

## The case for Open Access communications infrastructure in Africa: impact of international submarine cable infrastructure [SAT- 3/WASC] in four African countries.

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## ABSTRACT

It is generally accepted that Information and Communication Technologies (ICTs) have a key role to play in facilitating socio-economic development. ICTs allow for the provision of better market information; they also improve transport efficiency, reduce isolation and thereby increase the security of villages, organisations, and people. However, this acceptance of the role ICTs play in development is yet to translate into the development and expansion of communications infrastructures in Africa. Investment in such infrastructure has been, at both regional and national levels, disparate and inadequate for the needs of the continent's population. Furthermore, where infrastructure has been built, access to it has been restricted.

Impact of the dearth in communications infrastructure in Africa is easily identified; because Africa receives and/or spends the least in developing her communications infrastructure, she has the least amount of capacity/bandwidth available to her population, has the most expensive connection charges, and (not surprisingly) has the lowest Internet usage rates in the world. Such (poor) indicators of performance and their implications on development prospects have resulted in the initiation of various infrastructure initiatives to address the backbone infrastructure gap on the continent. At the same time, precautions are required in order to ensure that the maximum benefit is derived from these infrastructure projects and this has resulted in the questioning of the way communication infrastructures are traditionally built, owned, and operated. In particular, many stakeholder groups have called for the adoption of Open Access principles by owners of communication infrastructure.

In making the case for the adoption of Open Access in Africa, the South Atlantic Telephony-3/West African Submarine Cable (SAT-3/WASC) system is used to illustrate the shortcomings of infrastructure projects that do not imbibe the principles of Open Access. This paper presents the findings of a study commissioned by the Association for Progressive Communications (APC). The study researched and documented the impact SAT-3/WASC has had on the communications market of four member countries –Angola, Cameroon, Ghana, and Senegal. The findings of the study increase understanding (and better articulation) of the limiting factors that need to be addressed not only in the development of current and future infrastructure projects but also (and perhaps more importantly) in the operating environment of recipient/member countries.

# 1. Introduction: Information, Competitiveness and Connectedness

The possession and control of information offers (at various levels) considerable strategic advantages. These range from information that is necessary for survival, and which facilitates the attainment of basic needs and freedoms<sup>1</sup>; to more complex combinations of information that can become independent sources of productivity and power (van Dijk 2005).

Information has also been described as a source of competitiveness<sup>2</sup> - with respect to the business world the availability of information is said to change the structure of industries and thereby alters the rules of competition. Information bestows on those that have access to it new ways of out performing their rivals; and it can also create new business opportunities, even within existing business 'operations' (Porter and Millar 1985). Could these "competitive advantages" emanating from having access to information and the capacity to use it at the enterprise level be applicable to non-business entities of varying geographic scope - and in particular to nation-states?

Popular opinion amongst policy and decision makers seems to think so. These assert that affordable and accessible information can help nations to improve their global standing by lowering the cost at which they deliver economic and social activities. This they say can also enhance their ability to differentiate themselves by increasing the range/scope of activities they can deliver to distinguish themselves in the global marketplace. In response, many (developing) countries have adopted extensive/expensive programs of investment in infrastructure and high technology<sup>3</sup>. If indeed nations are like "...big corporation(s) competing in the global marketplace" (Clinton cited in Krugman 1994:29), it comes as no surprise that in a world in which information is increasingly the primary means and product of all processes, the extent to which a country is 'networked' or 'connected' to the rest of the world is seen as critical to its development.

Using comparative levels of communication infrastructure as indicators of levels of "connectedness" (see Table 1), the scale of the infrastructural gap in sub-Saharan Africa and implications on the competitiveness of this region of the world are easily identified. Table 1 compares the amount of bandwidth (measured in megabits per second – Mbps) that is available to people living in different regions of the world. It shows that (in 2004) approximately 88% of the total bandwidth available worldwide was located in developed regions of the world. More specific to the region under examination, using the indicator 'bits per inhabitants', Table 1 also shows that a person living in Europe or North America had access to approximately 570 more bits of bandwidth than someone living in Africa.

Low bandwidth is associated with poor telecom infrastructure; in this sense the poor bandwidth available in sub-Saharan Africa can to an extent be explained by how under serviced the region is in terms of international telecommunications infrastructure – in particular undersea fibre-optic cables. This dearth of international cable infrastructure is further compounded by expensive international satellite coverage and inadequate terrestrial networks between countries in the region – to the extent that communications between African countries are often transited via Europe and/or North America. The resulting situation is therefore not only one of (physical) communicative isolation but also of (prohibitively) expensive connectedness.

Table 1: Distribution of International Bandwidth across Regions

	International Bandwidth (Mbps)	% of World	Bits per inhabitant	AFRICA	ASIA	LAC
				Less than other regions [approx]	Less than other regions [approx]	Less than other regions [approx]
				2004	2004	2004
<b>World</b>	4,704,468.8		759.0			
<b>Africa</b>	5,329.4	0.11%	6.4		0.05	0.04
<b>Asia</b>	474,207.3	10.08%	128.3	20.0		0.9
<b>Latin America and Caribbean</b>	80,377.0	1.71%	146.3	22.9	1.1	
<b>Oceania</b>	26,789.6	0.57%	842.0	131.6	6.6	5.8
<b>Europe</b>	2,929,246.0	62.27%	3,643.0	569.2	28.4	24.9
<b>North America</b>	1,188,519.5	25.26%	3,647.9	570.0	28.4	24.9

Bits per inhabitant = International Bandwidth/Population

Source: ITU (2006) World Telecommunications Indicators Database

Strategies for increasing connectivity within sub-Saharan Africa and between the sub-continent and the rest of the world must comprise of the deployment of new communications infrastructure. New submarine cable infrastructures are being planned along both the east and west coasts of Africa; three cables – SEACOM, EASSy and TEAMS are projected to roll-out in 2009/2010. Also important to improving connectivity is the maximisation of existing infrastructure. This focus on maximisation (in terms of both low price and high volume) comes as a result of criticism of how existing infrastructure is being utilised. In particular, questions are being asked about the way such infrastructures are traditionally built, owned, and operated. In sub-Saharan Africa the criticism can only be levied at one infrastructure - a pair of optical fibre submarine communications cables known as South Atlantic 3/West Africa Submarine Cable/ South Africa Far East (SAT3/WASC/SAFE) and which originate in Europe (Portugal), run along the west coast of Africa down to Southern Africa and across – via Mauritius (and Reunion) – to the Far East.

This document focuses solely on the “Africa section” of the submarine cable; SAT3/WASC. It provides an introduction to the cable including background information on its development and operation. The document also outlines some of the key issues regarding the utilisation of SAT3/WASC, which have been documented in various publications and mass media. These issues will be discussed/exemplified using data from a recently concluded research project of the impact of the cable in four countries. The document concludes with recommendations (based on the findings of the research project) for maximising the impact of SAT3/WASC on Africa’s connectivity and competitiveness.

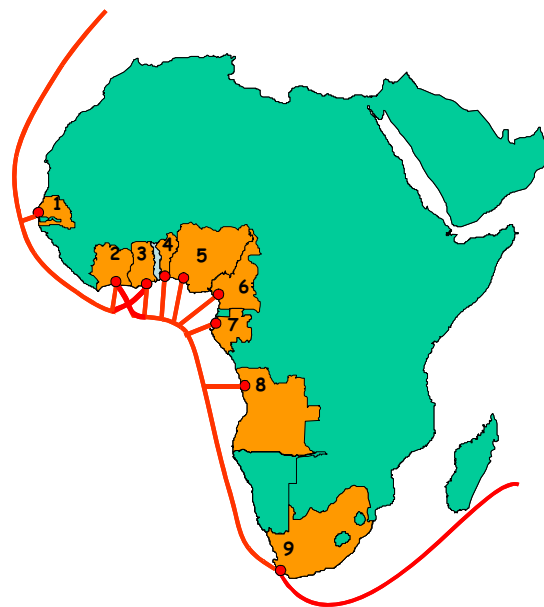
## 2. SAT3/WASC

The 3rd South Atlantic Telephone/West African Submarine Cable (SAT3/WASC) is a 14,350km undersea fibre-optic cable running along the western coast of Africa to the southern part of the Continent. When combined with the South Africa – Far East (SAFE) submarine cable; it forms part of a larger single network connecting Europe to Asia via western and southern Africa. The SAT3/WASC portion has a design capacity of 120Gbps (or approximately 6 million simultaneous telephone calls) and the SAFE portion a design capacity of 130Gbps.

SAT3/WASC starts at Sesimbra, Portugal - passes through nine African countries - and ends at Melkbosstrand, South Africa. The "Africa section" of SAT3/WASC (see Figure 1) has the following landing points<sup>4</sup>:

Figure 1: Landing points of the Africa section of SAT3/WASC

- [1] Dakar, Senegal
- [2] Abidjan, Côte d'Ivoire
- [3] Accra, Ghana
- [4] Cotonou, Benin
- [5] Lagos, Nigeria
- [6] Douala, Cameroon
- [7] Libreville, Gabon
- [8] Cacuo, Angola
- [9] Melkbosstrand, South Africa.



SAT-3/WASC was commissioned in 1999 and entered commercial service in April 2002. Information about the cable is difficult to attain and verify as the agreement governing its development, operation and management is deemed “commercially confidential”. The figures presented in this document are therefore subject to confirmation (but, where possible, information has been collated/corroborated from multiple sources). There are therefore unsurprisingly (and as illustrated by Table 2) gaps in the information available on the cable.

Reported amount invested in SAT3/WASC/SAFE differ, and has been stated to be as high as US\$650 million (Jensen 2006; Goldstein 2004). However, a shareholders’ agreement signed on 17 June 1999<sup>5</sup> cites the cost of the cable as US\$595 million. The consortium that owns the submarine cable comprises of a mix of African, American, Asian, and European (predominantly telecommunication) companies; in total 36 investors from 35 countries (NITEL 2007; Meyer 2004). How much each company invested and the complete list of who these investors are is hard to ascertain. Analysis of the 1999 shareholders’ agreement reveals that the largest investors in the cable are: TCI, a subsidiary of AT&T (12.42%), France Telecom (12.08%)<sup>6</sup>, VSNL (8.93%), and Nitel (8.39%). However other sources show different figures. Individual participants in the consortium, through their investment, own capacity (calculated in MIU-Kilometres<sup>7</sup>) on the cable; capacity allocations can therefore be used as a proxy of the level of investment that was made. Table 2 presents allocation figures for some investors.

In June 2003 the capacity of SAT-3/WASC was upgraded to 40 Gigabytes per second (Gbps) - a third of its design (maximum) capacity of 120Gbps. Yet actual usage of the cable at this time was estimated to constitute less than 3 percent of its design capacity (Goldstein 2004). Whilst unverified reports attribute savings of US\$400 million per annum to the SAT-3/WASC cable<sup>8</sup>; such utilisation figures question the efficacy of the investment that went into constructing the cable - for example South Africa and Nigeria are reported to have contributed nearly US\$85 million and US\$50 million respectively (Goldstein 2004). Demand for capacity is however very much on the increase and the recent upgrade of the cable to 120Gbps in 2007, which most African members of the consortium participated in, is beginning to raise concerns about the likelihood of capacity

on the cable running out. The question is therefore not one of whether demand for capacity exists but rather at what cost?

Table 2: Investors in SAT3/WASC/SAFE

Geographic Region	No. of investors [Meyer 2004]	Investors [Various]	Allocated[?] [Private]	% of Total
Africa:	12	Angola Telecom	805,270	3%
		Camtel	538,604	2%
		Cote d'Ivoire Telecom		
		Ghana Telecom	805,270	3%
		Maroc Telecom		
		Mauritius Telecom	805,270	3%
		Nitel	1,723,111	7%
		OPT Benin	805,270	3%
		OPT Gabon	538,604	2%
		Sonatel		
Telecom Namibia				
Telkom South Africa		4,738,603	20%	
America:	4	<sup>1</sup> TCI [AT&T Corp]		
		MCI Worldcom International	805,270	3%
		Sprint Communications Co		
		Teleglobe	1,326,103	6%
Asia:	8	China Telecom		
		Chunghwa Telecom Ltd Co		
		Communications Authority of Thailand		
		Korea Telecom		
		Reach		
		Singapore Telecommunications		
		Telekom Malaysia Berhad	2,263,603	10%
VSL	2,263,603	10%		
Europe:	12	Communications Global Network Services (BT)		
		Belgacom SA		
		Cable & Wireless Global Network	1,326,103	6%
		Cyprus Telecommunications Authority		
		Deutsche Telekom AG		
		France Telecom	2,738,603	12%
		KPN Royal Dutch Telecom		
		Marconi	183,047	1%
		Portugal Telecom		
		Swisscom Ltd.		
Telecom Italia SpA				
Telefonica de Espana				
		<sup>2</sup> Concert	1,638,602	7%
		<sup>3</sup> Global One Communications		
<b>Total[s]:</b>	<b>36</b>		<b>23,304,936</b>	

Notes:

<sup>1</sup> At that time a subsidiary of AT&T

<sup>2</sup> At the time Concert was a joint venture between BT and AT&T

<sup>3</sup> At the time Global One Communications was a joint venture between Deutsche Telekom, France Telecom and Sprint. It was acquired (in its totality) by France Telecom in Jan 2000

## 2.1. Sale of Capacity on SAT3/WASC

The sale of SAT3/WASC capacity in each country with a landing station is administered by the investment party from that country. An analysis of the 1999 shareholder's agreement states that SAT3/WASC is run by a Management Committee that makes all decisions except for those reserved for the Purchasing Committee<sup>9</sup>. The consortium also has three operational sub-Committees: Finance and Commercial; Operations and Maintenance; and Delivery and Restoration. The agreement further states that each consortium member is exclusively responsible for the operation and maintenance of its segments of the cable. Furthermore:

“Parties using the cable pay an annual charge to landing station owners [*cable station right of use – ROU*] described as being for covering operation and maintenance of the landing station. Landing station operators (described as “terminal parties”) are obliged to provide connections to the terrestrial systems in their country (something many did rather slowly). And significantly, these terms and conditions should not contradict the regulation in place in the countries concerned.” (Balancing Act 2006)

Other licensed operators are able to buy the right to use a dedicated amount of capacity through an Indefeasible Right of Use (IRU) contract. Such contracts provide exclusive and irrevocable use of the procured capacity but also place strict conditions on the buyer. For example, the capacity purchased is unreturnable and comes with an obligation to pay a proportion of the operating cost and a similar proportion of the costs of maintaining the cable (including any repair costs). Furthermore, IRU contracts do not confer the right to control or manage the cable (this is reserved for cable owners/members of the consortium) and the unit price for IRU capacity is usually higher than for the members of the consortium.

There is also the option to lease capacity from the consortium members – International Private Leased Circuit (IPLC) - for shorter terms and at higher cost than IRUs. Consortium members control the availability and prices of IRUs and leases, and capacities on offer are often limited.

These arrangements for selling capacity are not in themselves out of the ordinary and are comparable to what pertains on other cable infrastructure that are managed under a closed consortium basis. Furthermore, it should be noted that the cable was constructed and completed at the start of the financial downturn in the telecommunications and new technology markets and its financing and completion under such adverse, high-risk global conditions is commendable. Little can be done about the internal agreement between the consortium members – and as such the ‘problem’ with SAT3/WASC does not lie in the charging mechanism (terms and conditions) per se; rather the impetus for change must come from (and be in relation to) the context/environment in which these terms and conditions are being applied.

At the time of its conception, most of the African participants in SAT3/WASC were monopoly incumbents operating in pre-liberalised telecommunications markets. These incumbents were sole providers of international services – in most cases their monopolistic positions were enshrined in the legal framework of the country – and became through their participation in the SAT3/WASC monopolistic operators of the landing station. By the time of the commissioning of the cable and up to the present day, African telecom markets have been undergoing various levels/stages of liberalisation. There are now more operators and service providers in each country needing access to the capacity offered by the cable and they have been frustrated by the

monopolistic position taken by SAT3/WASC consortium members who have little incentive to increase traffic on the cable. The situation is further compounded when the drive towards regional integration – which is seen as a means of facilitating/accelerating the development of the sub-continent - is considered. As SAT3/WASC is (currently) the only international submarine fibre optic cable servicing sub-Saharan Africa, members of the consortium are not only gatekeepers of reliable (and potentially affordable) connectivity to their country but also to neighbouring coastal countries that are not connected to the cable as well as those that are landlocked.

## 2.2. The case for 'Open Access' on SAT3/WASC

Some stakeholders and commentators have argued that the key to unlocking the potential of SAT3/WASC lies in the creation of an 'Open Access' environment in countries where consortium members operate. Governments and their agencies are limited in what they can ask of the companies operating within the consortium and are rightly wary of the potentially harmful impact interference of a business contractual agreement can have on current and future prospects of investments into their respective countries. Furthermore, the 1999 agreement states that:

“No signatory can sell, transfer or dispose of any rights or obligations in relation to the fibre without the permission of the Management Committee. Furthermore (24.2) parties are bound to the terms of the agreement and these terms supersede those that any corporate entity might take to itself within their national jurisdictions.” (Balancing Act 2006)

However, signatories to the SAT3/WASC contract must also operate within the laws and regulations of the countries in which they operate. The call for Open Access presents an opportunity for governments and their agencies to influence/create opportunities for fair and low cost access to this infrastructure by establishing and maintaining an environment in which<sup>10</sup>:

- All legitimate operators (current and future) have access to capacity without undue distortion (fair competition)
- Access to facilities is unconstrained and at a fair price
- Mechanism to secure low prices to end-users are put in place
- and in the case of submarine cable infrastructure; Landlocked countries are not disadvantaged

It is the proposition of the research conducted by the Association for Progressive Communications (APC), which is documented in Section 6, that such an 'open' environment can be created in relation to SAT3/WASC by tackling/dismantling the monopolies that signatories enjoy in three areas:

- Cable infrastructure - as owners of the only submarine fibre cable in sub-Saharan Africa
- International Gateway – which ensures that consortium members are (often) the only operators that can legally bring in and take out international traffic into and out of the country
- Landing station – control of which enables consortium members to charge high access and inter-connection charges to use the facility.

This 'reinforced monopoly' enjoyed by the consortium members strengthen their position in their telecoms markets, and when coupled with weak terrestrial (national) networks constitute major impediments to the development of the telecoms and related industries.



The research reported in this paper documents and analyses the way SAT3/WASC has impacted/influenced the telecom markets of four national markets. It provides (positive and negative) lessons that can be learnt from the implementation and management of SAT3/WASC.

### 3. APC Country Case-Study Research

#### 3.1. Background

In November 2006, the Association for Progressive Communications (APC) initiated a study of the South Atlantic Telephony-3/West African Submarine Cable (SAT-3/WASC). The study was to research and document the effect ownership of SAT-3/WASC has had on the communications market of four member countries –Angola, Cameroon, Ghana, and Senegal. The study was limited in scope to the areas that “Open Access” seeks to address - namely access and cost; with particular focus on the impact of SAT-3/WASC on the competitiveness of the markets for international and Internet services in each country.

#### 3.2. Methodology

A case study approach was adopted for this study; this was felt to be an appropriate approach in examining the issues relating to SAT3/WASC within the context in which they occur<sup>11</sup>. The approach therefore facilitated an understanding of the unique factors and/or circumstances prevailing in each country that influenced access to, and cost of SAT3/WASC capacity.

The study was conducted by a team of researchers that were largely resident in each of the countries under investigation – at least two researchers worked on each country study. Key activities during the research comprised of the analysis of documents and reports; collation of pre-defined performance indicators using a standardised template specifically developed for the research; and the conduct of a series of face-to-face interviews with a cross-section of relevant stakeholder groups including telecom operators - fixed, mobile, ISPs - government representatives, regulators, and civil society<sup>12</sup>.

Specific areas covered by the case studies are as follows:

- Description of the country’s telecom market. This included a brief description of the SAT3/WASC consortium member, and changes in the country’s telecom environment (regulation, number of players etc.) prior to and after the commissioning of SAT3/WASC.
- Performance indicators assessing the level of success/failure of the country’s utilisation of SAT3/WASC. This included capacity utilisation, cost of services, subscription and usage figures etc. Where relevant, these indicators were compared with alternative infrastructure (i.e. satellite).
- Analysis of access. This included documenting (where data was available) who has access to the cable and how this (access) is decided. The case studies also focused on identifying barriers to access that exist in each country including regulatory (licensing), legal, financial (in terms of cost of access), political etc.
- Overview of the state of the national backhaul infrastructure. This analysis was conducted as a proxy for assessing ‘external’ limitations to the performance of the SAT-3/WASC cable by measuring the ability of the country to utilise the cable irrespective of the barriers placed by the consortium member.

## 4. Findings

This section synthesises information contained in the individual country study reports<sup>13</sup> and highlights some of the issues and trends that are common to all countries. The findings reported in this paper relate only to the performance of the telecommunication sector of each case country – particular emphasis is placed on cost of bandwidth since the commissioning of SAT3/WASC and on the impact increases in the availability of bandwidth has had on the price of international calls and Internet services<sup>14</sup>.

### 4.1. Performance of Telecom Markets

All of the countries studied have experienced increases in international bandwidth capacity; they have also experienced decreases in the cost of international bandwidth both on SAT3/WASC and from its ‘alternative’ – satellite (see Table 3). The cost of Internet access to consumers has also decreased over time (although this historical data is not presented in Table 3) this has also been the case regarding the cost of international calls.

#### Bandwidth Capacity and Utilisation

At the commissioning of SAT3/WASC Angola Telecom was allocated a total capacity of 805,270 MIU\*km<sup>15</sup> and an assigned capacity of 62,675 MIU\*km. The operator has since used up its original allocation and was at the time of this research in the process of upgrading its capacity. Likewise Cameroon Telecom (Camtel), whose success in marketing SAT3/WASC has been very limited<sup>16</sup>, has nonetheless increased its allocation on the cable. In December 2006, Camtel bought additional MIU\*km to stock up its capacity by about 30% and in March 2007 stated that it was using 60% of its allocated capacity. In Cameroon, Camtel is by far the biggest user of SAT-3/WASC capacity (this is also the case in all the other countries studied that the SAT3/WASC signatory is the largest user of its capacity). Camtel is estimated to use approximately 50% of Cameroon’s allocated capacity on SAT3/WASC, which corresponds to more than 80% of all used capacity. The bulk of the remaining capacity is used by only a handful of large companies that are connected directly to the cable<sup>17</sup>.

Of the countries studied, Senegal has witness the greatest increased in bandwidth. This has increased from 42 Mbits, in May 2002 (the year in which SAT3/WASC was commissioned) to 1.24 Gbits in five years - 2007. Between the launch of SAT3/WASC and November 2004 bandwidth in Senegal was upgraded on more than 11 occasions. Furthermore, Senegal’s bandwidth capacity is available (through Sonatel) to neighbouring countries including Gambia, Guinea Bissau, Mali, and Mauritania.

With respect to capacity utilisation, the one exception in the case studies was Ghana. The SAT3/WASC cable provides Ghana with a total allocated capacity of 805,270 MIU\*km and an assigned capacity of 66,875 MIU\*km. This research estimated the country’s utilization to be about 10-15% of the cable’s capacity into the country<sup>18</sup>. Sources interviewed during the course of this research however projected that utilisation would increase to 25-38% by 2011.

Table 3: Performance Overview of Telecom Markets

	ANGOLA		CAMEROON		GHANA		SENEGAL		
Name of Operator	Angola Telecom		Cameroon Telecom		Ghana Telecom		Société Nationale des Télécommunications		
Fixed line monopoly?	No		Yes		No		Yes		
International gateway monopoly	Yes		No		No		Yes		
SAT3 only submarine cable?	Yes		Yes		Yes		No		
Amount invested (US\$mil)	24		20		24		24		
Percentage shareholding	4%		3%		4%		4%		
Capacity allocated (MIU*Km)	805,270		'confidential'		805,270		na		
International bandwidth [Mbps]	na as at 2002		9 as at 2002		4 as at 2002		60 as at 2002		
	na as at 2006		310 as at 2006		40 as at 2006		1024 as at 2006		
Year sale of SAT3 capacity	2002		2002/2005		2002		2002		
Cost of access - SAT3 [E1/month US\$]	25,000.00 as at 2003		up to 22400.00 as at 2003		12,000.00 as at 2003		na as at 2003		
	14,400.00 as at 2006		4,400.00 as at 2006		up to 12,000.00 as at 2006		7,468.00 as at 2006		
Cost of Satellite [1Mb/month US\$]	na as at 2003		9,000.00 as at 2003		15,000.00 as at 2001		na as at 2003		
	up to 12,000 as at 2006		3,700.00 as at 2006		5,500.00 as at 2006		na as at 2006		
Operator's Dial-up Charges [US\$]	Corporate Residential		Corporate Residential		Corporate Residential		Corporate Residential		
- monthly	82.97 11.52		308.41 79.44		na na		17.76 17.76		Connection
	33.69 4.68				na na		11.96 11.96		Subscription
Operator's ADSL Charges [US\$]	ADSL ADSL Plus		ADSL ADSL PRO		B4U B4U		Royalty-Line Royalty-ISP		Download speed
- monthly	136.49 142.99		560.75 560.75		155.55				256
	166.58 203.16		934.58		274.81		47.83 34.24		512
			1,308.41		321.47 181.48		246.57 214.43		1024
							300.13 223.61		2048

NOTES:

<sup>1</sup> Fixed line operators are however government owned entities

<sup>2</sup> Calculations based on cost of US\$650 million

<sup>3</sup> Price is per mbps per month duplex to Portugal

<sup>4</sup> Price some organisations have been able to negotiate per month for an E1 link (2Mb/s full duplex). Advertised price by Camtel in 2003 was US\$12,500 (reduced to US\$7,500 since 2006)

<sup>5</sup> Price of E1 per month to Europe and America for GISPA (Ghana ISP Association) members. Price to non-GISPA is \$8000/month and to non-ISPs is \$12000/month

<sup>6</sup> Comprised of approximately US\$1,402 settlement fee and US\$6,066 monthly cost for 2048Kbps line

<sup>7</sup> Average Satellite Price (1 Mbit) – duplex. Not fully comparable with SAT3 due to different service characteristics

<sup>8</sup> Monthly estimates based on annual contract. Actual full costs to users will be substantially more once phone line costs are included.

<sup>9</sup> Corporate: Refers to RNIS product (Internet via ISDN). Made up of 50,000FCFA expense account; 15,500FCFA modem hire and 100,000 router hire.

<sup>9</sup> Residential: Refers to RTC product (internet via switched telephone network with throughput of 56kbps). Made up of 25,000FCFA expense account and 17,500FCFA for 50 hours usage. 500FCFA for each additional hour.

<sup>10</sup> Prices quoted are highest of two options - product termed "Kz". Price includes installation. 1 Angolan Kwanza = 0.01337 USD

<sup>11</sup> 535FCFA = 1USD conversion rate. Includes one time installation fee of 100,000FCFA. The low-end 128/64 package is the most commonly used one. The top three packages (256/128; 512/256; 1024/512) are virtually exclusively used by the corporate sector

<sup>12</sup> Ghana Telecom's Broadband4U prices (B4U). Includes US\$93 installation fee for all products (1USD = 9,639.83GHC). All options listed are for dynamic Ips (rather than static). 1024/256Kbps option listed under Residential is for Schools only

<sup>13</sup> Price includes a one-off installation price of 11,500 FCFA (\$US 22) for ADSL 512, and 103,000 FCFA (\$US 193) for ADSL 1024 and 2048

## Cost of International Bandwidth (Wholesale)

The cost of international bandwidth has also reduced although not to levels anticipated by the market (given the potential of SAT3/WASC). In the years immediately following the commissioning of the cable, the costs of SAT3/WASC bandwidth was often the same as or more expensive than satellite bandwidth.

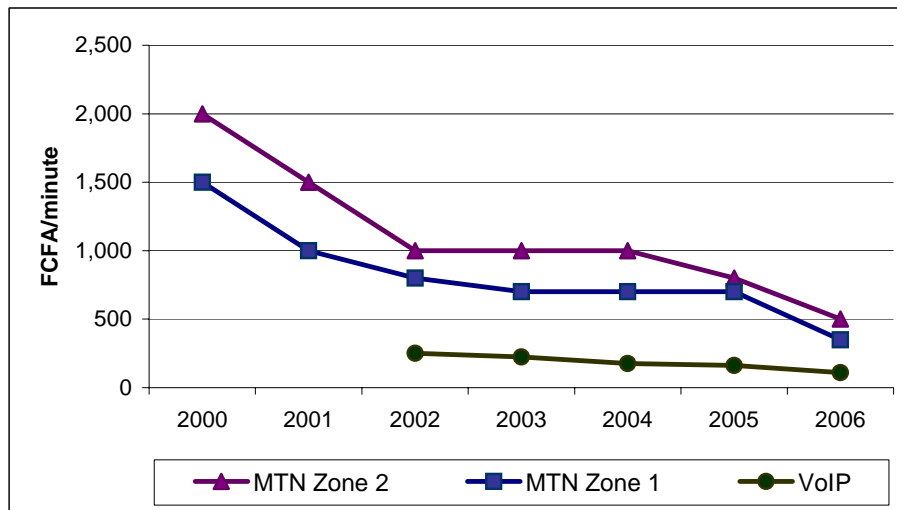
In Angola, the incumbent's (Angola Telecom) monopoly on the international gateway and the resulting lack of competition meant that there was little to no incentive to reduce international bandwidth prices. Unsurprisingly, Angola Telecom kept the prices for SAT3/WASC bandwidth high and downward reviews of prices recorded by the research are thought to be predominantly as a result of political rather than market pressure. Since SAT3/WASC came into service, Angola Telecom has reduced the cost of wholesale bandwidth on the cable only twice, once in June 2005 and again in October 2006. The initial price for SAT3/WASC bandwidth was recorded as being approximately US\$20,000 per mbps per month duplex to Portugal. The first reduction of 20% took it down to around US\$16,000 and the subsequent reduction of 10% down to US\$14,400. International satellite prices have also come down in two stages (and at the same time as that of SAT3/WASC) with a first reduction of 10% followed by a further reduction of 5%. Satellite prices vary between US \$4,000-5,000 duplex but still appear to be cheaper than fibre in most instances.

Ghana Telecom (GT) implements a differential pricing mechanism with respect to SAT3/WASC capacity. The price a prospective buyer pays differs according to whether they hold an Internet Service Provider (ISP) license and whether or not they are members of the Ghana ISP Association (GISPA). At the time of the research, registered members of GISPA paid US\$4,010 for an E1 connection whilst non-GISPA ISPs were charged US\$8 000 for the same capacity. The costs were even higher for buyers that were not ISPs, they paid US\$12 000 for the same E1 connection (which incidentally is the price GT used to charge all wholesale buyers when SAT3/WASC was first commissioned). Our research was unable to ascertain the cost basis/criteria behind the pricing differences and therefore assume that it has been largely in response to successful lobbying on the part of GISPA. The research also found that the average price for an 'equivalent' satellite connection (of 1 Mbit duplex) in Ghana during 2007 was approximately US\$5,500; this represents a significant reduction from the amount that would have been paid in 2001, which is estimated to have been approximately US\$15,000.

Research findings on Cameroon exhibit a distinct/clear correlation between increased availability and reductions in the price of wholesale bandwidth on SAT3/WASC and the cost of satellite bandwidth (see Figure 2). Prior to the commissioning of SAT3/WASC and despite competition between various providers in the Very Small Aperture Terminal (VSAT) sector in Cameroon, prices for bandwidth via satellite remained high at around US\$11,500 per month for a 1Mb/s downlink and 512Kb/s uplink. In 2003, Camtel began to advertise E1 links (2Mb/s full duplex) for US\$12,500. VSAT providers reacted to this by reducing their prices by approximately 35% to around US\$7,475<sup>19</sup>. Once Camtel connected its first wholesale SAT3/WASC customers, the price for dedicated VSAT bandwidth fell further. Camtel responded to this (in 2006) by reducing its price for an E1 by more than 40%. Furthermore, some ISPs in Cameroon have increased their bargaining power through organic growth and mergers and acquisitions, and have been able to achieve discounts of up to 40% on Camtel's 'list price'. Some of these companies were paying as 'little' as US\$4,400 per month for an E1 link. The VSAT

providers, in response, were at the time of the research offering 1Mb/s downlink for as little as US\$2,000.

Figure 2: Price of wholesale bandwidth, SAT3/WASC vs. VSAT, 2000 – 2006



Source: Interviews with major ISPs with access to SAT-3 bandwidth.

Note: Fibre and VSAT bandwidth prices are not fully comparable due to different service characteristics.

Unfortunately, the research was unable to provide a comparative analysis on wholesale pricing of bandwidth for Senegal; this is particularly ‘unfortunate’ as Senegal was also identified as the country with the most improvement in bandwidth availability/capacity. Data for both fibre and satellite wholesale bandwidth prices were difficult to obtain and/or verify with the operator Sonatel. The following extract from the case study report highlights the extent of the problem faced during the data collection process:

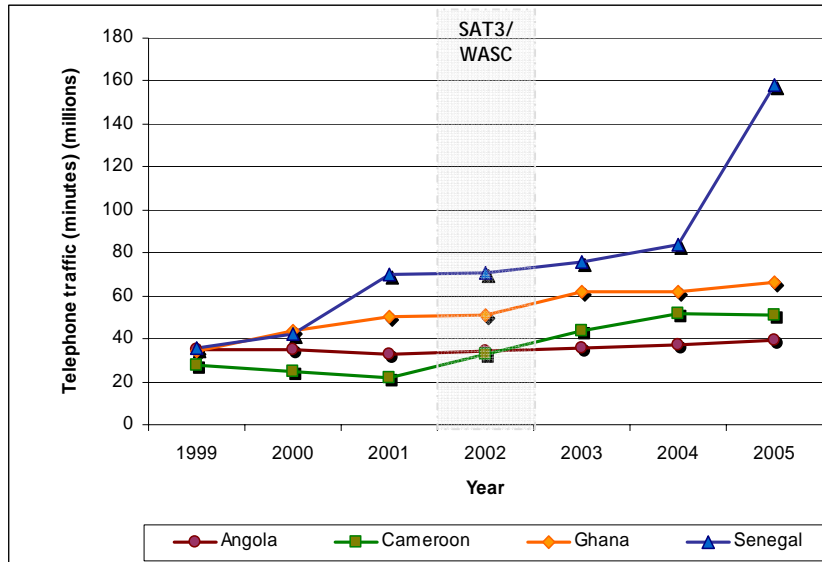
“Contrary to our thinking that data and information would be readily available especially from large corporations such as Sonatel and that certain historic data may exist on its websites. This was not the case. Attempts at scheduling interviews and discussions with several officials proved abortive and when contact was made either via emails or phones, responses did not return when anticipated. It took over two months to meet the first Sonatel official for an interview. Most of the questions posed during the interview especially those related to earnings, expenses and SAT-3 related figures were not answered. Our email requests on the price trends and subscriptions to internet and telephone since 1999 were not met.” (Senegal Case Study Report)

### Cost of International Calls for Consumers (Retail)

The extent to which decreases in the cost of international calls and increases in international call and data traffic can be directly attributed to SAT3/WASC is contestable. The markets for international and Internet services in each of the countries have at the same time as the commissioning of SAT3/WASC, also experienced increases in the number of (legal and grey market) operators providing services and the competition resulting from this has had a positive impact on reducing prices. This in turn may have had some impact on international outgoing traffic from these countries. Figure 3 shows the trend in international outgoing fixed telephone traffic in the countries

studied. It highlights an increasing trend in the number of minutes of international calls that were being made by the population of the country on the fixed network. Whilst all the other countries appear to have witnessed gradual increases in traffic since the commissioning of SAT3/WASC; Senegal registered a dramatic increase post-2004, which was investigated further by the research.

Figure 3: International Outgoing Fixed Telephone Traffic



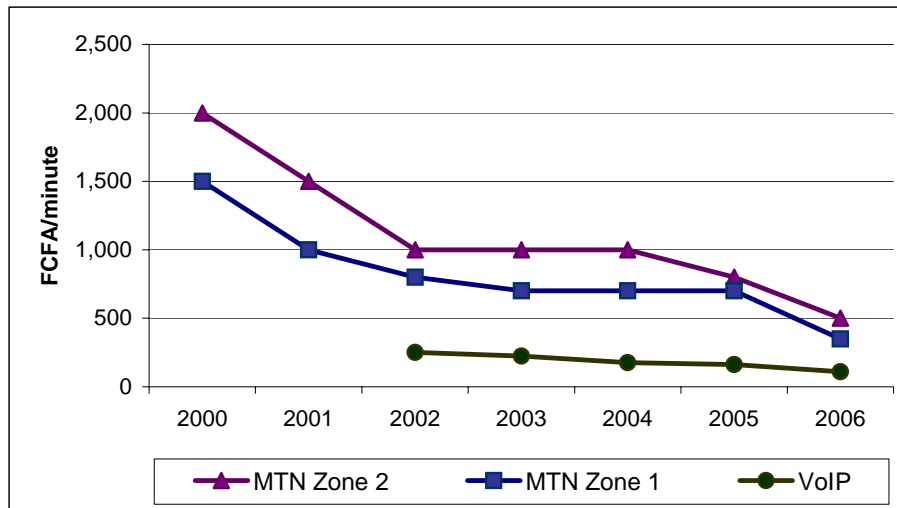
Source: ITU (2007) World Telecommunications Indicators Database

Note: 2004 data not available for Ghana so prior year's figure (62 million) is used.

In Senegal, prior to 2002, tariffs to international destinations were between US\$0.74 and US\$1.3 per minute depending on the destinations. This fell considerably during the period 2002 and 2006. In May 2006 a single tariff for international calls was introduced and categorisation of calling times into peak and off-peak was abolished. This tariff restructuring coincides with the peak in traffic shown in Figure 3 and is considered to be a stimulus for increases in outgoing international traffic. It is a conclusion of this research that SAT3/WASC, by making international bandwidth available, and the development and use of Voice over IP (made possible due to increased availability of higher quality bandwidth) have been key factors in lowering tariffs on international communications.

A similar downward trend in the price of international communications was reported in Cameroon (see Figure 4). Here the observed impact of SAT3/WASC on international tariffs is twofold. Firstly, the commissioning of the cable coincided with a temporary halt in the downward trend of international call tariffs. International tariffs had halved between 2000 and 2002 but remained virtually flat in the following three years to 2004/2005. It is possible that Camtel, facing a dwindling or (at best) stagnant customer base countered falling revenues by raising tariffs or at least keeping them constant. It was able to do this due to the higher quality of international connections that became available using SAT3/WASC capacity, compared to satellite. Renewed downward pressure on international tariffs only came in 2005 when the mobile operators gained access to Camtel's SAT3/WASC bandwidth.

Figure 4: International Call Rates in Cameroon



Source: MTN and various VoIP service providers in Cameroon.

Note 1: MTN Zone 1 = France and USA, Zone 2 = Rest of world.

Note 2: In 2006 MTN introduced a special rate of FCFA200 per minute to other MTN networks in Africa.

Secondly, SAT3/WASC enabled the large scale introduction of VoIP services in concert with the introduction of wireless broadband services. Prior to this, the use of VoIP in Cameroon was very limited due to the insufficient quality of dial-up and satellite links used for connectivity by ISPs and cybercafes. In 2002, international VoIP calls to most destinations were offered for around US\$0.71 per minute, which was about a quarter of the price for conventional calls on the fixed and mobile networks to the most popular destinations. VoIP rates have declined steadily to as low as US\$0.28 per minute in 2006 (including Camtel's own calling card service), at which time calls on both fixed and mobile networks cost between US\$0.85 and US\$1.13 to the most popular destinations.

In Angola, international rates in 1998 were reported to be around US\$2.96 a minute. By 2003 Angola Telecom international calling rates had fallen to between US\$1.10-\$2.50 a minute, and by the first quarter of 2007 these rates were around US90 cents a minute for more popular calling destinations. International calls are even cheaper via Angola's thriving grey market which operates through the country's cyber-cafes or using "leaky" PABXs. International calls to main destinations through this channel are between US\$0.25 to US\$0.31 a minute.

The cost of international calls in Ghana have also witness a similar decline – although a historical account was not collated for this case country – in 2001, a call to the US cost US\$1.50 per minute; this had reduced to approximately US\$0.50 per minute by 2006.

### Cost of Internet Services for Consumers (Retail)

Decreases in the cost of Internet services since the commissioning of SAT3/WASC was observed in all the case countries studied. In addition, increase in the adoption of wireless and broadband connections to the Internet was also observed by the research. These observed decreases in cost and uptake of broadband products have not been at 'anticipated' levels particularly in light of the high quality and speed of bandwidth SAT3/WASC provides.



The research found that a significant proportion of the Angolan market has gone over to either wireless or DSL broadband connections; but that prices do not appear to have come down. This is despite reductions in the wholesale price of both national and international bandwidth. Angola Telecom currently offers two tariff plans for its ADSL service, ADSL and ADSL Plus, which vary according to contention ratios and download limits. The ADSL service costs US\$99 for a 256k download speed and US\$149 for a 512K download speed. The equivalent on ADSL Plus costs US\$150 and US\$250 respectively.

By way of comparison, Angola Telecom's cable TV subsidiary TV Cabo offers three broadband tariffs: Residential, Professional and Mega; with prices that vary between US\$100 and US\$320 per month. Prices offered for mobile data services by Angola Telecom's mobile operator, Movitel vary depending on whether the subscriber is a pre or post-paid customer. Three download speeds are offered: 150K (costing US\$112/month), 300K (US\$173/month) and 1 megabyte (US\$254/month); the latter is currently only available in the capital Luanda.

Price decreases were also recorded for dial-up, wireless and ADSL products in Cameroon. Camnet launched ADSL at the end of 2005 with speeds ranging from 128/64 to 1024/512 kb/s. The low-end 128/64 package is the most popular product and at the time of the research cost US\$92 per month. High-speed packages were found to be virtually exclusively used by the corporate sector. Camtel's ADSL products attract a one-time installation fee which of US\$187 and the modem is rented, i.e. remained the property of the service provider. Tariffs for dial-up packages have also reduced over time. These have decreased twice: Once in 2002, the year SAT3/WASC was commissioned, and again in 2006 after SAT3/WASC bandwidth had become available on the wholesale market. However, the relevance of dial-up as an Internet access method is now decreasing quickly as wireless options and ADSL are increasingly becoming available.

In Ghana Internet dial-up costs in 2006 ranged from US\$25 to US\$35 per month. The average installation cost for broadband was US\$120 with monthly subscription fees of approximately US\$65 per month. The research however found that broadband prices varied across operators and were difficult to compare. Ghana Telecom's Broadband4U charges were found to be the lowest in the country. Monthly charges for Broadband4U products vary from US\$66 for a residential customer with download/upload speeds of 256/64 kbps, to US\$290 for business customers with speeds of 1024/256 kbps. All Broadband4U products attract an additional (one-time) installation fee of US\$99.

In Senegal, Sonatel has offered a number of tariff reductions over the years especially with its ADSL service offering. In May 2006, price discounts of 30% by Sonatel and 20% of Sentel Internet (Senegal's second mobile operator) on ADSL products delivering speeds of 1024 and 2048kbps have been credited with significantly raising the subscription rate of ADSL subscribers in the country.

The ability to connect to SAT3/WASC via Senegal's Sonatel has also had an impact on Internet access costs in neighbouring Mali. Ikatel, Mali's second mobile operator (and a subsidiary of Sonatel) launched its ADSL services in September 2006. ADSL 128Kbps costs US\$43 per month – this is comparison with Sonatel's US\$38 per month ADSL 512 Kbps (twice as much capacity) that can be obtained in Senegal.

Although a wider range of broadband speeds are available in Senegal and costs/prices of bandwidth and Internet access are comparatively lower than other case studies countries (and sub-Sahara Africa countries in general), the performance of Sonatel in utilising its SAT3/WASC capacity is still criticised in Senegal. Respondents to our

research noted that after 4 to 5 years of Sonatel's ADSL services in Senegal, the price of connectivity could and should be more affordable and the number of subscribers higher.

## 5. Discussion of Findings

The section above (Section 4) has outlined some of the key findings relating to the ownership structure of the telecom markets of the countries studied by this research and has provided examples of the performance of these markets since the commissioning of SAT3/WASC. The findings show that whilst cost and prices have in general decreased, such reductions have not been commiserate with the expectation/potential offered by SAT3/WASC. This expectation/potential is the focus of this section, which discusses how increasing access to SAT3/WASC bandwidth, reductions in cost of access and prices to consumers has/can improve international connectivity in the case countries. This section also identifies barriers to improving connectivity.

### 5.1. Increase in Bandwidth Capacity and Reduction in Cost of Access

The amount of bandwidth capacity available in each of the case countries were found to have increased over time and each signatory was found to have upgraded its capacity on the cable. Furthermore, such increases in capacity have been accompanied by decreases in cost of access. For example, in 2003 the advertised monthly cost in Cameroon (by Camtel) for an E1 link (2Mb/s full duplex) was US\$12,500; by 2006 some organisations had been able to negotiate this cost to US\$ 4,400 per month. It is anticipated that reductions in the cost of access to SAT3/WASC capacity will lead/trickle-down to decreases in the price of broadband products to consumers.

Table 4: International Internet Bandwidth (Mbps)

	1999	2000	2001	2002	2003	2004	2005	2006	CAGR-pre	CAGR-post
<b>Case Study Countries</b>										
Angola	11	11	2.0	7.0	7.0	7.0	68.0	110	59.19%	93.73%
Senegal	4.1	36.0	48.0	79.0	310.0	465.0	775.0	1240.0	110.03%	73.44%
<b>SAT3/ WASC/ SAFE Signatories</b>										
Benin	0.1	2.0	2.0	2.1	47.0	47.0	45.0	47.0	100.48%	86.20%
Cape Verde	0.5	10	2.0	3.0	8.0	10.0	14.0	24.0	55.74%	51.57%
Gabon	0.5	0.5	0.5	8.0	45.0	155.0	200.0	200.0	99.01%	90.37%
Mauritius	6.1	6.0	10.0	34.0	63.0	710	153.0	112.0	53.46%	41.37%
<b>&gt; 100 Mb sub-Saharan Africa Countries</b>										
Kenya	2.5	10.5	26.0	26.0	26.0	34.0	113.4	758.6	79.58%	96.34%
Burkina Faso	10	10	2.0	8.0	12.0	64.0	72.0	215.0	68.18%	93.14%
Uganda	0.8	17	5.1	7.7	10.0	60.5	60.5	113.0	77.83%	76.80%
Mali	3.0	3.0	3.0	6.0	6.0	11.0	26.0	310.0	18.92%	120.11%
Zambia	0.3	2.1	2.1	5.1	12.0	22.0	22.0	128.0	110.66%	90.37%
Togo	10	10	6.0	12.0	14.3	14.3	14.3	100.1	86.12%	52.84%

Source: ITU World Telecommunication/ICT Indicators 2007 Database

It should however be noted that increases in international bandwidth has risen over time in other sub-Saharan countries that are not signatories to SAT3/WASC. Table 4 below presents international bandwidth statistics from the ITU 2007 database on telecom and ICT indicators. Only SAT3/WASC/SAFE signatory countries with complete data sets for the years indicated are presented in the table (these are the three years prior to the commissioning of the cable and four years after it became operational).

The table also presents the compounded average growth rate (CAGR) in international bandwidth for the periods pre- and post- the commissioning of the cable.

Two comments can be made based on the data presented in the table above. First, the rate at which SAT3/WASC countries have been able to utilise the capacity they have access to differ. This may be due to a variety of factors including the state of the national terrestrial backhaul infrastructure (as exemplified by Angola), inefficient marketing of bandwidth (as shown by Cameroon), affordability and demand etc. The ITU quotes Senegal's capacity as 1240Mbps in 2006, significantly more than any other SAT3/WASC signatory for which data was available. It should also be noted (from CAGR figures) that Senegal has been consistently increasing its bandwidth in the periods prior to and post SAT3/WASC. Other signatory countries on the other hand record significant sudden increases in bandwidth as a result of connectivity to the cable.

Second there are countries that are not signatories to SAT3/WASC that irrespectively have been able to significantly improve the international bandwidth available to their population and even to levels much higher than what pertains in signatory countries – specifically Kenya and Uganda. The role SAT3/WASC can play on the continent is however highlighted by Burkina Faso, Mali, and Togo. Both Mali and Burkina Faso are connected to SAT3/WASC via Senegal whilst Togo is connected via Benin. These three countries have since then been able to significantly increase their international bandwidth capacity. A fibre-optic cable network linking Niger, Burkina Faso and Benin is also planned/being built which would provide Niger with access to SAT3/WASC.

## 5.2. Exertion of Barriers in Supplying Access to Cable Capacity

Whilst the research found evidence of reductions in cost of access, there was little evidence to show that the process of gaining access to SAT3/WASC capacity through the consortium member was becoming easier. Suspicions are raised in the case of Cameroon where Camtel – the consortium member - is by far the biggest user of SAT-3 capacity in the country, using 50% of the allocated capacity which corresponds to more than 80% of all used capacity.

Various reasons can be proffered for this; firstly the smallest unit of bandwidth sold by SAT3/WASC is a full E1 and the prices at which this is offered is unaffordable for a wide variety of service providers. Second, the poor state of national terrestrial backbones limits the areas where access to the cable is available. Again, using Cameroon as an example, at the time SAT3/WASC was commissioned in 2002, Camtel's national backhaul infrastructure was insufficient to effectively distribute fibre bandwidth beyond Douala where the landing station is located.

A similar situation pertains in Angola where at the commencement of SAT3/WASC's operation there was no fibre within the capital Luanda where a large part of international bandwidth demand is to be found. At the time of this research, nearly five years after the opening of the SAT3 landing station, the only piece of operational fibre in the Angolan national backbone plan is a route from the southernmost city in the country, Namibe to Lubango and onwards towards the Namibian border. When providing price information for services in Angola it is therefore often necessary to make the distinction between prices obtainable in the capital, Luanda and locations outside the capital. This is because communications between most locations within Angola occurs via microwave links or via satellite – these are additional costs to the price paid for bandwidth.

Thirdly, consortium members have been accused of using delayed tactics in connecting service providers they consider to be competitors. For example in Cameroon

ISPs were initially seen more as competitors than wholesale customers or partners; and even when they were able to get connected to the cable some found that they were not given the capacity they requested and had to embark on further negotiations and pressure with Camtel to have their application for access completed as agreed.

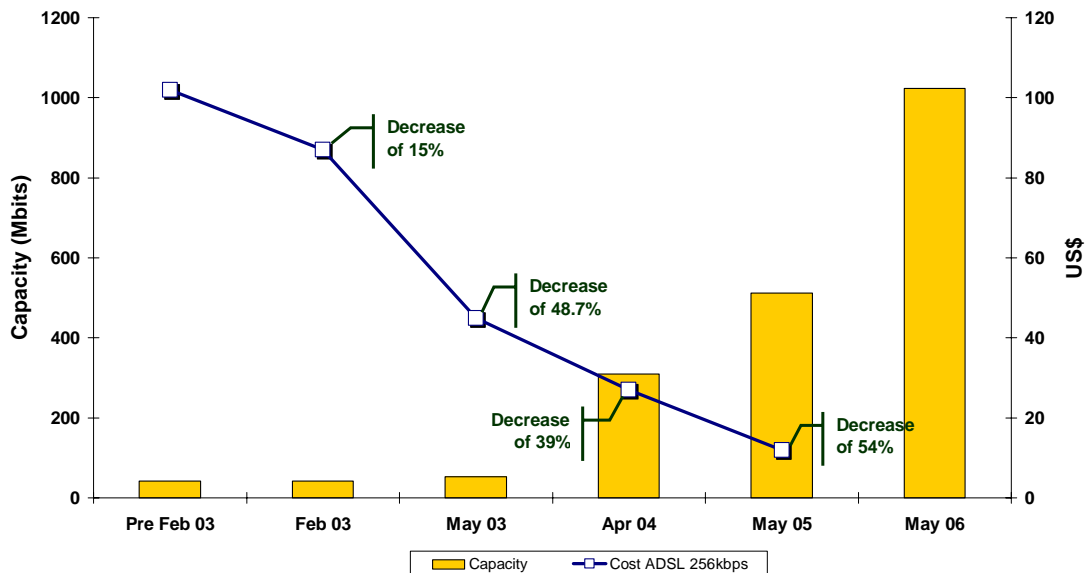
### 5.3. Increase in the Quality and Range of Products

The research also found increases in the quality and range of products offered in the market. Where fibre was available, it was often adopted by service providers – and at times at the expense of competing sources of bandwidth (i.e. satellite). The introduction of wholesale bandwidth on SAT3/WASC in the countries studied herald significant increases in the competitiveness of the telecoms market and decreases in international tariffs and cost of Internet access. In some cases (Cameroon especially) the downward trend in international tariffs also helped to push down national and local tariffs. However, some countries have had more success in the adoption of broadband products than others and availability/delivery of such products is limited by the geographic spread of the national terrestrial network – and is therefore often restricted to key urban areas/cities.

### 5.4. Decrease in the Prices of Products

Data from Senegal illustrates the recurring relationship observed by the research between increases in available bandwidth capacity and the price of products. Figure 5 presents an example of this relationship using a specific broadband product (ADSL 256) offered by the consortium member in Senegal – Sonatel. It shows that increases in capacity were accompanied by decreases in the price of the product - to the extent that the product has been ‘discontinued’ and replaced by a higher speed/quality offering ADSL 512kbps.

Figure 5: Relationship between Capacity Upgrade and Cost of ADSL (256kbps)



The decrease in prices is welcomed by consumers and is generating (in some circumstances) fierce competition at this level of the market. For example, despite its monopoly position in Cameroon, Camtel’s (through its ownership of SAT3/WASC) has helped to drive down the retail price of Internet services. Wireless Internet services only became available in Cameroon in 2002, the year SAT3/WASC arrived in Cameroon.

Using the example of 64Kb/s product<sup>20</sup>, the research found that the retail price for 64Kb/s shared wireless bandwidth has always remained below the comparable VSAT wholesale price. Shared bandwidth wireless Internet access was introduced (in 2002) at a retail price that was far below the wholesale price for comparable VSAT bandwidth.

This triggered a steep price decline for the VSAT product – which in turn caused the price for the shared wireless product to decline much faster in percentage terms than the price for dedicated wireless bandwidth. The price for shared VSAT wholesale bandwidth at the time of the research appeared to have stabilized, maintaining a price of around US\$374 per month since 2004, while the comparable wireless retail product continued its price decline to reach US\$84 per month in 2006 – a mere 20% of the VSAT price. The retail price for 64Kb/s dedicated wireless bandwidth was also found to be only 30% above that of the shared bandwidth VSAT product. The wireless bandwidth however offers up to ten times the bandwidth of the VSAT product and is more superior in terms of quality and reliability.

However, this is not all good news for consumers; such decreases in price may be masking non-competitive behaviour by the consortium member in the country. Such concerns are raised in light of the fact that the cheapest provider of “last-mile”, end-consumer level products and services is also often the consortium member (or its subsidiary). On occasion – as is the case in Ghana - what the consortium member charges is considerably cheaper than prices of the next alternative service provider.

In conclusion, two forms of competition can be seen emerging in the case study countries as a result of SAT3/WASC. In the “access market”, the research found some level of competition from VSAT operators. However, where available, resellers of bandwidth would migrate to using fibre bandwidth rather than satellite. The research also found evidence of competition in the “products market” specifically in the form of VoIP and buoyant ‘grey market’ in international services was reported in all countries studied.

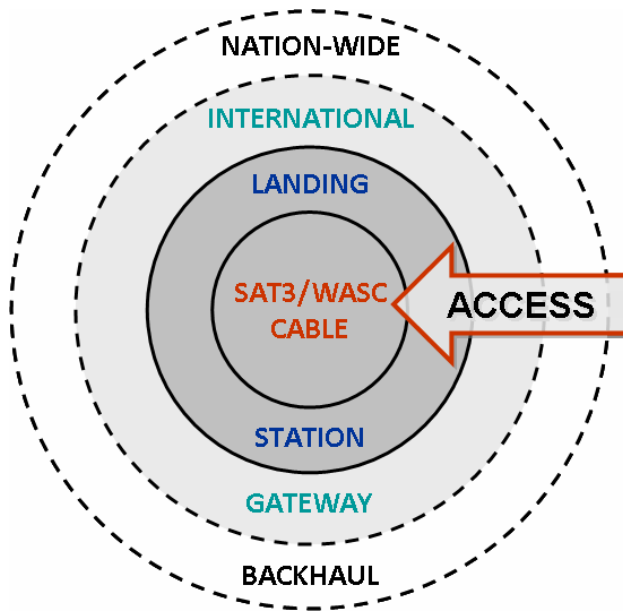
## 6. Implications and Recommendations

This research set out to study the effect SAT-3/WASC has had on the communications market of four member countries –Angola, Cameroon, Ghana, and Senegal. The study was limited in scope to the areas that “Open Access” seeks to address - namely access and cost; with particular focus on the impact of SAT-3/WASC on the competitiveness of the markets for international and Internet services in each country. The research found evidence of increased competition in these markets and largely positive effects of the cable in terms of bandwidth capacity in the countries studied. However, the research judged that the countries studied were not (to varying extents) making the most of the potential provided by having access to a high-speed, high-capacity infrastructure such as the submarine fibre-optic cable.

A key impediment to realising this potential identified by the research is the “reinforced monopolies” that are enjoyed by the SAT3/WASC signatories in the case countries studied. This is illustrated in the diagram below (Figure 6), which represents the varying levels of monopolistic barriers that exist in most SAT3/WASC countries and which by their very nature inhibit access. The diagram portrays monopoly of the SAT3/WASC landing station, international gateway licenses, and the ownership and extent of the national backhaul network as concentric circles around the SAT3/WASC cable itself and which those wishing to “access” the bandwidth provided by cable directly must navigate through.

These circles are represented using solid and broken lines. Solid lines represent pure monopolies; for example as at the time of this research SAT3/WASC was for the majority of countries the only submarine fibre-optic cable providing connectivity in sub-Saharan Africa. In such countries it is therefore a monopoly international fibre infrastructure. It is also the case that in the majority (if not all) of the signatory countries, access to the SAT3/WASC landing station is restricted to only the signatory operator. The research did not find any evidence of co-location at the landing station in any of the countries studied; this therefore constitute another monopoly situation.

Figure 6: Concentric circles of monopolistic barriers



Even though the ITU World Telecommunication Regulatory Database indicates that the market for International Gateways in many sub-Saharan countries is open to full competition, this is rarely the case. This research and similar studies on international connectivity on the continent show that incumbent operators (which in the case also refer to SAT3/WASC signatories) are often the legal sole providers of international connectivity in their countries – as exemplified in this study by Senegal and Angola. Although as indicated in this study ‘grey markets’ of international connectivity also exist in many countries. The “international gateway” circle is therefore represented by a broken line. This is also the case for the “nation-wide backhaul” network. On the one hand, the lack of an extensive national backhaul severely limits the utilisation of the international cable and the ability of the various regions of the country as well as neighbouring countries to access its capacity equitably – Angola and Senegal provide two very different examples respectively. Angola is still in the process of rebuilding its terrestrial network after years of civil war whilst Senegal is supplying bandwidth to its neighbours. On the other hand, sole ownership of the terrestrial network by the incumbent operator can lead to uncompetitive practices. A comprehensive terrestrial network is an expensive infrastructure to replicate and in the absence of strong regulation can constitute a de-facto monopoly within an apparently liberalised market.

The multiplicity of roles that the SAT3/WASC signatory plays when it has sole ownership of the landing station, dominates the international gateway market (or is the legal sole provider of international connectivity in the country), and also owns the

national terrestrial backhaul network unsurprisingly results in severe conflicts of interests. Examples of such conflicts were uncovered by this research with respect to competition. Its findings show that competition is limited in the “access market”. With monopoly over the undersea cable, landing station and international gateway; the SAT3/WASC signatory dictates the bandwidth capacity of country, the cost of bandwidth to other operators, and can also influence (by granting, denying, or delaying access) the activities of operators in the market (who are also often its competitors). The SAT3/WASC signatory was also found to influence competition in the “products market”. This is because, as the market leader in international and Internet services the signatory has a significant impact on the price of products in market.

Any intervention therefore by governments and/or relevant regulatory authorities in opening up access to SAT3/WASC must therefore be directed at these ‘concentric circles’ representing the signatory’s influence in the telecom markets of each of the countries. Such multidimensional measures must take all spheres of influence into consideration to be effective – for example providing access to SAT3/WASC landing stations without also addressing international gateway provision and/or the state of and equitable access to the terrestrial national backhaul network is unlikely to have a significant impact on the way in which SAT3/WASC is utilised for the country’s benefit.

With respect to the monopoly position of SAT3/WASC in the sub-Saharan region this paper recommends measures that will ultimately result in the deployment of competing submarine infrastructure. At least three new fibre optic submarine cables along the west coast of Africa are at different stages of completion and proposal<sup>21</sup>. It is anticipated that competition, in the form of another cable would promote the adoption of more market oriented approach to the marketing of capacity on SAT3/WASC.

With respect to the SAT3/WASC landing station this paper echoes the call made by other studies to promote competition by allowing other authorised operators (i.e. those that are able to carry international traffic into and out of the country) access to this facility and co-locating their equipment at such sites. As discussed in this paper, the copy of the 1999 SAT3/WASC/SAFE Shareholders Agreement that has been analysed by interest groups states that capacity on the cable can only be sold via the consortium member in each country with a landing station. Whether this is the case could not be ascertained by this research, however, opening up access to the landing stations would increase the ease with which other consortium members could sell their capacity directly to interested operators in member countries and is likely to initiate/facilitate business negotiations/decisions (and perhaps competition) between members and also between interested non-member operators and the consortium.

Although most SAT3/WASC member countries legally permit competition in the international gateway market, liberalisation of this market segment has to be actualised and the establishment of a competitive environment is required. This research in documenting the existence and in some cases buoyancy of ‘grey markets’ in the provision of international and Internet services, has highlighted the importance of VoIP in the countries studied. This is an area whose legality needs to be addressed by the regulatory authorities and governments so as to better capitalise on the potential it presents in increasing access to the population.

This research also highlighted the increasing deployment and adoption of wireless products and services. In combination with an extensive deployment of national terrestrial backhaul network from the landing point of SAT3/WASC, wireless technologies – largely provided by a myriad of operators - are likely to play a key role in providing ‘last mile’ connectivity to high-speed Internet access. Facilitating the

development and operation of such technologies and service providers/operators is therefore also key to realising the potential of SAT3/WASC and appropriate measures should be taken to create an environment in which new technologies can be adopted and that service providers are able to obtain a fair price for bandwidth in order to satisfy the demands of their customers/consumers. This paper therefore calls for studies on the appropriate costing of SAT3/WASC bandwidth in each member country and based on this, the implementation of appropriate mechanisms to 'regulate' prices.

Lastly, with respect to nationwide terrestrial (fibre) backbone infrastructure, the research found that these were generally underdeveloped with disparities in nationwide connectivity in that urban areas were significantly better connected than rural areas. Weak terrestrial infrastructure was seen to have an implications on the cost of access to backbone networks on the one hand (particularly when multiple networks are required in achieving nationwide coverage and the cost of interconnection has to be factored in), and on cost of bandwidth and demand on the other. In response, this paper calls for an increased prioritisation of terrestrial infrastructure development with national/rural access receiving as much promotion as regional connectivity.

## 7. References

- "Computing and Online Knowledge" *Higher Education in Sub-Saharan Africa* [website], <http://www.arp.harvard.edu/AfricaHigherEducation/index.html>. Accessed 04 Dec. 2007
- Axiom (2005). *EASSy Detailed Feasibility Study*: Final Report
- Dhliwayo, J. (2005). "Developing a Fibre Optic Backbone for Africa". In *Open Access for Africa: Challenges, Recommendations and Examples* S. Danofsky. New York, United Nations ICT Task Force Working Group on the Enabling Environment.
- van Dijk, M. (2005). *The Deepening Divide: Inequality in the Information Society*. California, Sage Publications, Inc.
- Fong, R. K. T. (2004). "Global submarine cable systems - sustainable growth or stagnation." In *International Engineering Management Conference 2004. Proceedings*. 2004 IEEE International 2: 803-806.
- Goldstein, H. (2004). "Surf Africa [telecommunications and Internet infrastructure]." *Spectrum, IEEE* 41(2): 48-54.
- Hamilton, P. and Telegeography (2004). *Identifying key regulatory and policy issues to ensure open access to regional backbone infrastructure initiatives in Africa*, Report submitted to Global ICT Policy Division (CITPO), World Bank.
- Haqqani, A. B. (2005). *The role of information and communication technologies in global development: analyses and policy recommendations*. US: New York, United Nations.
- Jensen, M. (2006). "Open Access: lowering the costs of international bandwidth in Africa" *APC Issue Papers Series* 2006.
- Krugman, P. (1994). "Competitiveness: a dangerous obsession." *Foreign Affairs* 73(2): 28-44.
- Lynch, G. (2005). "The new bandwidth barons: buying binge shifts global fiber assets from American to foreign ownership". *America's Network*.
- Malecki, E. J. (2004). "Fibre tracks: explaining investment in fibre optic backbones." *Entrepreneurship & Regional Development* 16(1): 21-39.



- Meyer, J. (2001). *SAT-3/WASC/SAFE - Public/Private Global Partnership*, Telkom South Africa.
- Porter, M. E. and V. E. Millar (1985). "How information gives you competitive advantage." *Harvard Business Review* 63(4): 149-160.
- Sen, A. (1999). *Development as Freedom*. Oxford, Oxford University Press.
- Shorb, P. and J. Tourgee (2002). Responses to the two follow-up questions directed to Paul Shorb by Admiral Watkins' letter of August 28, 2002., United States Commission on Ocean Policy: 1-5.
- Spintrack, A. (2005). *Open Access Models: Options for Improving the Backbone Access in Developing Countries (with a Focus on Sub-Saharan Africa)*, World Bank, Information for Development Program (infoDev).
- Telegeography (2001). *International Bandwidth 2001*. Washington DC, Telegeography, Inc

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- <sup>1</sup> The term "freedom" refers to the ability to live the life one values and has cause to value. It takes into account the ability to attain basic needs and indicators of quality of life well as the resources and/or income that a person is able to command. (Sen 1999)
- <sup>2</sup> Competitiveness is defined as the possession of an advantage over other participants in a venture/field/area that is able to improve/increase the performance of the owner.
- <sup>3</sup> See Krugman, Paul (1994) "Competitiveness: A Dangerous Obsession" *Foreign Affairs* 73 (2) pp. 28-44 for critique of this opinion.
- <sup>4</sup> The diagram (Figure 3) only shows landing points on the African continent and therefore excludes Sesimbra, Portugal.
- <sup>5</sup> See *Fibre for Africa* story: "SAT3 Consortium Contract Emerges" for summary and analysis of this agreement. Available online at <http://fibreforafrica.net/main.shtml?x=5039398&als%5BMYALIAS6%5D=SAT3%20consortium%20contract%20emerges&als%5Bselect%5D=4887798>
- <sup>6</sup> France Telecom is reported to have invested US\$96 million in SAT3/WASC/SAFE; incorporating the needs of subsidiaries: Sonatel in Senegal, Côte d'Ivoire Telecom and Mauritius Telecom.
- <sup>7</sup> BalancingAct's (2006) analysis of the 1999 shareholder's agreement states that capacity was calculated in a distance-related measure; it therefore lays the basis for charging using "distance-related tariffs".
- <sup>8</sup> This refers to the savings operators that are members of the cable consortium enjoy by not routing their international traffic through US and European satellites (Dhliwayo 2005)
- <sup>9</sup> The Purchasing Committee is "a sub-committee of MOU signatories that oversaw the building of the system and was given powers to run the capital project of building the system." (BalancingAct 2006)
- <sup>10</sup> As defined in Spintrack AB. (2005) *Open Access Models: Options for Improving the Backbone Access in Developing Countries (with a Focus on Sub-Saharan Africa)*. World Bank, Information for Development Program (infoDev)
- <sup>11</sup> See Eisenhardt, Kathleen M. (2002) "Building Theories from Case Study Research" in Huberman, Michael. and Miles, Matthew B. *The Qualitative Researcher's Companion*. Sage Publications Inc
- <sup>12</sup> For reasons of confidentiality the names of interviewees has not been published in this document.
- <sup>13</sup> Country case study reports will be made available on the Association for Progressive Communications webpage.
- <sup>14</sup> Other findings of the case studies can be found in the document A Primer on the South Atlantic 3/West Africa Submarine Cable, which can be found on the APC website.

## NOTES

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- <sup>15</sup> Capacity is allocated to the consortium members in MIU kilometers – MIU\*km - (where MIU stands for Minimum Investment Units), which includes a distance component. When a consortium member wants to implement a link to another member country, a defined number of MIU\*km is deducted from its balance. Additional capacity can be obtained on demand by consortium members out of a pool of spare capacity from other members.
- <sup>16</sup> To date only a small number of retail customers are buying SAT-3 bandwidth from Camtel, the first wholesale customers gained access to the facility only in 2005.
- <sup>17</sup> These include MTN (GSM mobile operator), Orange (GSM mobile operator), Sonel (the national power utility), Pecten (a Cameroon-based oil company), Schlumberger (diversified technology company), and SITIA (Societe Internationale de Telecommunications Aeronautiques).
- <sup>18</sup> There is an inland fibre connection to the SAT-3 landing point in Ghana with three nodes in the greater Accra area: Cantonments Node has 63 E1s, Accra-North Node has 42 E1s and one 34 Mbps tributary, and High Street (Cable Station) Node has 126 E1s.
- <sup>19</sup> Note that Camtel's US\$12,500 for SAT3/WASC bandwidth compares favourably to VSAT prices, considering that it provides twice the downlink bandwidth and four times the uplink bandwidth and is a better quality product with higher reliability and lower latency than satellite.
- <sup>20</sup> Most customers are still subscribing to lower-cost services with more dial-up-like speeds of 64Kb/s or 128Kb/s, since current pricing of real broadband packages is out of reach for the majority of customers.
- <sup>21</sup> These include the submarine cable being laid by Nigeria's second national operator Globacom (Glo-1); South Africa's proposed Infraco cable; Maroc Telecom's West Africa cable etc.