Siemens and Alcatel, set up in late 2012 to expedite high-bandwidth rollout across Kenya. The LTE network would operate on an 'open access' model: after building the network, shareholders would lease it to interested parties.

For now, telcos appear to be beholden to the timetable of the planned digital switch-over – a process that may yet face further delays. The government's lack of technical expertise – crucial to set up spectrum auctions, for instance – and failure to grasp the importance of accelerating spectrum release suggest that a major culture shift is required to avoid the impending spectrum crunch. Following the March 2013 elections in Kenya – telcos will be hoping that the new administration will choose to confront these challenges sooner rather than later.

Key Conclusions

In West Africa's largest economy, Nigeria, the mobile market has grown rapidly but is still a long way from saturation.

Nigeria's telecoms market is open and highly competitive but operators must be proactive in their relationship with the NCC to limit the effects of regulatory uncertainty.

In East Africa's largest economy, Kenya, the rise of m-banking has placed the telecoms market in the vanguard of mobile technology innovation.

However, operators must stay flexible in their operational planning and investment decision-making in light of the regulator's lack of technical capacity.

What does this mean for African telcos?



Implications for operators

As outlined in Chapter Three, the level and mechanism of spectrum allocation is a key consideration for operators in Africa. The cost implications of the differing methods together with any regulatory uncertainty will influence investment decisions and thus directly impact the provision of services that Africa needs so urgently.

In Europe, telco operators have already begun to demonstrate caution. The February 2013 spectrum auction for 4G in the UK raised £2.34 billion, significantly less than the amount expected (£3.5 billion) as well as the amount raised in 2000 for 3G. It has been suggested that the main reasons for the relative lack of interest in the 4G auction are the struggle telcos face to sustain ROI due to limited customer loyalty and the rapid pace of change in transmission technology (why upgrade now when there will be faster technology available in a year or two?). The prospect of continued growth clearly presents tremendous opportunities for telcos in Africa. There are, however, significant challenges, particularly to business and operating models.

The right business model

Operator revenue models will need to evolve to keep pace with the innovation in products and services. This innovation results from increased competition as well as government supported initiatives (such as mobile banking in Kenya, which resulted in a 64% CAGR in users⁴). Operators will need a clear line of sight on the sources of future revenue streams, the products, channels and customer segments that will generate this revenue.

In making investment decisions and designing operating models, operators will also need to take into account the risk that, without sufficient

spectrum, the provision of services may be significantly constrained. For example, realising the potential of the efficiencies made possible by technologies such as 4G and LTE will depend on the required spectrum being made available. Therefore it is important that telcos understand the regulator's objectives and future plans for spectrum allocation early in the product development process and use this to inform product pipelines and investment decisions.

Relationship with the regulator is key

With a geopolitically diverse landscape comes a broad range and variation in the way spectrum is allocated and managed. With over 40 countries in sub-Saharan Africa, the range of different individual regulatory frameworks is vast. The case studies in Chapter Four highlight that even in two of the more established countries in terms of telecommunications infrastructure and policy, the level and nature of political involvement varies significantly.

Regulatory uncertainty, particularly during economically challenging times, may result in increased costs (for example, resulting from the need to plan for multiple scenarios). A recent survey by the Economist Intelligence Unit⁵ drew attention to the need to build trust with regulators to enable better transparency and understanding of regulatory regimes and recommends using industry consultations as an effective tool for:

- Understanding and agreeing the criteria for successful application of spectrum, allowing operators to make more informed investment decisions.
- Providing transparent reporting on the use of the spectrum against agreed criteria, providing assurance to regulators that operators are acting in line with common objectives.

Global operators such as Vodafone, for example, need to deal with multiple methods of allocation in Africa alone, increasing the complexity and cost of operations. Understanding and using regulator objectives as an input into the evaluation process when operating in Africa countries, together with an appropriate level of sensitivity to broader social and environmental factors will be critical in making the correct decisions.

In Nigeria, for example, spectrum fees in rural areas have been priced to achieve “even development of telecommunications infrastructure across Nigeria”⁶ resulting in spectrum fees in rural areas that are significantly lower than in city areas such as Lagos. Having this insight early allows operators to plan future investments more effectively.

Impact of tax regimes

Tax regimes, in particular the tendency to levy taxes at short notice, complicate the African business environment and make planning difficult. Innovation in mobile transfers and payments, for example, particularly for the unbanked population, was a significant step forward in driving mobile use in rural areas. However, in Kenya, a new 10% tax on money transfers threatens the economic viability of the service.

Consumer awareness

In addition to all of the infrastructure challenges, consumers are learning from experience and the changing economic environment, and becoming more technically savvy. This evolution is likely to result in higher churn rates as consumers look for more competitive deals and innovative services at lower costs. This in turn is likely to result in increased costs to serve certain segments.

The right operating model

As operators are faced with tough investment decisions and increasing pressure on economic models, they will need to ensure their operating models (operations supporting revenue streams, such as supply chains, sales and marketing, and

support functions, such as Finance and IT) are configured to best support the economic models.

In broad terms, the cost to serve the respective revenue streams needs to be at a level in line with the operators required rates of return to demonstrate economic (and social) viability. Freeing up capital by using more efficient and effective operating models will help enable more investments.

For some operators, this may require little change and for others this may be a significant or complete overhaul of the existing model. Operating models must be ‘fit for purpose’ and as such should reflect and support the forward-looking business model. Equally important, telcos must build flexibility into their operating models, ensuring they are nimble enough to respond and adapt to both technology advances and the regulatory changes that African governments are likely to introduce.

Many telcos have and continue to undertake business and operating model transformations with a view to managing costs. Whilst reducing costs may be one outcome of such an exercise, it should not be at the expense of reduced flexibility and scalability, as this may reduce the viability of future investments.

Key Conclusions

Realising the benefits of technologies such as 4G and LTE will depend upon the availability of the required spectrum.

Telcos must base investment decisions on a sound understanding of the risk that regulators will fail to allocate new spectrum efficiently and within required time-frames.

Telcos should work closely with regulators and governments, building trust through transparency, to ensure innovative and effective use of spectrum.

Conclusion

The Africa story

The Africa story is an exciting one. With parts of the region experiencing exponential growth in mobile users and with operators leading the way in terms of innovation, the continent's telecommunications landscape has a bright future. We expect the number of mobile subscriptions in Africa to surpass 1bn by 2015, and growth in mobile data will be faster in Africa than perhaps anywhere else. Future growth will be highest in countries that combine relatively large economies and strong demographics with broadly stable regulatory regimes: South Africa, Nigeria, Kenya, Ghana, Tanzania, Uganda, Senegal and Cote d'Ivoire are among those likely to lead the way. However, the challenge for all countries across the region will be in ensuring the right enablers are in place to facilitate continued growth.

Challenges for regulators

Regulators need firstly to decide on the most appropriate method of spectrum allocation to support the rollout of new technology such as 4G and LTE, which will have powerful multiplier effects for wider economic and social development. In doing this, the requisite level of transparency and consistency in the allocation and pricing process is needed to drive appropriate behaviours regarding the commercialisation of spectrum.

Second, regulators must adopt a regional approach, for example in harmonizing spectrum from the Digital Dividend band across national boundaries. Bodies such as the Economic Community of West African States (ECOWAS) and the Southern African Development Community (SADC) provide forums for this. The aim must be to adopt uniform bands across much of Africa to allow for the cost-effective provision of standardized products and services in the mass mobile market.

Third, regulators should examine best practice in European, North American and Asian markets to locate opportunities for reforms such as re-farming unused spectrum or liberalising license agreements to allow new technology to be deployed quickly and efficiently.

Fourth, governments should reduce regulatory uncertainty and red tape. Overly complex and poorly coordinated regulations and approval processes – for spectrum, tower and fibre deployment, etc. – should be simplified or removed. Where it is outdated, legislation must be brought up to date. In achieving this, governments must also boost their own technical capacity and knowledge by seeking advice globally, developing new partnerships through forums such as the African Telecommunications Union (ATU) and building new centres of excellence.

Challenges for operators

For their part, operators need to work closely with regulators to understand the drivers behind the allocation methodologies and the expectations of government regarding socio-economic development. They need a clear view of the product and service pipeline (i.e. how spectrum is used) and its impact on broader economic development. It will also be important for operators to develop efficient operating models which demonstrate to regulators that they are contributing directly to national social and economic objectives.

Individually and collectively, operators should focus on research and advocacy to better demonstrate to African governments and societies the link between mobile adoption and economic growth. Mobile has already contributed US\$32bn to the sub-Saharan African economy and has the potential to generate more innovation and jobs on the continent than any other industry⁷. Delivering this message effectively will enhance the prospects for decisive action by governments

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Elix-IRR Partners LLP
Level 3, 20 Abchurch Lane
London
EC4N 7BB

www.elix-irr.com