

Network Sharing: a Hot Topic for Operators and Regulators in Sub-Saharan Africa

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Abstract: Network coverage, cost reduction and improvements in financial and operational performance are some of the issues telecom operators are currently facing in sub-Saharan Africa. Network sharing progressively has become a hot topic for operators and for regulators. The first part explains network sharing approaches in developing countries. This is followed by an assessment of the risks and benefits of sharing for operators and countries, and then by a discussion of the role of policies and regulations regarding network sharing based on case studies of Ghana, Nigeria, Cameroun and Kenya. This analysis shows that network sharing can have important economic implications for operators, countries and for end users, provided that institutions define a relevant regulatory framework and provide clear guidelines.

Key words: infrastructures, institutions, network sharing, regulation, sub-Saharan Africa, telecommunications.

Infrastructure sharing is a cooperative model of telecom network management, whether shared infrastructures are passive (masts, cables, ...) or active (antennas, transmission systems, ...), and whether this network already exists or still has to be built. This trend has recently increased, first on some developed markets, then on some emerging markets, pioneered by Indian telecom operators.

The case of India is a significant example of network sharing in emerging countries. Because India is an extended country (over 3 million km² with 70% of its population living in rural areas), deploying a telecom network there is particularly capital-intensive. In addition, telecommunications in India are a very competitive sector, conducive to partnerships between operators. These features make India a favourable environment to the development of network sharing.

Network sharing has also started to develop in sub-Saharan Africa, where there was an impressive growth of the telecom sector over the last decade: Bharti Airtel strongly intends to develop its tower sharing business

in Africa, as it did in India, and the tower companies market is growing (Helios Tower Africa, Eaton Towers, American Towers, Swap Technologies).

This paper is intended to emphasize the economic interest of telecom network sharing in sub-Saharan Africa, provided that a regulatory framework and clear instructions have been defined. The existing literature on this subject mainly focuses on developed countries, primarily on the United States and Europe, where the issue is quite different from developing countries. Experts' discussions and studies in this field have focused on the interest and the consequences of network sharing – whether they are positive (e.g. network sharing may contribute to develop competition according to the theory of the ladder of investment) (CAVE, 2006) or negative (e.g. network sharing may be a disincentive to investment) (PINDYCK, 2004). For the moment, literature has brought little attention to regulatory practices that could be recommended in the area of sharing in emerging countries. Based on a corpus of African countries case studies, this communication will share some thoughts on the role of institutions regarding network sharing.

The first part of this document will explain what infrastructure sharing is, the different types of sharing and the various forms of possible agreements. The second part will present the factors encouraging network sharing development, as well as the general risks and benefits for operators and countries. The last part will include four case studies of sub-Saharan African markets with a state of the art of network sharing (its market and institutions approach) before proposing a brief framework on the role of institutions in network sharing.

■ Network sharing in developing countries

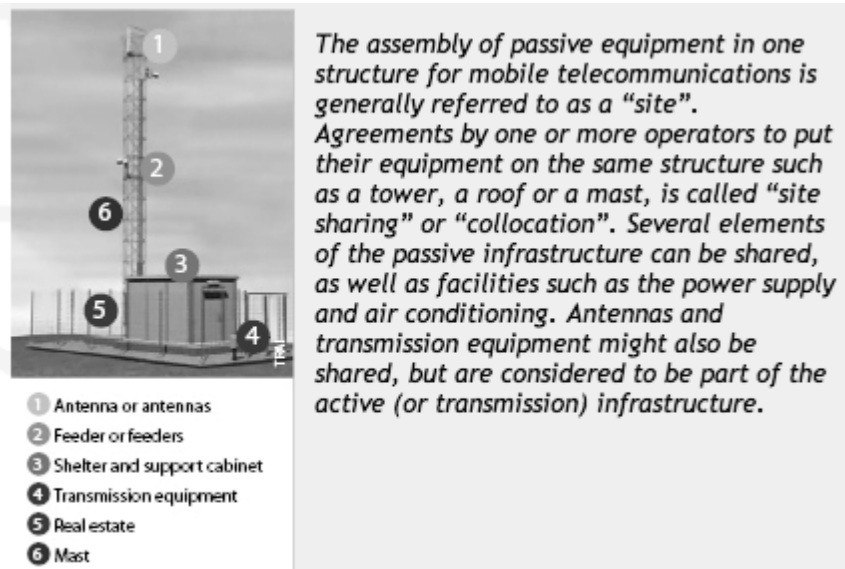
Types of sharing

Sharing is a cooperative model of telecom network management according to which several telcos operate on the same infrastructure. There are different types of sharing. On one hand, unbundling is usually mandatory from a regulatory point of view for incumbents and operators with a significant market power. It allows new entrants and challengers to lease part of the incumbent's network, to be able to enter the market and offer

competing services. On the other hand, infrastructure sharing is generally voluntary (it can even be encouraged by institutions and mandatory in some countries and cases). It can be sharing of active network ¹, of passive network ² or of spectrum ³. In India for example, the national regulator TRAI ⁴ clearly encourages both sharing of passive and active infrastructures. But in practice, whatever the market, operators are more likely to share their passive infrastructures for two reasons:

- It is simpler to implement than active infrastructure sharing.
- Active infrastructure sharing is particularly sensitive in terms of regulation and it is still too soon to assess such practices.

Figure 1 – Passive mobile sharing (site sharing)



Source: TRAI, *Recommendations on Infrastructure Sharing*

¹ Active infrastructures include antennas, electronic elements, transmission systems, radio equipment, ...

² Passive infrastructures include elements of civil and non-electronic engineering: sites rental (physical place), masts, technical shelters, energy supply (power, fuel, solar energy, ...), cooling systems and alarms, ...

³ Spectrum sharing has developed in mature markets. Because spectrum is a scarce resource, this model enables an operator to lease its underutilized spectrum to other operators.

⁴ TRAI: Telecom Regulatory Authority of India.

In sub-Saharan Africa, even if some stakeholders like Eaton Towers⁵ are considering active network sharing as a possible activity in the future, there is none in practice. For the time being, African deals of sharing only concern passive networks, such as the 2009 agreement between Zain and Essar in Kenya, on the sharing of 300 of their base stations. Thus, this paper will mainly focus on passive network sharing. Figure 1 presents a mobile passive infrastructure.

Types of agreements of passive infrastructure sharing

Operators share passive infrastructures according to various types of agreements, depending on market structure and penetration, on local regulation, on operators' situation (whether it is a new entrant or an incumbent) and on their strategies.

Direct sharing between operators

Operators share part of their infrastructure via a direct agreement between them. This agreement can be unilateral (an operator provides access to another one), bilateral (mutual access between two operators) or multilateral (access between several operators). Network maintenance remains the responsibility of each operator (e.g. Zain-Essar agreement in Kenya). Regarding billing issues, this kind of agreement can be a rent or a swap agreement (e.g. Orange Cameroun and MTN Cameroun deal).

Joint venture

Operators jointly build or share their existing infrastructures through a joint venture. Operations and maintenance staff of each network is maintained in the new structure. The major example in a developing country is the creation of Indus Tower in India in 2008, signed between Vodafone (42%), Airtel (42%) and Idea (16%), which is a tower company that owns more than 100 000 towers (2010). The first joint venture of this kind in sub-Saharan Africa was signed between Tigo and Helios Towers in Ghana early 2010.

⁵ Eaton Towers is a British "tower company" that has been acting in sub-Saharan Africa since 2010. The main activity of a "towerco" is to own and manage telecom infrastructures with the objective of renting them to several operators.

Outsourcing of infrastructures and/or services

An operator rents tower usage to a specialized company, a "tower company" ("towerco") for an annual fee.

- Either this agreement is made between an operator and an existing independent towerco (e.g. Vodafone and Eaton Towers in Ghana);
- Or the mobile operator creates its own towerco as a separate entity (e.g. creation of Bharti Infratel in 2007 as an independent towerco in India).

In this model, the operator sells all or part of its towers to the towerco ("divesting"), which will then rent its assets to this operator ("sale-and-lease-back agreement") and to others. This agreement often includes network operations and maintenance.

Lastly let's note that sharing can also be done between telecom operators and other utilities like power supply, water and gas: for example, a framework agreement was signed in 2006 in Cameroun for Camtel, MTN and Orange to share their networks with the power company Aes Sonel and the rail company Camrail.

Development of towerco market

The "tower company" is a company whose activity is to own and manage telecom infrastructures (after building or buying them) and to rent them to different operators at the same time. Besides renting infrastructures to its clients, the towerco can offer them additional services related to sites development (planning, administrative processes and applications to local authorities, ...), to sites management (security, energy supply management, ...). The duration of the agreement is usually between ten and fifteen years.

The objective of a towerco will be to multiply the agreements with various operators, in order to increase its tenancy ratio ⁶ and thus its economies of scale. The number of towers in Africa was estimated to be between 80,000 and 100,000 in 2010 ⁷. At first, Helios Tower Africa (HTA) started its

⁶ Tenancy ratio: fraction of total number of operators sharing the towers over total number of existing sites.

⁷ Balancing Act issue 525, October 2010.

activities in Nigeria in 2006, then in Ghana ⁸ and more recently in Tanzania ⁹. American Towers (United States) has been operating in Ghana and South Africa since 2010. Eaton Telecom (U.K) has also acquired African assets very actively since 2010: founded by former executives of Vodafone, Orange and Celtel, Eaton operates today in South Africa, in Ghana and in Tanzania. Bharti Airtel (India), by acquiring the African assets of Zain, also acquired its towers and asserts it wants to develop a tower business on the African market, building from its experience with its two towercos in India, Indus (joint-venture) and Bharti Infratel (subsidiary).

■ Factors and consequences of network sharing

Factors of network sharing's development

Factors stimulating development of network sharing in a country are linked to the market and to operators.

- *An increasing demand*: voice and data traffics keep increasing (mobile connection has been multiplied by 15 between 2000 and 2010 in Africa and the number of mobile data subscribers has been multiplied by 10 between 2006 and 2011 ¹⁰). This encourages operators to optimize their investments in order to face this increasing demand and maintain the service level.

- *Market maturation* leads to a growth slowdown: in 2010, telecom revenue growth was only 7.4% in sub-Saharan Africa ¹¹, against 22% in 2006.

- *Increasing competition and higher penetration rate* result in a price war between competitors, and thus a falling Average Revenue Per User (ARPU has fallen from US\$15 in 2006 to US \$8 in 2011 ¹²). This makes operators willing to improve their financial performance by lowering Capex and Opex. This is the case in Cameroun where MTN's ARPU has fallen from

⁸ January 2010: Agreement with Tigo.

⁹ August 2011: Helios gets a licence to develop a tower network.

¹⁰ WCIS (World Cellular Information Services), www.wcisplus.com, "World Cellular Data Metrics", August 2011.

¹¹ IDATE, Market & data report, *Le marché mondial des services télécoms*, January 2010.

¹² WCIS, www.wcisplus.com

\$14 in 2007 to \$7 in 2011 and Orange's ARPU from 13€ to 6.3€ over the same period ¹³. Thus, Ebitda (Earnings Before Interest, Taxes, Depreciation and Amortization) margins are decreasing for some operators who are then forced to seek other ways to maintain their margins. (Vodacom's Ebitda in Democratic Republic of Congo, for example, has gone from 32% in 2006 to 9% in 2010; Safaricom's one in Kenya from 53% to 42% over the same period ¹⁴).

- Factors linked to *network deployment* and *cost reduction* can facilitate network sharing: when new licences are proposed in a country (3G for example) or when an operator needs to develop its network in non-dense or isolated areas, sharing can be a solution to optimize its costs of deployment.

- Also *environmental issues* might facilitate decision for network sharing, whether they apply to the operator (sharing lowers energy costs) or to the country (existing environmental laws or lobbies on population's health regarding antennas).

- Lastly, *local regulatory environment* regarding network sharing is key; it may go from banning sharing to mandatory sharing or incentives from authorities, as we will see below.

In parallel, some characteristics intrinsic to operators also come into play: marketing strategy of the operator is one of them, according to what he considers as his "core business". Indeed, if the operator focuses on services (marketing, brand, customer service, ...), as it is the case for MVNO (Mobile Virtual Network Operators), it will be less inclined to differentiate through its network (coverage and quality of service) and will be more inclined to share it. On the other hand, if there is a significant gap between internal skills and market know-how regarding network issues, sharing can allow the operator to address this gap, while continuing to monitor its network performance (data remain quantifiable, traceable and the service provider may be punished for non-compliance on quality).

Risks and benefits of network sharing

If there is a form of consensus in favour of passive network sharing, due to the opportunities it provides for markets and players, the question of its

¹³ WCIS, www.wcisplus.com

¹⁴ WCIS, www.wcisplus.com

legitimacy may arise. If it is improperly framed, it may indeed induce some risks. It is understood that advantages and disadvantages quoted below do not necessarily apply to all types of sharing, depending on the type of agreement and on the level of sharing.

Network sharing and competition

First of all, at market level, network sharing can facilitate competition in the telecommunication sector, by lowering entry barriers: sharing a network allows new entrants to bypass the original sunk costs. According to the theory of the ladder of investment (CAVE, 2006), regulation can contribute to improve competition by establishing low access prices that will enable a new entrant to offer the same services on the market as the incumbent operator. The new entrant is thus on the first bar of the scale. Then, once it has consolidated its position on the market (it has developed its customer base, increased its revenues), he is led to gradually "climb on the scale of investment" by investing in its own infrastructure. In this way, when a market is open to competition, new operators can progressively invest, by relying on others' networks. On the other hand, network sharing has the economic advantage to reduce network duplication. It can also encourage operators to develop new technologies and to improve their service offer (possible collocation of 3G equipment with 2G existing equipment for example).

However, the OECD points out that there is a consensus that infrastructure competition provides the most sustainable and efficient level of competition on communication (OECD, 2007). In some cases, the sharing agreement between operators might provide opportunities for collusive behaviours and thus potentially lead to increase entry barriers. For example, an exclusive agreement between operators limiting access to their sites for other operators would particularly be a problem in urban areas where these resources are scarce. Another example of collusive behaviour would be a bilateral agreement involving dominant operators. Network sharing would therefore become a barrier to market competition on the market (on prices, on coverage, ...) to the detriment of the end user. To a lesser extent, there is the example of Ghana, where each operator has signed an agreement with a towerco: some characteristics of these agreements (such as the capitalistic links between operators and towercos) can discourage other players to join them.

Still at the market level, network sharing can be a disincentive to investment. This was the thesis of Pindyck (PINDYCK, 2004) in the *Telecommunications Act of 1996* in the United States, which is an incentive

regulation that had made unbundling mandatory. The author uses the concept of "irreversible investment", according to which any investment in a telecom infrastructure is an irreversible cost ("sunk cost"), as the asset cannot be resold¹⁵ and as there is a great uncertainty on its return on investment. Pindyck indicates that in practice, price calculation made by incumbent, applied to the new entrant and imposed by the regulator, does not take into account the irreversible nature of the cost born by the incumbent. This leads to an asymmetric allocation of risk between both operators and a potential disincentive to investment for incumbent: disincentive to build new networks (lowers network competition) and to improve existing networks (less incentive to innovation). Thus a challenge for institutions is to find a balance between two objectives: lowering the entry barriers and stimulating investment.

Network sharing and cost reduction

From operators' point of view, the main objective of network sharing is cost reduction and economies of scale. It results indeed in a decrease of the network Total Cost of Ownership (TCO). TCO includes the investment needed for network deployment (Capex) and the network operating expenses (Opex). Opex here relate to management, operation and maintenance of infrastructures (sites rental, labour, security, generator, air conditioning equipment, ...). These Opex are an important part of total Opex and they are particularly high for rural sites or areas with difficult access. With network sharing, costs are transferred to a third party and lowered thanks to mutualisation. Savings are estimated to be around 30% on Opex and Capex¹⁶ and can have several impacts on the market:

- service innovation or customer relationship improvement,
- market price reduction,
- larger network coverage.

However, in some cases such as Ghana, the initiative of sharing might not immediately provide the expected economies of scale. Indeed, several operators do not necessarily share the same network proposed by a towerco. For example, on the Ghanaian market, each operator has sold its assets to different towercos in order to then rent them (Tigo to Helios Tower; Vodafone to Eaton Towers; MTN to American Tower). The costs of each

¹⁵ It is not economical to resell these assets, because their costs are mainly made of labour costs.

¹⁶ Source: GSMA, "Mobile infrastructure sharing" (2008) .
<http://www.gsmworld.com/documents/gsma.pdf>

operator are therefore transferred to each towerco, but as there was no infrastructure mutualisation between operators, there have not been economies of scale. It is only when a towerco pools several operators on the same infrastructure, and thus increases its tenancy ratio, that value is being created.

Network sharing and environmental footprint

By reducing the number of sites, network sharing enables to optimize the use of so-called "scarce" resources such as land and energy, and thus has some environmental benefits. In addition to alleviate local residents' concerns regarding the impact of antennas on health, mobile network sharing also means a reduction in the total number of antennas and thus:

- an improved visual impact,
- less possible interferences with electronic devices,
- less electricity required for site operations.

Network sharing, independence and flexibility

The main argument given by operators against network sharing is the potential loss of control and independence: the operator has no longer exclusive control over the steering of its quality of service. But there are usually detailed clauses about service level in the agreements signed between partners. This argument of loss of independence is often associated with the risk of information leakage. This is because network sharing is a partnership between competing parties, and particularly possible when staffs of both parties have to work in the same structure (in a towerco for example).

Coming from this potential loss of independence, another risk is the loss of operational and strategic flexibility: network sharing might make operations more complex to conduct, compared to an internal network deployment. Operators must agree on the different aspects of their collaboration: project planning (investment prioritization), potential sites identification, costs sharing, new structure governance implementation, operational teams coordination, strategic decisions, ...

Also, agreements are usually long – lasting 10 to 20 years – and operators sharing their network might lose flexibility and have more difficulty adapting to market changes and to regulatory constraints. However, instead of acquiring or building its own network, the operator rents its network: thus

one can also consider that, by transforming fixed costs into variable costs, the operator becomes more flexible to market changes.

Other risks and benefits

Other mentioned risks relate to the loss of competitive advantage (on the quality of service, geographic coverage or prices) due to sharing between operators of a portion of the costs, or also the increased complexity from a technical (compatibility between partners' networks) and administrative (accounting, taxes, faster depreciation of a shared network asset) point of view. Network sharing is a model that is less capital-intensive than a classical model of network development, deployment is faster and the time-to-market is shorter. Finally, network sharing enables to outsource some of the risks and to avoid a number of constraints, such as meeting local regulation requirements, ensuring the security of goods and staff in difficult access areas or areas of conflict. In conclusion, in order to fairly distribute value creation between stakeholders, institutions should contribute to finding a balance between competition and cooperation.

■ **Institutions' approaches of network sharing in sub-Saharan Africa**

Policies and regulation facing network sharing issue

Countries' authorities regard telecom infrastructures as very important as they participate closely in their economic and social development. Decision of network sharing – and reduction of number of sites – remains a sensitive issue in terms of regulation because – as we saw earlier – it can increase welfare (by improving capacities and network coverage) and also decrease it (by reducing competition level for example). Thus the regulator must ensure that a sufficient part of positive effects of network sharing is well reflected on the end user. At the international level, there is kind of a consensus for passive infrastructure sharing provided that certain conditions are met, such as competition, fair prices for the use of infrastructure and a guarantee of coverage and of quality of service for the end user.

But depending on the country of course, the position of the institutions varies and depends on many factors, such as the number of operators on

the market and the level of cooperation between them. In some countries, network sharing can be forbidden for regulatory reasons linked to competition. For example, sharing the active part of a network is forbidden in some countries: the active part being considered as a real source of competitive advantage, sharing it would be likely to limit competition. In other countries, sharing is encouraged by incentives: in India, a subsidy system has been implemented, using the universal service fund, for the sharing of passive infrastructures, when deploying network in rural areas.

Network sharing is even mandatory in some countries. This can apply only to operators with a dominant market power or to certain types of infrastructures. In China for example, when attributing 3G licences in 2008, in order to avoid duplication of towers on the same sites, the Ministry for Communications and Information Technologies required that Chinese operators open their towers to their peers: this resulted in an agreement between China Mobile, China Telecom and China Unicom. In India, passive network sharing has become mandatory first in Delhi and Mumbai areas, with the objective to then extend it to the rest of the country, in order to lower prices and improve coverage.

Similarly, governments and regulators of some countries in sub-Saharan Africa have started to think about the network sharing issue and about its impact on the market. The following part of this paper will present the examples of Ghana, Nigeria, Cameroun and Kenya. But other examples, such as Tanzania and Zimbabwe, could have been given: TCRA ¹⁷, the telecom regulator of Tanzania, encourages network sharing in its *Tanzania Communications (Access Facilities) Regulation* of 2005. Helios Towers and Tigo have recently announced their tower-sharing agreement in this country. In Zimbabwe, operators were first reluctant to tower sharing, considering network as a competitive advantage. The national regulator, Postal and Telecommunications Regulatory Authority of Zimbabwe, with the objective of covering rural areas of the country, started building towers in 2011, financed by the universal service fund; and operators will share these towers. In addition, for some cases, authorities are studying not only mobile infrastructure sharing, but also the development of a national fibre-optic backbone or network sharing between telecom operators and non-telecom infrastructures.

¹⁷ TCRA: Tanzania Communications Regulatory Authority.

Some cases of network sharing in sub-Saharan Africa

The case studies presented here have been chosen because – in addition to the fact that information is available – these countries have different characteristics in terms of market and approach to network sharing:

- Ghana and Nigeria are competitive markets, where some towercos have launched operations and signed agreements with local operators, in an institutional context that is favourable to sharing.
- Cameroun and Kenya are stricter towards network sharing, operators share their networks and authorities have developed a national fibre backbone, in order to improve coverage and decrease prices.

Based on the economic and regulatory stakes we have seen before, this part makes a review of the current situation of network sharing in these countries.

Ghana and Nigeria: competitive markets and tower companies

Ghana (81% mobile penetration) and Nigeria (56% mobile penetration) have competitive markets, with five mobile operators each including one dominant: MTN Scancom has 49.8% market share in Ghana ¹⁸ and MTN has 48.3% market share in Nigeria. In Ghana, competition, including competition on prices, has made pressure on operators' revenues and ARPU's of some of them have fallen below \$5. Thus operators have looked to a way to quickly lower their costs: outsourcing of their towers. Then agreements between operators and towercos have been signed. In Nigeria, according to operators, network sharing is a way for them to face the increasing market demand. In these contexts, towerco markets have strongly developed in both countries.

In Ghana, in January 2010, Tigo (Millicom) signed a "sale-and-lease-back" agreement with Helios Tower Ghana (subsidiary of Helios Tower Africa), to whom Tigo has sold 750 towers. The agreement is a joint venture and Tigo has taken minority stakes in Helios Tower Ghana. In October 2010, Vodafone outsourced 750 towers in Eaton Towers for \$45m. The ten-year contract includes an \$80m investment by Eaton to improve Vodafone's towers and country coverage. In December 2010, a joint venture between MTN and TowerCo Ghana (subsidiary of American Tower) includes

¹⁸ Market share in number of subscribers, June 2011, Source: NCA.

outsourcing of 1876 MTN towers for \$428m and an equity share of 49% in the towerco capital. Also, Airtel, which has operated in Ghana since it bought Zain's African assets in 2010, strongly intends to develop its towers outsourcing model in Ghana. Up till now, these towercos have not yet signed any second agreement with another operator ¹⁹, their "tenancy ratio" remains at 1 for the time being (the average tenancy ratio is 1.5 in emerging economies of Africa, Middle-East, Asia ²⁰). Operators have just transferred their tower costs here, but without making economies of scale. This model has some minor advantages in terms of Opex savings, compared to a model in which operators would have kept their own infrastructures. Besides this, the take-off of 3G in Ghana does not encourage operators to share their networks, even through a towerco.

Existing agreements show there are strong links between operators and their towerco, whether they are bound by equity stakes (Millicom/Helios; MTN/American Tower) or others (Eaton's executive team is made of former Vodafone's executives). These stakes do not encourage other operators to join the existing agreements: they fear they could lose control over part of their network for another operator.

To conclude on Ghana's towerco market, if network sharing can bring costs savings and more financial flexibility for operators, it does not always create economies of scale.

In Nigeria also, towerco market has strongly developed. In 2005, Helios, the first independent towerco on the African market, started operations in Nigeria. In 2009, Helios got a loan from the African Development Bank, for its project of deployment of 2000 towers. Today, Helios is a major actor on this market, with 1500 towers in Nigeria and 10 operators in its customer base, including MTN, Zain and Starcomms.

Other agreements have taken place between towercos and operators in Nigeria. In 2009, the operator PNN Ltd – in order to reduce its costs – and the towerco ITL (Independent Towers Limited) signed a sharing agreement, to collocate 200 sites in Nigeria, Ouganda and Ghana. In December 2010, Starcomms Nigeria and Swap Technology also signed a sharing agreement.

¹⁹ Another operator is said to be interested in sharing former Vodafone's towers, via Eaton Towers, but there has not been any confirmation published yet.

²⁰ Source: Cap Gemini Consulting, quoted in the following article:

<http://www.telecoms.com/16089/tower-sharing-offers-opportunities-for-emerging-markets/>

All these agreements have been signed in a favourable regulatory environment. Both in Ghana and Nigeria, institutions have encouraged network sharing.

In Ghana, the Government via the Ministry of Communications and the NCA (National Communication Authority), the national telecom regulation authority, work together on infrastructures deployment, strongly encouraging network sharing for several years now. The "National Telecommunications Policy", published in 2004 by the Ministry of Communications, already encouraged sharing:

"In order to ensure fair competition, to minimise cost and public inconvenience, and to protect the environment, access to public rights-of-way, towers, telephone poles, underground conduits, international cable landing stations, and other physical support structures will be shared among operators to the greatest extent possible." ²¹

Then in May 2010, the government published guidelines regarding standards and procedures for tower deployment in the country ²². Main objectives of this document are to frame and facilitate tower deployment, in order to ensure larger territory coverage and to meet an increasing services demand. In this context, late 2010, the NCA launched a call for licences for tower building. The aim is to prevent a "wild" tower building (50% of them would have been built without any authorisation, according to the Environmental Protection Agency) and to mitigate the growing concerns of the population about the potential dangers of the proximity of these towers.

In Nigeria also, institutions play a role in favour of network sharing. In 2006, in its "Guidelines on Collocation and Infrastructure Sharing", the NCC (Nigerian Communications Commission), the national telecom regulator, clearly encourages it:

"These Guidelines are designed and developed to encourage collocation and infrastructure sharing among telecommunications operators within a predetermined framework to remove uncertainty and create an environment for better co-operation".

The main reasons given by Nigerian authorities are the following:

²¹ National Telecommunications Policy, Ministry of Communication, Republic of Ghana, 2004. <http://www.ict.gov.gh/Telecom%20policy/Ghana%20Telecom%20Policy%20Final.pdf>

²² *Guidelines for the Deployment of Telecommunications Towers*, Government of Ghana, 2010. http://www.nca.org.gh/downloads/Communications_Towers_Guidelines.pdf

- by cutting Capex and Opex, infrastructure sharing benefits smaller actors;
- sharing allows a faster expansion of the network.

To conclude on Ghana and Nigeria, both countries have competitive telecom markets and a developing network sharing. Regulation framework is favorable to sharing but has no real incentive yet to make it very efficient in terms of economies of scale, which would benefit the sector and the end user.

Cameroun and Kenya: low competition and strong support of institutions to network sharing

Cameroun and Kenya are not very competitive markets. In Cameroun, the incumbent Camtel is the fixed network operator, and there is an oligopoly on the mobile market between MTN (53.8% market share, 2011) and Orange (46.2% market share, 2011). In Kenya, Safaricom has a dominant market power with 69.9% market share in mobile and 92% in fixed. In contrast to Ghana and Nigeria, institutions have been the initiators of network sharing in Cameroun and Kenya.

The Cameroun government has been willing to improve network coverage and market penetration (42% in 2010). In 1999 already, the decree on the interconnection regime encouraged operators to share their (passive and active) infrastructures. Ignorance of this text by operators has led, despite its existence, to the multiplication of towers on the territory. Therefore in 2006, a framework agreement initiated by authorities including the ART (Telecommunications Regulation Agency of Cameroun) was signed between private operators (telecommunications) and public operators (telecommunications, electricity, rail and media). The aim of this agreement is to encourage operators to share infrastructures between telecom (Camtel, Orange, MTN) and non-telecom operators (Cameroun Radio and Television, Aes Sonel Electricity, Camrail, ...), who often own large networks that potentially cover non-dense areas. Another initiative taken by the government to improve coverage and penetration is to develop a national optic fibre backbone. Several projects have started for this purpose, such as participation of Cameroun in the CAB (Central African Backbone) project, which is an open access infrastructure crossing several countries.

There are similar context and initiatives regarding infrastructure sharing in Kenya. Two main factors have led Kenyan authorities to be in favour of network sharing:

- a strong increase in demand (+31%/year in broadband, +15%/year in mobile data);
- cases of vandalism (some operators do not hesitate to cut the optic fibre network of competing operators) lead to many failures of the network, thus penalising the end user.

Thus, in 2008, the "Kenya Communications Bill" created a legal framework for network sharing. Then in 2009, regarding colocation, the "Kenya Communications Regulations" stated:

"Where a telecommunications Licensee has the right to install facilities on, over or under private land or take advantage of a procedure for the expropriation or use of property, the Commission shall require the sharing of such facilities and property with other telecommunications Licensees, in particular, where other telecommunications Licensees do not have access to viable alternatives." ²³

The tower sharing model has started to develop on the Kenyan market: in April 2009, Zain and Essar signed an agreement to share 300 of their base stations for 15 years. In June 2011, Orange and Safaricom created a joint venture to share their existing infrastructures, in order to rationalise network duplications and make economies of scale.

In Kenya also, the government initiated a National Optic Fibre Backbone Infrastructure (NOFBI) in 2007, in order to link main cities to a large capacity infrastructure. This is meant to be an open access network for all mobile operators, based on fair conditions for all of them. Assets could then be sold to Helios or to Africa Infrastructure Investment Managers, which is an investment fund willing to penetrate the Kenyan infrastructure market.

In Cameroun and Kenya, institutions have boosted network sharing development by creating legal frameworks that encourage operators to share their infrastructures, and by initiating projects of national backbones. Nevertheless, existing frameworks do not include incentive measures, nor real regulatory constraints.

²³ The Kenya Communications (*Interconnection and Provision of Fixed Links, Access and Facilities*) Regulations, 2009.

■ Conclusion

Institutions (governments, competition and regulation authorities) usually consider network sharing as a good way to deploy larger networks faster (for incumbents as well as for new entrants), and to reduce operators' costs and thus prices for the end user. For operators, the main interest of network sharing is cost reduction, enabling margin optimization: network costs represent a large part of their operational expenditures (53.7% Opex of Safaricom in Kenya, 2010). This way, network sharing enables operators to optimize their investment in network deployment – particularly in less populated areas – and in quality improvement and innovation (services, technologies).

The literature and expert studies have focused on the economic interest and consequences of network sharing, but for the time being, little attention has been given to regulatory practices that could be recommended in the area of sharing in emerging countries. Moreover, as seen in this paper, there is a fine line between positive and negative consequences of network sharing. On the one hand, the conditions under which network sharing may be allowed become clearer, but on the other hand there is still a need to clarify the position of authorities on this issue.

Diversity of sub-Saharan African countries makes any single conclusion on the subject impossible but there are lessons to be learned from the case studies we have seen above.

In countries with favourable factors to network sharing development and where it seems to be an appropriate model, institutions have to study how it can be implemented.

Based on the examples seen above, regulator's actions should focus on the following points:

- *Transparency*: set a regulatory framework that will be transparent and non-discriminatory, and bring it to the knowledge of all operators so that they are informed of the existence of the conditions applied to network sharing in the country.
- *Competition*: ensure competition on the market and prevent anti-competitive behaviours such as exclusive agreements. On this point, it could be interesting to explore the subject of the towercos market that is currently developing in sub-Saharan Africa. Indeed, their independence is an important criterion for operators, which guarantee that value created (by

coverage increase or network improvement) will be well distributed between players. In addition, an independent towerco faces the 'first customer dilemma': it can propose some attractive terms of contract to get its first customer, then not be able to attract a second customer on its network, and thus it will not be able to achieve economies of scale. So it would be preferable that privileges and equity stakes between operators and towercos remain limited, in order to encourage third-party operators to join the existing agreements. Institutions have a role to play in the development of this infrastructure suppliers market.

- *Coverage*: identify priority areas for network expansion, for example in rural or in urban areas where construction of new towers can be prohibited. There are several ways to quickly improve coverage: the development of an open access national backbone; sharing with other infrastructure industries that already have their own fibre network (this allows utilisation of capacity surplus or duct sharing); implementation of incentives like tax rebate for shared sites or rebates on administrative charges for any network sharing project.

- *Prices*: set up price mechanisms of infrastructure usage with the following objectives: realistic prices for small operators and return on investment for the network owner.

- *Conflicts*: set up a clear framework for dispute, for problem solving and conflicts between operators.

This paper has aimed to present some thoughts on the role of institutions in the development of telecommunications network sharing in sub-Saharan Africa. Because this phenomenon is particularly recent, it is still difficult to draw any lessons and conclusions from these experiences. However, the case studies on the experiences of Ghana, Nigeria, Cameroun and Kenya, already show the importance of a regulatory framework and of clear instructions. Thus, network sharing – through its role on the development of the telecom sector, on the improvement of access to technologies and on the increase in people's welfare – will be able to bring its contribution to the economic development of sub-Saharan African countries.

References

African Alliance Securities (2001): "Tower sharing in Africa: where is the upside?" *Mobile Telecommunications Services, Equity research*, June.

Agence de Régulation des Télécommunications du Cameroun, www.art.cm

Agence d'Information Economique Africaine, www.agenceecofin.com

American Tower, www.americantower.com

Bharti Infratel, www.bharti-infratel.com

BORBA LEFÈVRE, C. (2008): "Mobile sharing", International Telecommunications Union, 8th Global Symposium for Regulators.

Business Monitor International's Industry report & forecasts series (2011): "West & central Africa telecommunications report", Q.3.

Cap Gemini Consulting (2009): "Mobile Tower Sharing and Outsourcing: Benefits and Challenges for Developing Market Operators", *Telecom & Media Insights*, no. 43.

CAVE, M. (2006): "Encouraging infrastructure competition via the ladder of investment", *Telecommunications Policy*, 30, pp. 223-237.

Communications Commission of Kenya, www.cck.go.ke

Eaton Towers: www.eatontowers.com/sanjiv_ahuja_of_eaton_telecom_infrastructure.php

GSMA (2008): "Mobile infrastructure sharing".
<http://www.gsmworld.com/documents/gsma.pdf>

Helios Tower: www.heliostowers.com

IDATE Consulting & Research (2010): "Le marché mondial des services télécoms", Market & data report, January

KAMGAM, F., under supervision of L. GILLE (2010): "Evaluation du partage d'infrastructures des télécommunications au Cameroun", Mémoire de fin de formation du BADGE, ENST Paris.

Ministry of Communications of Ghana, www.ict.gov.gh

National Communication Authority (NCA) of Ghana, <http://www.nca.org.gh/>

Nigerian Communications Commission: www.ncc.gov.ng

Nigerian Communications Commission - NCC (2008): "Guidelines for Collocation and Infrastructure Sharing", Nigerian Communications Commission, Lagos, Nigeria.

Organization for Economic Cooperation and Development - OECD (2007): "Convergence and Next Generation Networks", Ministerial Background Report.

Ovum (2010): "Strategies for future growth in Africa's mobile market", January.

PINDYCK, R. S. (2004): "Mandatory unbundling and irreversible investment in telecom networks", National Bureau of Economic Research, Working Paper 10287.

Pyramid Research's series of Africa & Middle East Country Intelligence Reports:

- (2011): "Kenya: Data Services and Infrastructure Investment Top Operator To-Do Lists" (March).

- (2011): "Nigeria: Opened Markets and New Infrastructure Stoke Competitive Fires" (March).

Republic of Ghana:

- (2010): "Guidelines for the deployment of telecommunications towers. www.ict.gov.gh

(2005): Ministry of Communication, "National Telecommunications Policy", January. www.ict.gov.gh

Telecom, Internet & Broadcast in Africa: <http://www.balancingact-africa.com/>

TSANGA EBODE, J. A., under supervision of Carole ARMOET (2010): "Quel cadre réglementaire pour le déploiement d'un réseau en fibre optique en zone urbaine au Cameroun ?", Mémoire de fin de formation du BADGE, ENST Paris.

WCIS - World Cellular Information Services (2011): "World Cellular Data Metrics", August. www.wcisplus.com