The Case for "Open Access" Communications Infrastructure in Africa: The SAT-3/WASC cable

Ghana case study

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1 Overview of report

The main objective of this report is to document the effect the submarine fibre optic cable known as the South Atlantic 3/West Africa Submarine Cable (SAT-3/WASC) has had on communications in Ghana, as well as the opportunities that have been missed and the reasons behind these. The report is one of four similar documents commissioned by the Association for Progressive Communications (APC) in November 2006 - the three other countries researched being Angola, Cameroon and Senegal. A briefing that synthesizes the results of the four studies is available for download from APC's website (www.apc.org).

The report focuses solely on the 'Africa section' of the submarine cable - i.e. South Atlantic 3/West Africa Submarine Cable. (The cable also includes a South African-Far East connection (SAFE). In its entirety, its rather cumbersome acronym is SAT-3/WASC/SAFE.) It offers a brief overview of the history of telecommunications sector in Ghana, as well as the history of SAT-3/WASC. It looks at issues such as subscription, usage and capacity utilization, costs and tariffs, traffic usage, and how these impact on the sector. The report also looks at the environment for access to the SAT-3/WASC cable in terms of regulation and licensing. The final section addresses issues surrounding national backhaul infrastructure.

The methodology used for the country research was a combination of desk research, reviewing existing documents from the Ministry of Communications and the regulator (NCA), and interviews with key stakeholders in the telecommunications industry in Ghana. Amongst others, the incumbent Ghana Telecom, Internet Service Providers (ISPs) and mobile service providers were interviewed by our team. The interviews were conducted by Eric M.K Osiakwan and Charles Amega-Selorm in March and April 2007.

2 Background

2.1 Brief country profile

Ghana covers a total area of 239,460 sq km and is bordered by Cote d'Ivoire, Togo, Burkina Faso and the Atlantic Ocean. In 1957, it became the first sub-Saharan country to gain independence. A series of coups resulted in the suspension of the country's Constitution and a ban on political parties in 1981. By 1992, multi-party activities were restored as a result of the approval of a new Constitution. This paved the way for elections in 1992 and 1996, which were both won by the National Democratic Congress (NDC) led by Former President J.J. Rawlings. President John Kufuor won the 2000 elections on a New Patriotic Party (NPP) ticket by defeating the then vice-president John Evans Atta Mills. He was re-elected in 2004 and has remained president since.

Figure 1: Ghana

Ghana is rich in natural resources. According to Doing Business in Ghana, a country commercial guide for US companies, the Ghanaian economy has shown steady growth for the past four years, driven by the industry and service sectors. Its Gross Domestic Product (GDP) per capita was US$2600 in 2006, double that of the poorest countries in the sub-region.

The economy grew by 4.5% in 2002, 5.2% in 2003, and 5.8% in 2004 and 2005. In 2006, the economy grew by 6.2%, slightly above the 6% target. Headline

inflation declined to 10.5% at the end of October 2006 from 14.8% at the end of December 2005. The cedi depreciated by 9.5% against the pound and 7.8% against the euro in the same year, while a moderate depreciation of 0.9% was recorded against the US dollar.

The mainstay of the economy is the agricultural sector, contributing 35.8% to GDP in 2006. The industrial sector comprises 25.7% of GDP and its contribution to the 6.2% GDP growth in 2006 was 1.8.%. As a share of GDP, the service sector increased from 29.9% in 2005 to 30.1% in 2006. This growth is largely driven by increased government expenditure in the provision of services and increased competition in the finance and insurance sub-sectors. The latter was in part due to the Bank of Ghana – the central bank – implementing sound monetary policies that controlled inflation, and also reducing official reserve requirements for banks. This led to an increase in the number of new banks and new financial products. The manufacturing sector grew by 4.2 % in 2006, showing a slowdown from the 5% growth in 2005. Road and infrastructural development in the country has led to higher output in construction, registering growth of 8.2 % in 2006.

Continued economic growth is, however, threatened by serious challenges in the energy sector, including rising crude oil prices globally and low electric power generation. Industry has been asked to cut its energy use by 30-60% due to power shortages.

Despite its relative economic strength, Ghana still remains heavily dependent on international donors for financial and technical assistance. The country opted for debt relief under the Heavily Indebted Poor Countries (HIPC) programme in 2002, and was included in a G-8 debt relief programme decided upon at the Gleneagles Summit in July 2005. Priorities under its current US$38-million Poverty Reduction and Growth Facility (PRGF) include tighter monetary and fiscal policies, accelerated privatization, and improvement of social services. Ghana has also been allocated US$500-million from the Millennium Challenge Corporation (MCC) that could assist in transforming the country's agricultural export sector.

2.2 Overview of Ghana's telecommunications market

Ghana's telecommunications sector began major reform in November 1974, when National Redemption Council Decree No. 311 declared the Post and Telecommunication Department a public corporation. The department was

placed under the authority of the Ministry of Transport and Communications in the same year. In 2007, the Ministry of Communications was still responsible for formulating telecom-related policy and for the control of Ghana's telecommunications sector.

Since 1974 many developments have taken place in the sector. Between 1994 and 2004, Ghana moved from having a government-controlled Post, Telegraph and Telephone (PTT) agency, which had a virtual monopoly over a very inadequate telecommunications infrastructure, to an environment where Internet Service Providers (ISPs) and mobile operators actively challenged the incumbent operator, Ghana Post and Telecommunication Corporation.

The Accelerated Development Programme (ADP, 1994-2000), which was part of the structural adjustment programme of the WorldBank, established the National Communications Authority (NCA, www.nca.org.gh) to regulate the communications industry, by passing the National Communications Act 524 in 1996. The ADP also called for the separation of post from telecom services and their conversion into limited liability companies. This resulted in the formation of Ghana Post and Ghana Telecom. Ghana Telecom (www.ghanatelecom.com.gh) became a partially privatised corporation in 1996 when GCOM (a consortium lead by Telecom Malaysia) purchased a 30% stake in the company.

In addition to the shareholding, GCOM was given a management contract, which required it to roll out 500,000 high-quality lines. This was not achieved and the management contract was abrogated when it expired in February 2002. In place of Telekom Malaysia, the government entered into a management contract with Telenor of Norway during the early part of 2003. But Telenor's contract was later also abrogated for lack of performance, and a local management team was put in place.

After a protracted dispute, which went to the International Court of Justice in the Hague, the Ghanaian government and that of Malaysia agreed to an amicable settlement for the former to buy back shares in Ghana Telecom in 2006. The government reportedly paid about US$55-million for the 30%, which had been bought by Telkom Malaysia and its other partners in GCOM for $38-million in 1997. The move restored the entire 100% stake in Ghana Telecom back to the government. Ghana Telecom has since been fully owned by the government, but is due for re-privitisation.

Westel Telecommunications, the Second National Operator (SNO), was licensed to operate in 1997, but commenced actual operations in 1999. Due to Ghana Telecom's dominance and anti-competitive practices, coupled with Westel's inability to compete favourably, the incumbent has continued to be the predominant telecommunications provider in Ghana. In 2007, Westel could only boast of about 3,000 subscribers in the Accra metropolis.

According to the World Bank, the telecom sector contributed 5.3% to GDP in 2004, up from 1.8% in 2000. Teledensity grew from about 2.5% in 2001 to about 27.8% in the last quarter of 2006. Table 1 shows the subscriber base of the various voice telephony operators for the third and last quarters of 2006.

Organisation	Type of Service			As at 30th September, 2006	As at 31st December, 2006
	Fixed	Mobile			
Ghana Telecom Company	✓		Subscriber base	351,557	357,577
			No. of Pay Phones	11,364	11,364
WESTEL	✓		Subscriber base	2,798	2,798
			No. of Pay Phones	165	165
SCANCOM LTD. (Areeba)		✓	Subscriber base	2,398,521	2,585,467
MOBITEL(tiGo)		✓	Subscriber base	1,234,150	1,546,721
KASAPA		✓	Subscriber base	172,810	200,104
GT-Onetouch		✓	Subscriber base	774,885	877,106

Table 1: Subscriber base of voice telephony operators
Source: NCA, http://www.nca.org.gh

As Table 2 shows, mobile telephony subscription grew to about 5.2-million and the number of fixed-line subscribers grew to about 360,000 in 2006.

	1999	2000	2001	2002	2003	2004	2005	2006*
Fixed Lines	153	206	249	270	288	313	334	360
Mobile	38	86	222	383	775	1,189	2,990	5,209
Total	191	292	471	653	1,063	1,502	3,324	5,569

Table 2: Subscription in thousands (voice telephony)
* Values are up to the last quarter of 2006
Source: NCA and Ministry of Communications

Access to the Internet has increased considerably and costs are three times lower than 2001. Internet user numbers rose from 20,000 to about 1.5-million, with about 12,000 broadband subscriptions.

A number of companies provide Integrated Services Digital Network (ISDN), High bit-rate Digital Subscriber Lines (HDSL) or IDSN Digital Subscriber Lines (IDSL) to their corporate customers, but for most private end-users dial-up services and, recently, broadband services, have been available. InternetGhana was the first company to introduced Asymmetric Digital Subscriber Line (ADSL). Presently, companies such as Africa Online Ghana, Engineering Systems and Services, Zipnet, BusyInternet and Ghana Telecom, among others, are also offering ADSL.

ADSL is the main broadband technology (apart from wireless) with Ghana Telecom as the leading provider. Its broadband service (Broadband4U) was launched in 2004 and is limited to 10 telephone exchanges in Accra.[2] The use of wireless (WiMax) is also gaining credence, again with InternetGhana as a pioneer. Companies such as KNET, an ISP, Intercom Data Networks (IDN), Network Computer Systems (NCS), Ecoband, Africanus, iBurstGhana, and AccelonGhana are also providing wireless broadband services in the country.

Subscription levels, however, appear to be relatively low. The subscription base of three companies providing ADSL services surveyed stood at 4,700 in the third quarter of 2006, while three companies providing wireless

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[2] Cantonments, Accra North, Accra Central, Tema A, Tema B, Dansoman, Achimota, Madina, Baatsonaa, Teshie-Nungua, Weija, Gbawe.

broadband – Internet Ghana, BusyInternet and AfricaOnline – have 220 subscribers.[3]

2.3 History of the SAT-3/WASC cable in Ghana

Jointly funded by its 36 consortium members and spearheaded by Telkom South Africa (SA), which invested US$85-million for a 13% stake, the SAT-3/WASC submarine cable project cost about US$650-million dollars. The ownership of the cable was established based on a confidential shareholder agreement. The shareholders appointed Telkom SA, which has the largest amount of traffic, as the managing operator of the cable, taking charge of its day-to-day performance and maintenance.

The consortium members had a monopoly on selling access to the fibre in their country of operation until April 2007. As a result, in Ghana, the only way operators outside the consortium can have access to the cable is to buy from the national carrier, Ghana Telecom. Moreover, a pre-requisite for direct access is having a licence to carry international traffic.[4]

The other way to access SAT-3/WASC is by buying directly from the consortium pool and bypassing the national carrier. This can be done through evoking an Indefeasible Right of Use (IRU) from the cable's network administrator (Telkom SA). This can only happen if the consortium members build more capacity than they can actually use. The monopoly operators cannot charge more than the pool price, which is set by the consortium members. This is to protect buyers from over pricing. The national carrier, however, has first right of refusal of the direct sale.

Dickson Oduro-Nyaning, then General Manager of the International Department and now acting CEO of Ghana Telecom, was instrumental in ensuring Ghana participated in the SAT-3/WASC cable. With support from his colleagues, they convinced the board to have a landing station in Ghana. A Mr. Enchill, who was in charge of circuit provisioning at Ghana Telecom, represented the company on the Procurement Group, which was one of the

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[3] Most of the ISPs declined to respond to the request for data on subscription, cost and revenue.

[4] See: http://www.foundation-partnership.org/pubs/bandwidth/index.php?chap=chap4#

sub-committees of the SAT-3/WASC management committee. Ghana was made chairman of the Finance and Commercial Sub-committee and Awuah Boateng, who was then Chief Financial Officer (CFO), represented the company.

Richard Gyawu became responsible for SAT-3/WASC when Enchill was transferred. Gyawu's vision is to expand the capacity consumption of Ghana and to ensure there is a good distribution system to the entire country.[5] The strategy is to build inland fibre to most of the economic centres that will act as distribution points for SAT-3/WASC.

Being the only international fibre cable available has put the consortium in a relatively unassailable position.[6] Sentech, the South Africa state-owned broadcasting signal distributor, argued in parliament in 2005 that Telkom SA's monopoly over the cable was limiting its ability to provide affordable, high-speed internet access to consumers. It said that SAT-3/WASC was a strategic national asset that was funded by taxpayers money and should be available to all the players. At the time the cable was initiated, Telkom SA enjoyed a statutory monopoly and was majority-owned by the state.

In Nigeria, the SNO Globalcom did not succeed in getting direct access to SAT-3/WASC after pursuing their interest in court. In response, Mike Adenuga, the chairman of Globalcom, embarked on building a competing cable called Glo1. Plans are far advanced for this to happen with landing points in most of the SAT-3/WASC countries, as well as those not represented in the SAT-3/WASC consortium. The Glo1 fibre also has inland fibre into some of the countries to connect commercial centres.[7]

Westel was not a threat to Ghana Telecom when it came to SAT-3/WASC because of its under-performance – largely due to obstacles placed in its path by the incumbent, such as frustrating access to its networks. The main reason for this tactic was that Ghana Telecom and the then minority shareholder Telkom Malaysia needed exclusivity in the long distance voice-telephony market to maintain its profitability. This exclusivity period ended in 2002. By

[5] Interview with Ghana Telecom
[6] Source: http://www.mybroadband.co.za/nephp/?m=show&id=192
[7] Daily Graphic, Friday, March 16, 2007

the time Ghana Telecom started operating the SAT-3/WASC fibre in 2002, Westel did not have the funds to even consider having direct access to the cable.[8]

After signing a memorandum of understanding in June 1996, it took consortium members three more years to generate any funding interest and a sufficient market for the SAT-3/WASC project to take off. Ghana Telecom invested US$24-million into the project; whether or not it has been able to recoup this investment over the five-year exclusivity period is yet to be established.

Debates on the SAT-3/WASC cable have centered on the issue of access. Landlocked African countries that want to connect to the cable need to use landing points in countries whose incumbents are members of the consortium of owners. African operators who have tried to purchase the SAT-3/WASC fibre capacity directly from one of the consortium's international members have found themselves being charged as much to reach a SAT-3/WASC landing point as they were charged to get from the landing station to Portugal. These high costs have made it cheaper to send the traffic directly by satellite, even for SAT-3/WASC shareholders such as Telecom Namibia, which has no landing point of its own. Many analysts think the situation is unacceptable, especially in Africa, where there are not many cable alternatives.

In Ghana the emphasis has been on how operators can have access to the cable without limitations, such as technical and bureaucractic limitations imposed by Ghana Telecom. Pricing has also been an issue, but Ghana's ISP Association GISPA has been able to negotiate price reductions. Burkina Faso and Togo can have access to the SAT-3/WASC cable from Ghana upon completion of the country's planned nation-wide terrestrial fibre backbone network. However, given that these are Francophone countries, it is

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[8] Already the NCA had slapped it with a sum of US$25-million in penalties for its inability to perform as a national fixed-line operator. Kinz Telecom subsequently offered to pay US$95.15-million for a 66.67% stake in Westel and to pay off the company's debt of US$38.5-million. The company has said it will invest an amount of US$500-million in Westel over a five-year period.

anticipated that they will seek connection to SAT-3/WASC through Cote d'Ivoire instead.

2.4 The impact of SAT-3/WASC in Ghana

The SAT-3/WASC cable provides Ghana with a total allocated capacity of 805,270 MIU km, and an assigned capacity of 66,875 MIU km for international connectivity. There is an inland fibre connection to the SAT-3/WASC landing point in Ghana, with three nodes in the greater Accra area: Cantonments Node has 63 E1s (A bi-directional full duplex 2M/s) link, Accra-North node has 42 E1s and one 34Mb/s tributary, and High Street (cable station) Node has 126 E1s.

Apart from the SAT-3/WASC cable, Ghana Telecom also has a satellite earth station at Nkuntunese. This station currently carries about 15-20% of Ghana Telecom's international traffic. The SAT-3/WASC cable and satellite systems are used to provide International Private Leased Circuit (IPLC)[9] with speeds ranging from 64Kb/s to 155Mb/s. Ghana Telecom's network comprises microwave, intercity fibre[10] and fibre operated by Volta Communications (Voltacom) owned by the Volta River Authority (VRA). These networks are accessed through copper cables, HDSL, licensed and unlicensed wireless, Code Division Multiple Access (CDMA) and Fixed Cellular Terminals (FCT).[11]

It was recently estimated that Ghana's utilization of SAT-3/WASC is about 10-15% (6 STM1s[12] of the cable's capacity into the country). At least one source in Ghana Telecom projects 15 STM1s by 2011.

The existence of the SAT-3/WASC cable in Ghana has brought about some price improvements in international connectivity. However, the potential of the cable to turn things around cannot be said to have been fully realised due to the relatively high price that is still being charged - especially compared to India and other countries where Business Process Outsourcing (BPO) is

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[9] See: http://searchnetworking.techtarget.com/sDefinition/0,,sid7_gci827417,00.html
[10] The Accra-Tema intercity fibre network diagram is in the last section
[11] Interview with Ghana Telecom
[12] Synchronous Transport Module.   See: http://en.wikipedia.org/wiki/STM-1

flourishing. GISPA members pay US$4,010 to access an E1 from Ghana Telecom, but it is still quite expensive for non-GISPA members, who pay US$8,000 for a full circuit to the US and Europe. Non-ISPs pay US$12,000 for a full circuit to Europe and the US, which is the same price that was paid by all categories of buyers for the product approximately five years ago.

The SAT-3/WASC cable has some correlation with the cyber-café boom, which has now slowed down in the city of Accra. The largest group of Internet users of bandwidth is the commercial sector, partly because of the large number of Internet cafés, which amount to around 1,200 in the whole of Ghana (about 700 are found in Accra). The regulation of Internet services is minimal and ISPs have few licence restrictions for starting operations. The cost of Internet access at these cyber-café averages a little below US$1/hr.

The best-known public access facility is BusyInternet, a 'mega' telecentre[13] modelled after the Easyeverything chain in Europe and the US. BusyInternet has 100 workstations. However, it goes further than simply providing Internet access and combines the cyber-café idea with an incubating environment for small businesses, and leisure add-on services such a wireless hotspot, restaurant and movie centre. BusyInternet has direct access to SAT-3/WASC through inland fibre. Like a number of ISPs in Ghana, it combines this access with (Very Small Aperture Terminal) VSAT connectivity to boost bandwidth.

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[13] Telecentre means a community centre equipped with technical facilities and services, such as computers, Internet and e-mail facilities, photocopiers, fax machines, printers, TV and video machines, video conference media, decoders, scanners and much more, depending on the needs of the community.

3 Performance indicators – successes and failures

3.1 Subscription, usage and capacity utilisation

The country's telecom sub-sector has seen a lot of improvements as a result of a very competitive and flourishing mobile industry. It has been the main contributor to teledensity with about a 25% penetration rate by the end of December 2006, when overall teledensity was 27.2%. While growth in mobile telephony almost doubled each year since 2002, the case is not the same for landlines. By 2003, mobile phones became affordable and the cost of buying SIM cards went down considerably. Some mobile companies at one point sold SIM cards at a cost of about $60. This, together with reasons such as the inefficiencies of the two national providers who had licences to provide fixed lines, led to the stunted fixed-line growth.

Internet user growth has been hampered due to inadequate infrastructure and high cost of bandwidth. Statistics show that there were about 45,000 Internet subscribers in Ghana in March 2007. As of September 2006, there were about 401,300[14] Internet users, representing about 1.8% of the population. Most of these users are accounted for by academic, government and corporate bodies. It is, however, important to note that the 'ownership' and 'usage' elements are not correlated. In some cases people use the Internet in their offices and many go to cyber-cafés to get online.[15] BusyInternet, which is the largest privately owned Internet café in Ghana, has about a thousand people passing through the centre everyday, with half of them being regular users.[16] International Telecommunication Union (ITU) statistics show that in 2003, dial-up subscriptions stood at about 20,100. Broadband subscription figures from three leading ISPs are shown in Table 3.

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[14] Source: http://www.internetworldstats.com/africa.htm
[15] Source: Internet Research internal analysis
[16] Interview with Estelle Akofio-Sowah, MD of BusyInternet

Company	Broadband subscription (31 March, 2006)
Ghana Telecom (BB4U)	2,700
AfricaOnline	150
Internet Ghana	600
Total	3,450

Table 3: Broadband subscription
Source: www.nca.org.gh

Most ISPs are members of GISPA and, as a result, are able to buy access at a better price from SAT-3/WASC. Some GISPA members also purchase capacity from VSAT operators, which they use for redundancy. ISPs who are not members of GISPA must either buy capacity on SAT-3/WASC at a higher rate of US$8,000, or rely exclusively on VSAT for international bandwidth.

There are concerns about the lack of redundancy with respect to international cable connectivity, since the SAT-3/WASC cable is the only undersea cable system that Ghana has access to. As mentioned, satellite communication is used as an alternate mode of connectivity, but is not found to be appropriate for the IT Enabled Services (ITES) and BPO sector, due to cost.

The estimation that the country's utilization of the SAT-3/WASC is about 10-15% of the cable's capacity[17] means that there is still a lot of capacity on the cable, which can be used to solve the problem of demand for Internet bandwidth in the country, but with lower cost. It might be that the low utilization figures are a result of the non-competitive way it which capacity has been and/or is being priced. While access to the cable for GISPA members has been made easier, it is still quiet expensive for ISPs who are not members to pay the US$8,000 for a full circuit to the US and Europe, and for non-ISPs to pay US$12,000 for the same access. This is negatively affecting government's effort to attract ITES–BPO into the country.

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[17] According to Ghana Telecom

3.2 Cost and tariffs

In general, dial-up and broadband access is three times cheaper than it was in 2001, and the cost of international services have been lowered. Table 4 summarizes the cost of Internet and international services in Ghana.

		2006	2001
I	Local call cost	US$0.054	US$0.21
II	Call to US cost	US$0.5	US$1.5
III	Internet access cost	Dial-up US$25-35 per month/ US$100-120 per year Broadband: Average Installation fee: US$120 plus Subscription fee of US$65 per month	X 3
IV	Average cost of 20 hours of Internet use (cyber-café)	US$20	US$60
V	Price of full circuit (to US/UK) SAT-3/WASC	Non-GISPA - US$8,000 Non-ISP - US$12,000 GISPA members - US$4,010	US$12, 000
VI	Average satellite price (1 Mb/s) – duplex	US$5,500	US$15,000

Table 4: Internet and international services
Source: Ministry of Communications http://www.nca.org.gh

As the table suggests, SAT-3/WASC costs a GISPA-registered ISP $4,010 per E1. Its satellite equivalent costs US$5,500. The average cost of 20 hours of Internet use is US$20 (down from US$60, which used to be the case some six years back).

Varying tariffs are charged by the operators for consumer broadband access. The following tables show the pricing levels of some of the ISPs in Ghana.

	SPEED(Kb/s)		PRICE(US$)[18]	
	Download	**Upload**	**Installation**	**Monthly**
Residential	256	64	99	66
School	1,024	256	99	93
Business	512	128	99	192
Business Plus	1,024	256	99	241
Business SOHO	512	128	99	241
Business Plus Pro	1,024	256	99	290

Table 5: Broadband4U monthly charges (2006)
Source: http://www.broadband4u.com.gh/4u_residential/residential.html

In general, Ghana Telecom Broadband4U charges are the lowest in the country. Comparing these charges with those of InternetGhana, the premier broadband provider, shows that Ghana Telecom charges approximately US$192 for broadband speed of 512/128Kb/s for its business category, while InternetGhana charges US$240 for the same. In the case of broadband for schools, Ghana Telecom charges US$93 for a speed of 1,020/256Kb/s, while InternetGhana charges US$290 for a lower speed of 256/128Kb/s.

DSL at office	**DSL at school**	**Pre-paid DSL service**
Download speed up to 512Kb/s & 128Kb/s upload Set up Fees with ADSL modem = US$240 Month fee = US$225	Browsing speed of 256/128 Kb/s download & upload Set up fees with ADSL modem = US$290 Monthly Fees = US$100	Browsing speed of 256/128Kb/s download & upload Monthly contract three months = US$110 six months = US$200 12 months = US$350

Table 6: InternetGhana broadband charges per month (2006)
Source: www.internetghana.com

AfricaOnline charges a minimum of US$395 for a broadband speed from 32Kb/s per month for both its wireless and ADSL broadband, but gives discounts of 5% and 10% for prepayment for six and 12 months respectively.

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[18] Ghana Telecom charges are quoted in cedis but converted into US dollars based on Bank of Ghana annual inter-bank average exchange rate of 9,200 for 2006.

Broadband wireless access	Broadband leased line
Bandwidth speeds ranging from 32Kb/s to 2Mb/s	Utilizes national telco's copper lines
Pricing ranging from minimum $395 per month	Bandwidth speeds ranging from 32Kb/s to 2Mb/s
Customer premises equipment (CPE) cost of $1,100	Contract period of one year
One off installation/hook up fee of $600	Pricing ranging from $395 per month
Discounts of 5% for 6 months prepayments and 10% for 12 months prepayments	Discounts of 5% for 6 months prepayments and 10% for 12 months prepayments

Table 7: Africa Online broadband charges per month (2006)
Source: http://www.africaonline.com.gh/country.cs.php?cid=9

BusyInternet provides both shared and dedicated packages to customers. For a speed rating of 64Kb/s, a dedicated package costs US$426, while a shared package costs US$175.

Speed rating	Cost of service	
	Premium package (100% dedicated) (US$)	Standard package (burstable & shared) (US$)
64	426	175
128	653	250
256	1,106	400
512	2,012	600

Table 8: BusyInternet broadband charges per month
Source: www.busyinternet.net

ISPs - especially those providing ADSL - have accused Ghana Telecom of using predatory (or lower) prices to push them out of the market. The companies depend on Ghana Telecom for backbone support, and, as a result, cannot retail the service at the rates offered by Ghana Telecom to its broadband customers.

Internet pricing, until recently, was mainly post-paid. Companies such as NCS, InternetGhana and BusyInternet have now introduced pre-paid into the sector. The pre-paid voucher of NCS cost 100,000 cedi, and gives 10 hours browsing time. On average, for dial-up Internet services, ISPs charge one-time connection fees of between US$40 and US$50, and a monthly subscription rate of US$35-40 for unlimited Internet access.

Premium Plus	Premium	Basic	e-mail only
- Connection speed at maximum 56Kb/s - Allows for 400 hours of connect time - Able to browse - Minimum payment of 3 months - Set up fee of US$43.48 - Fixed charges per month - US$146.74 - Hours in excess of 400hours billed at US$1.75 per hour - Discount of 5% on six months pre-payments and 10% on 12 months prepayments	- Connection speed at maximum 56Kb/s - Allows for 70 hours of connect time - Set up fee of US$43.48 - Fixed charges per month - US$43.48 - Hours in excess of 70 hours billed at US$2.43 per hour - Discount of 5% on six months pre-payments and 10% on 12 months pre-payments	- Connection speed at maximum 56Kb/s - Allows for three hours of connect time - Able to browse - Minimum payment of three months - Set up fee of US$43.48 - Fixed charges per month - US$17.7 - Hours in excess of three hours billed at US$4.43 per hour - Discount of 5% on six months prepayments and 10% on 12 months pre-payments	- Connect speed at maximum of 56Kb/s - Unlimited e-mail connect time - No browsing allowed - Minimum payment of three months - Set up fee of US$43.48 - Fixed charges per month - US$25 - Discount of 5% on six months prepayments and 10% on 12 months pre-payments

Table 9: Africa Online dial-up Internet service charge per month
Source: http://www.africaonline.com.gh/country.cs.php?cid=9

Unlike BusyInternet and InternetGhana, AfricaOnline does not provide unlimited access, but gives quantum hours for usage, beyond which the subscriber pays an additional tariff. For example, a subscriber in the Premium category is allocated 70 hours per month and pays an additional US$2.43 per hour for excess time used.

Ghana Telecom recently set up its dial-up service (Dial-up4U). The company has removed the payment of one-time subscription and monthly fees charged by most ISPs providing dial-up Internet services, and charges 150 cedi per minute. The success of this service will have debilitating effects on the operations of ISPs, where one pays for subscriptions, as well as the telephone bill. The effect could still be greater on ISPs who have introduced pre-paid systems. For example, in the NCS pre-paid system the user has to pay for the telephone connection in addition to buying a voucher at 100,000 cedi.

3.3 Traffic and impact on other sectors

The combined capacity for GISPA members is 35Mb/s to the Internet and 45Mb/s down through a combination of SAT-3/WASC and satellite routes. The same capacity is estimated to exist for non-GISPA ISPs and other corporate users who are not ISPs.

Ghana Telecom averages an STM1 capacity on its nationwide Synchronous Digital Hierarchy (SDH) network. Dominant mobile operator Areeba, which has been acquired by MTN, has almost the same capacity on its nationwide backhaul, while Kasapa and tiGO, the two other cellular providers, are in the process of acquiring the same capacity.

The duplication stems from the high cost of the Voltacom fibre, which has a ring in the southern sector from Accra to Kumasi, then to Obuasi, Takoradi, Cape Coast and back to Accra. Voltacom charges a one-time connection fee of US$1,500 and an additional one-time connection fee of US$1,500 for each drop-and–insert. It charges US$16,000 for fixed rates. For variable annual rental rates, the company charges an annual rental rate of US$70 per km for the first 100km of the link, and US$50 for each additional km for the rest of the link above the first 100km. A discount of 6% is given on the fixed annual rental rates on each E1 link where the customer has provided his own access radio. These charges are exclusive of VAT and other statutory levies and taxes.

The Ghana Internet eXchange (GIX) is an Internet exchange point which serves local Internet traffic in Ghana. GIX allows local Internet service providers and network operators to easily exchange traffic within Ghana, while improving connectivity and services for their customers. It was launched in October 2005 and has about 2Mb/s of traffic going between the seven ISPs connected to it. The objective of this exchange point is to keep local traffic local, and it is therefore open to all network operators.

The introduction of SAT-3/WASC into the telecommunications landscape of Ghana has brought about noticeable changes in the sector. In 2003, when InternetGhana first introduced broadband, dial-up was available. Since SAT-3/WASC, broadband has been the major driving force in the industry, though the speeds are not as fast as other parts of the world.

Ghana Telecom's Broadband4U is presently one of the most affordable service providers in Ghana. It has been argued in certain circles that the reason for this is that it pays virtually nothing for access. Most cyber-cafés are subscribed to Broadband4U, despite the many technical problems they face. Nevertheless, there are a number of ISPs subscribed to the SAT-3/WASC cable and providing good service to customers. The implication is that ISP's can still make profits despite Ghana Telecom's uncompetitive pricing tactics.

If the government's plan to buy excess capacity on SAT-3/WASC and connect that to the national fibre backbone they are building becomes a reality, Ghana could be a destination for ITES-BPO. The national fibre backbone is a combination of the Voltacom fibre, and a yet to be built northern sector collapsed ring fibre that would have landing points at all district capitals.

4 Analysis of access to SAT-3/WASC

The SAT-3/WASC cable was built by what analysts refer to as "closed club shareholders", and these shareholders have been operating this cable since inception. Access is determined by the incumbent in the landing country. Pricing of this cable in Ghana is therefore determined by Ghana Telecom. Ghana Telecom charges prices it deems appropriate and determines who it sells its bandwidth to.

In its 2007 budget, the Ministry of Communications said it will push for regulation on how access to the cable is determined and allow for competitive pricing. It is anticipated that by the time the privatisation of Ghana Telecom and Westel is completed, the SAT-3/WASC cable will be more accessible and priced competitively.

SAT-3/WASC has not yet solved the high costs associated with broadband access in the African countries it connects to. Bandwidth subscription fees are generally very high. Due to this problem, most ISPs in Ghana prefer to subscribe to satellite services, even though the price of an E1 has been reduced for ISPs belonging to GISPA. Moreover, anti-competitive pricing by the incumbent, especially in the ISP industry, is stalling the efforts made by providers to offer value-added services to their clients. Our study therefore argues that one of the main objectives of SAT-3/WASC - to bridge the digital divide between Africa and the more developed world - has not been achieved.

4.1 Legislation and regulation

The problems of the telecommunications market in Ghana are rooted in a political environment where Ghana Telecom, with one of the poorest networks in Africa, distributes capacity, and where many important regulatory areas fall outside of the NCA's jurisdiction.

According to a report published by Spintrack IT Advice in 2004, the first major problem concerns Ghana Telecom's distribution and pricing of SAT-3/WASC capacity. Ghana Telecom has admitted that the cable is underutilized, while Internet users are demanding more bandwidth. An explanation for these distortions is to be found in the incumbent's deficient service and high pricing. As an example, an American BPO company named Rising Data recently chose to invest in a call centre in Accra, considering

Ghana has – according to a study done by Hewitt Associates – a "compelling list of assets including a stable democracy, a well-educated English speaking population and sufficient IT infrastructure, especially with the arrival of SAT-3/WASC".[19] However, the company has described the bandwidth cost as still "extremely high", and while starting its operations it had to wait for 3-4 months before Ghana Telecom installed its fixed lines. This frustrates investors and may probably drive prospective ones away.

The second problem concerns the duopoly structure of the fixed-line market. Ghana Telecom has always had the best of the market and been able to use its strength to hold the SNO, Westel, back. Some analysts say that the SNO's only lifeline has been its licence for international connections. The incumbent's newly attained access to the SAT-3/WASC cable, and its access to seemingly unlimited bandwidth, has, however, entrenched its dominant position and put Westel in a precarious situation.

Both problems could be solved by increasing competition in the market and by expanding the NCA's mandate. The Minister of Communication has stated: "We need a good regulatory environment where we can hold Ghana Telecom responsible for delays". But there has been little action to back up these statements.

Voice over Internet Protocol (VoIP) has also presented a regulatory challenge. Ghana Telecom recently blamed an annual loss of about US$15-20-million of its revenue on international calls on ISPs providing VoIP services. The reduction in revenue was huge and could be seen very clearly on the balance sheets. Indeed, the ITU reported that Ghana Telecom's revenue dropped from US$170-million in 1999 to US$89-million in 2000.[20] ISPs were, however, terminating calls on their terrestrial network and collecting the hard currency that was Ghana Telecom's due. Some ISPs – Mac Telecom, IDN and Tin-Ifa Ghana, each a licensed ISP – were raided and equipment confiscated. Some executives of the ISPs were also thrown into jail. Tensions ran high among various interest groups, including ISPs, the NCA, government, Ghana Telecom, the diplomatic and general community.

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[19] Source: InfoDev @ http://www.infodev.org
[20] ITU, African Telecommunications Indicators 2004

ISPs petitioned the courts and lodged a complaint against the NCA. The NCA lost because it could not justify its action and could not provide the courts with evidence of wrongdoing on the part of the ISPs. The courts ruled in favour of the ISPs and directed that the confiscated equipment be released on condition that the ISPs decoupled the voice segment of their data operations.

It is evident from this that even though VoIP in itself is not illegal, there is no clarity in the existing laws on its use. The NCA said that it is not illegal for ISP customers to send voice over private networks, but it is illegal for companies to provide VoIP on a commercial scale, terminating locally on Ghana Telecom's platform.

One of the objectives the Ministry of Communications wanted to achieve in 2007 was to address the cost of international connectivity and to promote competitiveness in accessing the SAT-3/WASC cable. Presently, only Ghana Telecom and Westel have been licensed to do VoIP. Despite mounting pressure from data communication operators, it remains to be seen when this law will be reviewed. Minister of Finance and Economic Planning Kwadwo Baah Wiredu has assured operators that the Ministry of Communications, in consultation with the NCA, would clarify the rules of engagement for VoIP. This would be refreshing indeed for the sector since exclusivity in providing international voice communications for both national operators ended in 2002. The NCA has only verbally said that VoIP is legal as a technology. The regulation to lay out the framework, however, is yet to be promulgated.[21] Analysts hope that Wiredu's assurances are not just more political rhetoric.

4.2 Dispute resolution mechanisms

According to the NCA Act 542 of 1996, mediation will always be the required first step when disagreements exist between operators. The NCA may facilitate mediation or operators may seek such mediation through a neutral

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[21] Major Rtd J.R.K Tandoh @ NCA 10th anniversary Consumer Assembly on 20th February 2007

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third party. Demonstration of a comprehensive mediation effort is necessary before a disagreement is brought before the NCA for dispute resolution.[22]

The NCA has a mediation committee in place which is responsible for settling disputes between operators, and between operators and customers. In an interview with the director of the legal department of the NCA, a Ms. Asafo-Adjei, she said that dispute resolution mechanisms are clearly spelt out in the National Communications Regulations LI 1719. She cited four cases the NCA has mediated on – between InternetGhana and Ghana Telecom, Westel and Areeba, Millicom Ghana and the NCA, and Westel and the NCA.

In those cases where the NCA is involved, the NCA board serves as the mediation committee. One case – between the NCA and Millicom Ghana – ended up in the Supreme Court of Ghana.

In February 2004, Ghana Telecom and InternetGhana entered into an agreement allowing InternetGhana use of the incumbent's infrastructure for the purposes of rolling out its ADSL service. This agreement was however terminated unilaterally by Ghana Telecom, and it was not until after an intervention by the then Minister for Communications and Technology, Kan Dapaah, that the NCA set up a mediation committee to investigate and mediate the dispute between the operators. The result of the mediation committee was a comprehensive operator access agreement, which was signed by both parties in June 2004.

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[22] The Act says further: "The NCA shall have jurisdiction to resolve dispute among competing operators in all matters especially those related to negotiation of interconnection arrangements or allegedly anti-competitive practices. All rulings on competitive disputes will be transparent and non-discriminatory, and will be resolved in the shortest time possible. The NCA shall issue formal regulations setting forth the procedures and requirements for dispute resolution proceedings. In instances where NCA decisions (are) appealed the initial rulings shall be binding upon all parties unless and until reversed on appeal. All costs of mediation, dispute resolutions and/or arbitration will be the responsibility of the operators involved".

However, while Ghana Telecom indicated its intention to have its services to competing providers 'regulated', it further exerted its authority in a different way by launching Broadband4U in July 2004. A comparison of the services showed that Ghana Telecom was offering up to eight times the bandwidth of InternetGhana's (ADSL) product, but US$5 cheaper (in all service categories). It was alleged that Ghana Telecom could afford to do so because access to bandwidth via SAT-3/WASC was subsidized, but to InternetGhana the access was being exorbitantly priced. Simply put, clients had a far better option in Ghana Telecom's Broadband4U than in ADSL services offered by InternetGhana.

It can only be deduced from the above that Ghana Telecom placed unnecessarily barriers that makes it almost impossible for some ISPs – especially those that have an interconnection agreement with them – to operate competitively. (The ability of GISPA to negotiate a reduction in SAT-3/WASC prices has, however, made things easier.)

It was clear from the interview with Asafo-Adjei that the mediation processes have met with mixed success. All of the cases mentioned have either been sent to the courts or have not been fully resolved. However, she also said there are instances when some customers have lodged complaints about some operators, and such cases have been resolved by the NCA.

There is no court in Ghana specifically designed for ICT-related disputes, but a Commercial Court (with the status of a High Court) has been established within the judicial system. The court is to handle all commercial cases, and has the objective of maintaining a conducive legal environment for business development. The commercial court was opened in March 2005 and by March 2006 it had settled 164 cases of the 472 brought before it.[23] The court is still in its formative period and hopefully it will be nurtured to give quick and sound judgement so as to win the confidence of the business community, including international investors.

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[23] See http://www.judicial.gov.gh/publications/com_court_1st%20anniversary.htm Materials retrieved on 27th October, 2006

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4.3 Investment and business environment in Ghana

Ghana has enjoyed a very stable economy for the past three to four years and this makes it a good investment destination. However, recent power supply problems could have disastrous effects on investments.

It is difficult to get data on investments made in the ICT sector by the various operators as most of them declined to provide this information. However, according to the ITU, over US$24-million was invested in the mobile telecom sector between 2000 and 2002.[24] It was also reported in the media that TiGO is to spend US$40-million - in addition to US$60-million it had already spent - to improve its operations and expand services to cover the entire country. Similarly, in 2006 Ghana Telecom negotiated a loan of US$65-million from Societe General to undertake the second phase of its nationwide mobile telephone expansion programme.[25] Ghana Telecom is also reported to have spent US$75-million on expansion works on its mobile and fixed-line telephone networks.[26] In June 2005, Scancom Ghana, the then operator of Areeba, obtained a US$40-million credit from the International Finance Corporation to finance its mobile telephone expansion programme in the country.[27]

In the case of the fixed-line telephone sub-sector, it is only Ghana Telecom which is investing in the market. The company has obtained separate loans from the World Bank and the Chinese government to support an expansion programme. The World Bank granted the incumbent a US$40-million loan, and the Chinese government a US$30-million loan for this programme. The loans, according to Minister of Communications, will be targeted at bridging the digital divide between the urban and the rural areas by accelerating the deployment of a fibre optic network across the country.[28]

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[24] The data did not indicate whether the amount involved represents the investment made by all the mobile telephone operators.

[25] http://www.moc.gov.gh/modules.php?op=modload&name=News&file=article&sid=165 Data retrieved on 25th October, 2006

[26] http://www.moc.gov.gh/modules.php?op=modload&name=News&file=article&sid=165 Information retrieved on 26th October, 2006

[27] See http://www.investcomllc.com/ Information retrieved on 26th October, 2006

[28] http://www.moc.gov.gh/modules.php?op=modload&name=News&file=article&sid=165 Information retrieved on 26th October, 2006

Kinz Telecom has announced that it will invest US$500-million in Westel, which the company bought for US$95 million.[29] Internet research puts the investment made by GISPA members in the ISP sector at about US$65-million, with an additional US$35-million from non-GISPA members and corporate networks.

4.4 Liberalisation of sector

Much is expected by the sector once Ghana Telecom's exclusivity for SAT-3/WASC expires in June 2007. For one, the ministry's plans to deregulate access to SAT-3/WASC by the time Ghana Telecom and Westel are privatised should allow competitive pricing.

The option of declaring the SAT-3/WASC an essential facility, and pricing it at cost is also open to the government. But steps the government would take are still unclear, as some analysts argue that if it decouples SAT-3/WASC from Ghana Telecom the state enterprise will becomes less attractive for foreign strategic investors.

Ecobank Development Corporation has been contracted as the transactions advisor for the privatisation of Ghana Telecom. According to the *Daily Graphic*, analysts have valued its assets at around US$2-billion.[30] It is the intention of the government to take SAT-3/WASC from Ghana Telecom and fuse it into a national fibre backbone company to form a national infrastructure provider, which would be accessible to everyone, including Ghana Telecom and Westel. However, it is unclear if SAT-3/WASC is included in the valuations of these analysts.

Westel was nationalized in 1996. In 2006, it became fully state-owned after the government acquired the remaining two-thirds equity. Kinz Telecom bought a 66.67% stake in Westel in March 2007 for US$95-million and has promised to invest an amount of US$500-million into the company.

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[29] Daily Graphic, Tuesday, March 20, 2007
[30] Source: Ecobank to oversee sale of GT, Daily Graphic, Tuesday, June 26, 2007

Though Ghana Telecom is the monopoly gatekeeper of SAT-3/WASC, it did not hold back efforts by GISPA to negotiate for a reduction in price. Though the critical point for GISPA was the retail market operation of Ghana Telecom's Broadband4U, in some markets like South Africa, Telkom would still not reduce the wholesale cost of SAT-3/WASC in the way that the Ghanaian incumbent did. Perhaps the government's quest to make bandwidth affordable was one of the primary considerations, in addition to GISPA members' agitation that Ghana Telecom was undercutting them in the retail market.

4.5 Human resource capacity

52.31% of the population, over 15 years in age, can read and write in English. This translates to over 11-million people across the country. In Accra metropolis, the corresponding figure is about 860,000. The number of graduates in a year in Ghana is approximately 29,000 students passing out from public universities and polytechnics.

The educational system in the country is made up of 12-years of pre-tertiary education. Computer education in schools is low. The senior secondary school curriculum does not include any specific subjects on computers. In most cases computers in schools are used as aids to teach other subjects. While some of the skills needed in the work environment are acquired by graduates, many graduates do not leave the education system with basic computer literacy.

The low penetration of personal computers of about 0.52 per 100[31] compounds the problem. Corrective steps are being implemented both in the pre-schooling and tertiary levels by introducing market-led curricula. Some private training institutions also offer training in various applications.

The Ghana Telecom Training College – now the Ghana Telecom University College – has been the main training institution in telecommunications in Ghana. The university offers diploma, certificate and degree courses in telecom engineering, information technology, information systems and BPO, amongst others. A course on how to manage the SAT-3/WASC resource is

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[31] Source: International Telecommunications Union

also included. A former trainee at the school[32] felt that this course was productive and that, technically, the staff at Ghana Telecom are very competent.

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[32] Interview with Adzimah Franklin, Ghana Telecom University College Laboratory

5   National backhaul infrastructure

The nation's backhaul infrastructure is mostly owned by state corporations and is concentrated in the south of Ghana – especially Accra, Cape Coast, Takoradi and Kumasi. These are four of the most populous areas in the country. Most of this infrastructure has been built by Ghana Telecom. VRA owns an intercity fibre which covers predominantly the southern half of Ghana. Voltacom – the subsidiary of VRA – operates the fibre.[33] The cable stretches from Accra, Kumasi, and Nkawkaw to Winneba, the Cape Coast and Obuasi, and covers about 15 major cities and towns in the southern part of Ghana.

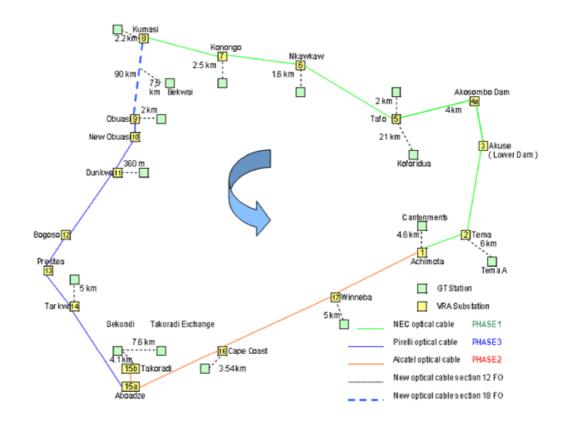The following diagram shows the existing Ghana Telecom and VRA fibre networks.

Figure 2: Ghana Telecom and VRA fibre networks

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[33] The Voltacom fibre uses SDH at 150Mb/s.

The Voltacom fibre optic will also be linked further up north and then connected to the SAT-3/WASC network in Accra. As mentioned, a national backbone infrastructure company, which will be a separate entity from Ghana Telecom and VRA, will also be formed to manage the cable. The government has already passed legislation that allows it to separate Voltacom from VRA, and in June 2006 signed a US$100-million loan contract with the Chinese government to complete the cable. The network will be run by a private enterprise on behalf of the Ghanaian government, which wants it to be considered an essential national utility, similar to roads, water and electricity. This is in line with the open access model adopted by some governments around the world. Once complete the cable is also expected to help connect neighboring countries like Togo, Burkina Faso and Mali to the SAT-3/WASC cable.

The following map shows the current and future structure of the Voltacom fibre. The green legend in the map depicts the current infrastructure in place, and the red legend depicts the future infrastructure.
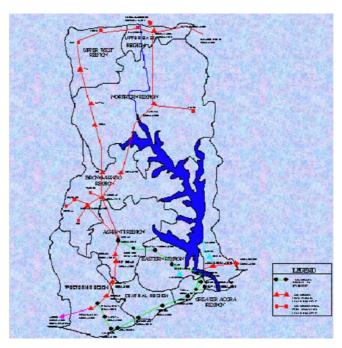

Figure 3: Map of the VRA OPGW

Ghana Telecom's network backbone is based on the Asynchronous Transfer Mode (ATM) transport technology, which is fast and reliable. It uses

microwaves extensively in its networks,[34] which are accessed through copper cables, HDSL, wireless CDMA and FCT.

The SAT-3/WASC landing station is located in Accra. Ghana Telecom already had an intercity fibre in place in the Accra metropolis, built to connect the SAT-3/WASC landing station to its exchange in Cantonment and Accra-North. It also has a memorandum of understanding with VRA to use the Voltacom fibre. With these in place, it made it possible to leverage the potential of the SAT-3/WASC cable.

Other private and public companies have built their own networks for their operations. For example, Ghana Commercial Bank is the most networked bank in Ghana with branches in every district in the country.

The NCA has granted licenses to many ISPs to operate their own international satellite gateways. As a result, ISPs currently operate using Ghana Telecom's SAT-3/WASC fibre or satellite connectivity. For terrestrial connectivity they typically use leased lines from Ghana Telecom, wireless technologies such as Kasapa CDMA technology, copper cables and licence-free frequency spectrums. A few ISPs use a combination of SAT-3/WASC fibre and satellite connectivity.

The ISPs build their own networks within Ghana by providing access to other regional capitals using a combination of VSAT, microwave and fibre optic connections for their backbone connectivity. Although the fibre optic ring that links the regional capitals in the southern part of Ghana was intended to help manage the electrical grid, the plan was also to use it as a high-speed data backbone for the country. Only a few ISPs, like ThirdRail (now DiscoveryTel) and InternetGhana, use Voltacom's backbone capacity.

Research has revealed that the dial-up services offered by some of the ISPs via the old copper cables of Ghana Telecom gave subscribers major

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[34] Ghana Telecom also has an extensive network of telecommunication infrastructure up to Tamale in the northern region of the country through its SDH microwave setup.

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problems.[35] About a third to a half of all calls do not complete because of network congestion and poor maintenance. The poor state of the telecoms infrastructure and the drop in international call rates has encouraged a rapid growth in grey market Internet telephony. Ghana Telecom has estimated that this is costing the company approximately US$15-20-million a year in revenue. The ISPs have not totally moved away from using the copper cables, but try to find solutions to these problems.

Mobile operators Areeba, tiGO and Kasapa have built their own networks on which they deploy Global System for Mobile communication (GSM), (Enhanced Data Rates for GSM Evolution) EDGE, (General Packet Radio Service) GPRS and CDMA. These networks cover a greater geographic area of the country than Ghana Telecom and Voltacom's networks. All of these companies have interconnection agreements with Ghana Telecom, which allow them to use the incumbent's network.

5.1 Geographic coverage

Because Ghana Telecom's infrastructure does not cover most parts of Ghana – especially the rural areas – the company introduced FCT. FCT emulates the services provided by fixed-line telephone using GSM networks. It is a solution for providing access to fixed services where there is no traditional fixed-network infrastructure or additional fixed phone lines are needed. FCTs are installed in areas where Ghana Telecom has GSM coverage and operates on the GSM triple band (GSM900MHz/GSM1800MHz/GSM1900 MHz). FCTs have all the features that the Onetouch GSM (Ghana Telecoms's mobile business) network has, including Internet access via the GPRS technology that was launched on the Onetouch network in November 2006.

In Ghana, as in many other African countries, the distribution of telephones is highly skewed towards the urban areas. About 55% of all fixed telephone lines are found in the Accra region, although only 25% of Ghanaians live in this region. This is, however, an improvement on telephone distribution in the early 1990s. For example, in 1993, 80% of all telephone lines were in Accra and there were no pay phones outside the capital. The northern part of the country with 40% of the population had only 1% of the total telephone

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[35] Source: www.voa.com

lines. Despite the government's effort to improve access in rural areas, the operators' share of traffic from these areas has not expanded appreciably. The government charges all operators 1% of revenues for a rural telecommunications fund called Ghana Investment Fund for Telecommunication (GIFTEL). It has being in operation since 2005.

	Subscribers		Teledensity	% of country's population
	Number	% of total		
Greater Accra	184,526	67.7	6.0	15.4
Ashanti	27,947	10.3	0.7	19.1
Western	17,009	6.2	0.8	10.2
Eastern	10,057	3.7	0.5	11.1
Central	8,621	3.2	0.5	8.4
Northern	5,438	2.0	0.3	9.6
Brong Ahafo	6,808	2.5	0.4	9.6
Volta	6,311	2.3	0.4	8.6
Upper West	1,728	0.6	0.3	3.0
Upper East	4,084	1.5	0.4	4.0

Table 10: Regional distribution of Ghana Telecom subscribers (Dec 2002)
Source: **Fostering and facilitating Access on SAT-3/WASC/SAFE by Spintrackhttp://www.nca.org.gh**

The Ashanti account for about 19% of Ghana's population, but made up only about 10.3% of fixed-line subscribers in 2002. Despite the numbers, Accra still accounted for about 67.7% of Ghana Telecom's fixed-line subscribers. It had a population of approximately 2.2-million in 2007 and accounts for about 25% of the urban population in Ghana. Accra and Kumasi, Ghana's two largest urban centres, together make up over 40% of the total urban population. Regionally, about 60% of the urban population is concentrated in Greater Accra and the Ashanti and Eastern Regions, all three of which are located in southern Ghana – the reason it has the most coverage in terms of fixed lines. Despite the change in population statistics between the two largest urban

cities since 2003, over 50% of all fixed-line subscribers are still located in Accra.

The mobile networks have covered a lot of geographical area. It is now possible for people living in a village to own mobile phones, making mobiles a key contributor to bridging the urban-rural digital divide in Ghana. Kasapa deploys mobile services using the CDMA2000 1x technology. Areeba, which commands about half the mobile subscriber base, uses a combination of the GSM900, GPRS, and EDGE technologies. TiGO and Ghana Telecom Onetouch also deploy these same technologies; however, Areeba's network has a much wider geographic coverage. We do not have any coverage map for Kasapa, but this network covers about seven regions in Ghana, with a presence in most cities and towns. Together, these mobile networks cover between 80-85% of the population.

6 Conclusion

Ghana is considered an economic gateway to West Africa. It has the potential to compete in the global ICT marketplace if it can overcome its many obstacles, ranging from high levels of illiteracy to low infrastructure levels like electricity problems, lack of quality access roads to rural areas and a lack of adequate telecommunications infrastructure.

Reform in the telecommunications sector in the late 1990s has improved the performance of the sector significantly, even though the fixed-line sub-sector did not do well. However, further reforms are necessary. We recommend that the NCA's mandate is expanded and strengthened to enable it to perform its duties, such as establish an interconnection regime between Ghana Telecom and ISPs. The NCA must develop far-sighted regulations which allow technology to evolve.

The ability of GISPA to negotiate a price reduction in accessing SAT-3/WASC shows how significant trade associations are to the telecoms sector. ISPs, however, complain that Ghana Telecom is undercutting them in the retail market, making it difficult for them to compete. The NCA should enforce a level playing field in the retail market for Internet provision.

The country has the potential to be a destination for ITES-BPO. To fulfil this potential the government must first complete its planned nation-wide terrestrial fibre backbone network and connect it to the SAT-3/WASC cable. Ghana would also be required to purchase additional capacity on SAT-3/WASC to cope with the increased demand from the ITES-BPO sector.

We think that Ghana Telecom is a very viable company and can be sold independently of the cable. It has a mobile licence and competes favourably in the market with lots of very innovative products and services. However, we acknowledge that this is unlikely to happen.

7 Glossary

ADSL	Asymmetric Digital Subscriber Line
CDMA	Code Division Multiple Access
DSL	Digital Subscriber Line
E1	A bi-directional (full duplex) 2Mb/s link
EDGE	Enhanced Data Rates for GSM Evolution
GDP	Gross Domestic Product
GPRS	General Packet Radio Service
GSM	Global System for Mobile communication
GT	Ghana Telecom
HDSL	High bit-rate Digital Subscriber Lines
HSDPA	High Speed Download Packet Access
IDN	Intercom Digital Network
IDSL	IDSN Digital Subscriber Lines
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
ITES-BPO	IT Enabled Services–Business Process Outsourcing
ITU	International Telecommunication Union
Kb/s	Kilobits per second
LAN	Local Area Network
Mb/s	Megabits per second
MoU	Memorandum of Understanding
MIU km	Minimum Investment Unit kilometers

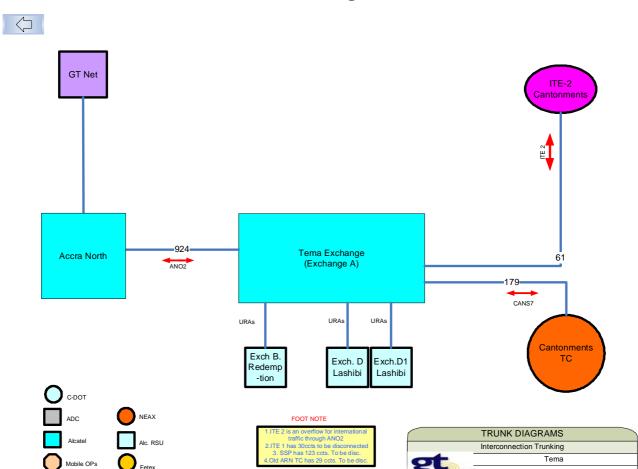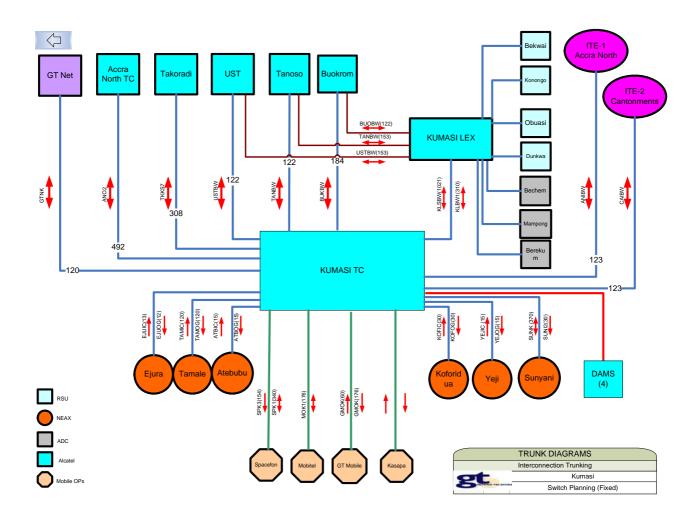|	
NCS	Network Computer Systems
NoC	Network Operation Center
SAT-3/WASC	South Atlantic 3/West Africa Submarine Cable
SDH	Synchronous Digital Hierarchy
SLA	Service Level Agreement
SNO	Second National Operator
VoIP	Voice over Internet Protocol
VPN	Virtual Private Network
VSAT	Very Small Aperture Terminal
Wi-Fi	Wireless Fidelity
WiMax	Worldwide Interoperability for Microwave Access

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9 Appendix 1: Interconnection trunking diagrams

9.1 Tema interconnection trunking

Legend:
- C-DOT
- ADC
- Alcatel
- Mobile OPs
- NEAX
- Alc. RSU
- Fetex

FOOT NOTE
1. ITE 2 is an overflow for international traffic through ANO2
2. ITE 1 has 30ccts to be disconnected
3. SSP has 123 ccts. To be disc.
4. Old ARN TC has 29 ccts. To be disc.

TRUNK DIAGRAMS
Interconnection Trunking
Tema
Switch Planning (Fixed)

9.2 Kumasi interconnection trunking

9.3 Accra interconnection trunking