A National Broadband Strategy

for

Economic Growth and Development

Post-Stakeholder Workshop Concept Paper

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Introduction

A 2009 World Bank Information and Communications for Development report analyzed the impact of broadband on growth in 120 countries from 1980 to 2006. The study showed that each 10% increase in broadband penetration results in 1.21% increase in per capita Gross Domestic Product (GDP) in developed countries, and 1.38% increase in developing countries. Broadband penetration therefore has more of an impact in developing countries than in developed countries[1].

The National Broadband Strategy seeks to achieve a 10% annual increase in broadband penetration and an increase in broadband bandwidth from 256 kilobytes per second (kbps) to 2 megabytes per second (mbps) between 2010 and 2015. Specifically, the strategy aims to help implement mechanisms for the reduction of broadband cost that achieves broadband penetration of 50% by 2015 from the current rate of 0.2%. This penetration will be contributing 6.9% to our GDP growth over five years, and approximately one in every two Ghanaians would have broadband access.

Background

Ghana has the opportunity to develop and implement a national broadband strategy as indicated in the Information Communications Technology (ICT) for Accelerated Development[2] and Telecom[3] Policies, modelled after President Barack Obama's broadband strategy[4] which was advanced by a coalition of stakeholders[5]. The strategy is meant to ensure the uptake of broadband in Ghana as an economic stimulus by making it **accessible** and **affordable**, and by looking at elements of how it would contribute to our GDP growth and human development. Other countries including Australia are investing heavily in broadband as part of economic stimulus packages.[6]

Figures recently released by the Ministry of Communication Technologies show that the ICT sector in Tunisia has posted a growth of 17.8% in 2008. Its contribution to the country's Gross Domestic Product (GDP) amounted to 10% in 2008 against only 3.9% in 2001. It is expected to reach 13% by 2011.[7] According to the Ghana Investment Promotion Centre (GIPC), the Telecom sector contributed 6% of GDP in 2005, moving from 1.8% in 2000[8].

Ghana's UNDP Human Development Index (HDI) is 0.553 and GDP per capita (PPP US$) is 2,540, according to the 2007/8 UNDP Human Development Report.[9] GDP stood at $73 billion representing a growth of 7.3% in 2008. Investing in broadband is an investment in economic growth and an indirect investment in development.[10] For broadband to affect development, it must be made accessible and affordable. This would have an impact on health, education and standard of living; the three main indicators in the HDI.

The current statistics on broadband and internet usage are low. The total number of broadband subscribers is about 15,000 representing 0.07% of the 22 million Ghanaian population. The total number of internet subscribers is about 47,000 representing 0.2% of the population. The total number of Internet users is about a one million representing 4.5% of the Ghanaian population. And, one in every three Internet subscribers has broadband access and this ratio is inadequate.[11]

The National Broadband Strategy seeks to increase broadband penetration by reducing the cost of broadband as well as reducing other related costs in order to ensure that it is accessible and affordable. This assumes that the purchasing power of Ghanaians would remain the same or increase.

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[1] http://web.si.umich.edu/tprc/papers/2005/450/L%20Waverman-%20Telecoms%20Growth%20in%20Dev.%20Countries.pdf
[2] http://www.ict.gov.gh/pdf/Ghana%20ICT4AD%20Policy.pdf
[3] http://www.ict.gov.gh/Telecom%20policy/Ghana%20Telecom%20Policy%20Final.pdf
[4] http://www.barackobama.com/issues/technology/
[5] http://www.bb4us.net/
[6] http://www.govtech.com/gt/695429?printall
[7] http://www.tunisiaonlinenews.com/2009/05/15/tunisia-ict-sector-contributes-10-of-countrys-gdp/
[8] Ghana Investment Promotion Centre ICT Sector Profile
[9] http://hdrstats.undp.org/en/countries/country_fact_sheets/cty_fs_GHA.html
[10] http://ipcommunications.tmcnet.com/news/2009/06/17/4231817.htm
[11] Values quoted are approximated based on research data by Internet Research

The National Broadband Strategy seeks to achieve by 2015:

National Broadband Strategy

   a. **50% Broadband penetration for Ghanaians by 2015**

   b. **Reduce Broadband Cost by 80%**

   c. **Reduce Customer Premise Equipment (CPE) and Personal Computer (PC) cost by 90%**
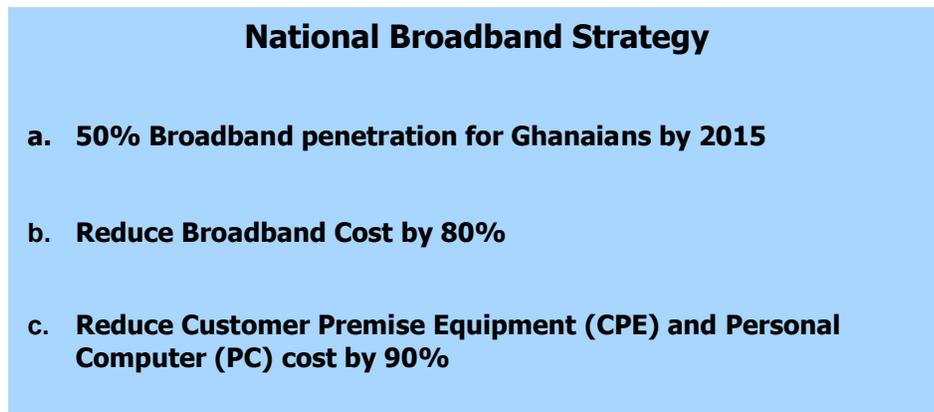
Figure 1: National Broadband Strategy

Benefits of Broadband Accessibility

How does broadband increase GDP growth?

Like the World Bank study discussed above, studies indicate a strong positive correlation between broadband penetration and economic growth. This is promising however, more work needs to be done to examine the direct causality between broadband penetration and GDP growth. And specifically related to a National Broadband Strategy for Ghana, more work needs to be done to examine this causality within developing countries and Ghana's own economy.

The literature on broadband for GDP growth takes into account the following characteristics of broadband:

- The shift from intermittent to "always on" access to information that broadband permits;
- The availability of higher speeds and lower unit costs, which in turn is closely associated with the reduction in the waiting time to access information and waiting for a website to load;
- The enhancement of user experiences through multimedia, both in the residential field (e.g., the rise of video on demand services, such as YouTube) and in the business field (e.g. the facilitation of e-commerce);
- The access that broadband provides to global markets, for instance for outsourcing, and for encouraging global, real-time, transparent competition;
- The ability of broadband to "cannibalize" other services, for instance by substituting downloaded video-on-demand for live TV shows, or substituting voice over broadband for regular telephone service. Broadband's ability to offer multiple play should generate cost savings and efficiencies.

These characteristics of broadband have been seen to impact economic, social and cultural development in many ways including the following examples:

- Greater access to healthcare (e.g. telemedicine access to healthcare specialists who may be concentrated in major cities) and education (e.g. access to free course materials from world-renowned institutions)
- Increased business intelligence such as researching competitor information and trends, and utilising the latest knowledge that improves business performance within minutes or days of publication (e.g. new proven irrigation technique for farmers)
- Reduction of transaction and processing costs such as in the case of the e-Customs System in Ghana
- Increase in e-Commerce including expanding customer base, improving supply chain management, and more.
- Enabling a business process outsourcing industry for in-shore, near-shore and off-shore companies.
- In Australia, broadband created opportunities for low-carbon development by utilising broadband-based services such as remote management of power appliances and presence-based power, telecommuting, real-time freight management and on-live high definition video-conferencing.
- Several studies including a BT study of flexible working patterns among small business which showed that 82 percent of small businesses that had adopted broadband reported a better work-life balance. Flexible working patterns and broadband connectivity translate to more productive working hours, reduction in traffic jams,

increased ability to expand businesses to multiple cities, towns and locations using voice-over-IP telephony, video conferencing, email and other communication technologies.

The "always-on", higher connectivity speed nature of broadband enables individuals and businesses to more easily access services that significantly reduce the time (e.g. publication printing and distribution) and distance (e.g. travel) constraints of more traditional communication and transaction modalities. It is worth mentioning again, that the specific services and capabilities needed by individuals and businesses in Ghana must be identified and monitored for this National Broadband Strategy to be effective.

Socio-Economic Benefits

Increased broadband penetration will improve Ghana's potential competitiveness in the global market. It will also have an impact on health, education and standard of living; the three main indicators in the UNDP Human Development Index (HDI).

Users will be able to access public information and send private or public correspondence at very little time and marginal financial cost.

A reliable broadband network will improve access to market information for Ghanaian businesses, which will enable them to make better-informed business decisions and improve their productivity.

For example, businesses will have more information regarding competitive prices and so may decrease the cost of inputs into the production process. Businesses will have better access to information about other stakeholders in their industry, which will improver their understanding of the supply-chain in which they produce. They will be better equipped to deliver tailored and relevant products.

Broadband is not only an issue of high-speed networks, it also provides a platform for interactive technologies that enable ordinary people to produce, share and distribute content on the Web as well as engage in commerce. The Internet is now a global trading platform enabling transactions worth billions of dollars daily. These technologies are likely to become as ubiquitous on mobile devices as they are on the Internet. This poses challenges and opportunities for local content and commerce industries to generate and distribute content as well engage in commerce with a broadband world.

Broadband can also help facilitate e-citizenship and e-governance and enhance relations between citizens and government to build and strengthen our democracy. Broadband Internet has enormous potential for strengthening community voice in public debate and decision-making and in maintaining transparency and accountability in government.

National Broadband Strategy

Broadband is usually defined as any 'always-on' high-speed connection to the Internet. The Organization for Economic Cooperation and Development (OECD) specifies a download speed of 256 Kilobits per second or higher as constituting broadband as opposed to the much slower connection to the Internet. The unit of measurement of broadband is bandwidth.

Broadband cost between $500 and $1000 per month in Ghana today to the end user either on a shared or dedicated basis. This does not include the Customer Premise Equipment (CPE), which ranges between $200 and $10,000. The Ghana Internet Services Providers Association (GISPA) members buy a dedicated e1 (which is 8 x 256 kilobits per second) from Vodafone Ghana's SAT3 undersea cable at $4500 per month. Both the high cost of a broadband connection and the price of personal computers puts broadband out of the reach of most Ghanaians.

Two undersea cables namely SEACOM and TEAMS landing in Eastern and Southern Africa this year have announced to sell an e1 at $500 per month wholesale to operators, which means broadband market prices would range between $100 and $200. Ghana must be able to match these prices or offer cheaper. This may be possible due partly to the arrival of the GLO and Main One undersea cables, which would give competition to SAT3 in 2010.

50% Broadband penetration for Ghanaians by 2015

The National Broadband Strategy seeks to achieve broadband penetration of 10 percent annually over the period between 2010 and 2015. Broadband bandwidth is pegged to grow from 256kbps to 2mbps.

Today, there are 12million mobile phone subscribers, representing 54.5% of the population. If one in every two Ghanaians has mobile access then increasing broadband penetration to 50% from the current 0.2% is possible: the mobile rate was achieved in four years what the broadband strategy wants to do in five.

Achieving 50% broadband penetration means contributing 6.9% to our GDP growth over five years. Approximately, one in every two Ghanaians would have broadband access. Currently an estimated 55 % Ghanaians owned personal mobile phone numbers. This is up from 22 per cent in December 2006, 33 per cent in 2007 and 50 per cent in 2008. The figure is expected to reach 85 per cent in 2013. Ghana leads Africa in mobile penetration but when it comes to Internet penetration, Ghana is 28th out of 56 countries in Africa.

Mobile growth in Ghana and Africa is largely due to reduction in cost of access device and services. Broadband penetration would follow the same trajectory. The table below shows that though Ghana has being doing well on economic indicators compared to Sub-Saharan Africa, apart from mobile subscription, the country is not doing well on other indicators that contribute to broadband.

Indicator	Ghana	Sub Sahara
GNI (method Worldbank Atlas in $)	590	951
GDP growth %	5.5	5.1
Adult literacy %	65	62
Gross primary enrolment %	53	51
Telephone line (per 100 people)	1.6	1.6
Mobile subscriptions (per 100 people)	32.4	23
Internet subscription (per 100 people)	0.1	1.2
PC (per 100 people)	0.6	1.8
Households with a tv (per 100 people)	25	18
Internet users (per 100 people)	3.8	4.4
Price basket fixed lines	6.3	12.6
Price basket mobile services	5.7	11.6
Price basket internet service	9.4	43.1

Source: MoC, NCA, Ghana Statistical Service, ITU, Worldfacts Book

Broadband consist of three (3) elements; international, national and last mile bandwidth. International bandwidth is the upstream connectivity either through satellite, microwave or undersea cables. National bandwidth is the platform for distribution and transmission of the international bandwidth from point A to B within the country. Last mile bandwidth is the delivery of the national bandwidth to end user customers either at home or in their offices.

International Bandwidth

The Vodafone SAT3 undersea cable currently delivers international bandwidth cheapest in Ghana compared to satellite. The Vodafone SAT3 monopoly will end in 2010 when GLO-1 and MainOne land their undersea cables in Ghana.

In the short term the current monopoly situation dictates that price reduction can only be on cost base analysis until competition kicks in.

Total investment in the SAT3 undersea cable is about US$32 million including the latest upgrade, which gave Vodafone double the original capacity allocated. Yearly maintenance and operation costs are approximately 1.3 MUSD. Life span of the cable is 15 years, bringing the cost of investment to US$178000 per month for the whole system. Maintenance cost would be maximum USD 19'000 per STM1 for now. Today Vodafone has at its disposal 16 STM1s. It is using 4 STM1 for its own ISP, Vodafone Broadband. GT has purchased equipment at the landing station that can deploy STM64 without further investment. With a profit margin of 50% allocated to GT, we recommend a maximum price of USD 1191 per e1, and USD 44'450 per STM1 lease cost per month at wholesale to ISPs. The price of USD 1191 per e1 could fall significantly if Vodafone moves towards a high volume, low margin approach to unlock the STM64 capacity at their disposal.

With the arrival of competition from GLO and MainOne in 2010, we estimate an e1 to come down to $500 for ISPs, this is the wholesale cost at which Seacom and TEAMS have announced to sell their capacities to Internet Service Providers (ISPs) in East Africa.

Government needs to look at competition regulation for the market since we have dominant market players and the lack of government interventions could result in "cartel" activities and unfair practices. The National Communications Authority (NCA) needs to be more effective in facilitating the market and ensure a level playing field as well as a competitive framework that ensures better entry into the market.

National Bandwidth

When the international bandwidth lands at the beach, it can be driven by microwave, satellite or terrestrial fiber to the various regions, regional capitals and districts.

National Communications Backbone Company (NCBC) is the only terrestrial fiber infrastructure so must be regulated as an infrastructure provider with fair access and competition to all operators. NCBC is currently owned by Vodafone Ghana, so a fear may exist among competitors that the company may use it to their advantage.

The NCBC network has a ring in the southern sector as well as a central ring with a link to Tamale, which would form the northern ring. An e1 on the network is currently $1,000 with a $2,500 per end connection charge. There is a discount scheme on volume and terms but additional cost for value added services.

For example, driving an international e1, which was bought at $4,500, to Tamale would cost you an additional $1,000 plus a $2,500 one time activation fee. This means an e1 would be more expensive in Tamale than in Accra, hence the lack of broadband in such areas.

An alternate model is to take the Traffic on Customer (TOC) of the system over 10 years or more, do a customer (not traffic) forecast and project a profit margin of 20% or more. Should more operators enter the space and become customers you are able to provide lower rates for everybody already using the cable. This model leans more at the high volume, low margin approach that eventually creates a bigger market.

Bandwidth upgrades for the early adopters should be free so the model works very well (although returns are long term) and for customers. It is clearly targeting a de-regulated scenario with exponential traffic growth.

Going forward, it is important for more infrastructure licenses (like right of way) to be granted for competing infrastructure to be built to discourage the monopoly of NCBC.

A plan for the route of fiber nationwide needs to be developed so that potential investors can follow to avoid duplication to the detriment of other areas. Until there is a nationwide coverage of fiber, duplication should be discouraged.

Last Mile Bandwidth

From the capital or district it takes microwave wireless or telephone cables to extend the bandwidth to offices and homes. This access can also be through satellite.

Much of the telephone cables (copper), which belong to Vodafone Ghana, are not the best choice for high bandwidth transmission using Asynchronous Digital Subscriber Line (ADSL). Investments must be made to improve the cables and the local loop unbundled to allow access to the copper by all competing providers for last mile access.

Most of the providers of last mile access use microwave wireless, which requires the building of mast and use of tall buildings for access. There are about 850 masts in Greater Accra alone which are owned by ISPs, mobile operators and others. Each operator who invests in a mast transfers that cost to the customer, making customer access costs high.

Developing a national mast plan that situates masts strategically and ensures sharing of masts by operators would eliminate the duplication of investment and reduce the cost to customers as well as minimize the health implications of indiscriminate mast sitings.

The use of the Ghana Investment Fund for Electronic Communications (GIFEC) Fund to develop infrastructure such as masts to be shared by operators in underserved communities is a good initiative that should guide the sharing of other infrastructure even in the urban centers. But the infrastructure does not need subsidization since these areas are commercially viable.

The move by government to tax communication services under the Communications Services Tax (CST) is laudable but some of the market operators like ISPs pay the CST and still pay the old taxes on CPEs. This means the customer pays double tax, an addition to cost.

Energy is essential for broadband and is needed across the entire value chain. 65% to 80% of the energy needs of operators are met through the national electricity grid while 20% to 35% is met through operating generators. The order of magnitude cost of energy from the generators is very high compared to that from the national grid so it is important that the energy supply in the national grid is not only reliable but cost effective. Government and private sector need to look into alternative sources of clean, renewable and quality energy.

NCA licensing and renewal cost contribute to the operators cost on the value chain so our recommendation is for such cost to reduce over time.

Reduce Customer Premise Equipment (CPE) and Personal Computer (PC) cost by 90%

A CPE is any device that brings the bandwidth to the customer's premises and then connects to the PC for access. CPEs and PCs fall within the category of access devices.

Freight and handling contributes about 30% to the cost of CPEs and PCs while taxes contribute about 15%. CPEs and PCs are not manufactured or assembled in Ghana so a PC that costs $500 in a western country would cost double by the time it gets to Ghana after freight, handling and taxes.

In the short term it is important to remove taxes on CPEs and PCs and facilitate access. For example; the government's "PCs for all" initiative, which gives PCs on credit and deducts from source for government employees is laudable, this needs to be extended to the private sector through collaboration with initiatives like the one laptop per household and hundred dollar laptop programmes.

In the long term government needs to create the incentives for private investors to situate assembly and manufacturing plants in Ghana for the local production of CPEs and PCs.

Market Demand

Generate demand for broadband by increasing computer and Internet literacy as well as availability of services that meet demand of customers. Development of applications and services that create demand like e-government, e-health, through the Community Information Centers (CICs) and other private sector lead outlets is necessary.

Action Plan

ID	Action/Initiative	Owners	Timeframe / Indicators
1.	Reduce costs of international bandwidth	NCA, NCBC, Vodafone, PSCC	Q4 2009
2.	Utilise fibre capacities of mobile operators and other fibre capacity providers to effectively reduce prices	NCA, GISPA, PSCC	Q4 2009
3.	Ensure price breaks from international and national bandwidth cost reductions are passed onto last mile service providers and consumers	NCA, GISPA,PSCC	Q4 2009
4.	Encourage 'Made in Ghana' products and services	PSCC	Q4 2009
5.	Encourage reduction in licensing costs	NCA	Q4 2009
6.	Reduce or eliminate taxes for providers of broadband internet and related equipment	GoG, PSCC, Ghana Connect	Q4 2009
7.	Separation of wholesale and retailer functions in telecommunications companies	PSCC	Immediate
8.	Increase financing schemes available for internet-enabled devices	Local financing organisations, GoG	
9.	Review of NCA regulations to ensure they drive broadband internet penetration	NCA	Q1 2010
10.	Stronger engagement between associations such as GISPA, ISOC and GARNET with NCA	GISPA, NCA, ISOC, GARNET	Q1 2010
11.	Improve NCA engagement with the public	NCA	Q1 2010
12.	Improve ISOC engagement with the public	ISOC	Q1 2010
13.	Ensure uptake of rebates and other provisions made for broadband internet access to educational institutions	GARNET, NCA	Q1 2010
14.	Improve infrastructure and facility sharing	NCA	Q1 2010
15.	Ensure localities have coordinated approach to development and enforcement of ICT infrastructure plan	Ministry of Local Government, EPA, NCA	Q1 2010
16.	Implement regulations that reduce or eliminate sub-standard ICT products and facilitate electronic waste disposal	EPA, Standards Board, Ministry of Communications, PSCC, NCA	Q1 2010
17.	Setup CERT to protect infrastructure and consumers	Ministry of Communications	
18.	Implement advocacy group	Ghana Connect	
19.	Develop voice-enabled internet access options	Ministry of Education, Ministry of Communication, GINKS, Ghana Connect, GASSCOM	
20.	Expand incubator program(s)	Ministry of Communications, Ghana Connect	
21.	Commercialise affordable, renewable, clean power sources	University Researchers, Ministry of Energy, Ministry of Communications	Q1 2010
22.	Implement tax incentives	GISPA, IRS, VAT, NCA	Q1 2010
23.	Build local hosting options	ghNIC, Ministry of Communication, GASSCOM, MTN	Q4 2009
24.	The establishment of an independent body recognized by government and responsible for conducting research, establishing realistic and attainable goals, lobbying with government and consumer education.	Ghana Connect	Q4 2009
25.	Ensure warnings and penalties are applied if polices	NCA, Ministry of	

| and legislature is not followed. | Communication | |

1. Reduce costs of international bandwidth

In relation to International Bandwidth, fibre service providers should develop graduated pricing schemes for international bandwidth. The impending competition in the international bandwidth market should provide operators and service providers with more international bandwidth vendor options in the near future. This should encourage current international bandwidth providers to consider reducing prices now to begin forging longer term relationships with their customers.

2. Utilise fibre capacities of mobile operators and other fibre capacity providers to effectively reduce prices

In relation to National Bandwidth, NCBC should adjust their pricing downwards to reflect a more reasonable rate of return on their infrastructure investment. Mobile operators who have fibre capacities should make their capacities available at competitive prices to introduce more competition into the market. Buyers should be made aware of the options with regards to national terrestrial fibre providers.

3. Ensure price breaks from international and national bandwidth cost reductions are passed onto last mile service providers and consumers

In relation to Last Mile bandwidth, price breaks from the supply chain (International and National bandwidth Providers) should trickle down to consumers. ISPs and Operators should reflect a more reasonable rate of return for their infrastructure investment.

4. Encourage 'Made in Ghana' products and services

Government should direct Ministries, Metropolitan, Municipal and Districts Assemblies (MMDAs) to give preference to locally manufactured products and services.

5. Encourage reduction in licensing costs

NCA should be encouraged to reduce the price of operating licences.

6. Reduce or eliminate taxes for providers of broadband internet and related equipment

Government should review taxes incurred by the broadband supply chain and move towards tax reduction or elimination. Service providers and operators should study, understand and take advantage of existing tax laws and codes that will help reduce their tax burdens.

7. Separation of wholesaler and retailer functions of telecommunications companies

The Parliamentary Select Committee on Communications should provide stronger oversight on the separation of broadband wholesaler and retailer functions of telecommunications companies.

8. Increase financing schemes available for internet-enabled devices

Local financing organisations should provide financing schemes that will aid in the penetration of internet-enabled computing systems, and the Government of Ghana should support those organisations in doing so.

9. Review of NCA regulations to ensure they drive broadband internet penetration

NCA agrees to review the application conditions for broadband wireless licences including rollout requirements, percentage requirements for minimum Ghanaian ownership and others, in order to ensure that these requirements drive broadband penetration. Specifically, the NCA agrees to consider scaling down the five-year wait before

licensed broadband wireless operators can carry voice traffic.

10. Stronger engagement between associations such as GISPA, ISOC and GARNET with NCA

Associations, particularly GISPA, ISOC and GARNET agree to have stronger engagement with the NCA. Though members of these groups may be in competition with one another, it is advised that these groups should be well organized in order to have effective engagement with the NCA.

11. Improve NCA engagement with the public

NCA agrees to improve its engagement with the public through use of public forums.

12. Improve ISOC engagement with the public

ISOC should better engage with the public including educating the public to directly engage service providers on concerns of inadequate or poor service quality.

13. Ensure uptake of rebates and other provisions made for broadband internet access to educational institutions

GARNET should work with NCA to understand the regulatory provisions made for service to educational institutions, and provide advocacy for the uptake of those provisions.

14. Improve infrastructure and facility sharing

NCA agrees to drive policies related to infrastructure and facility sharing, as it is believed that this will reduce costs.

15. Ensure localities have coordinated approach to development and enforcement of ICT infrastructure plan

The Ministry of Local Government working with the Environmental Protection Agency (EPA), with local authorities including those authorities for roads, highways, energy, water, police and so forth, and with recommendations from the NCA, should ensure that ICT infrastructure plans exist for their areas. These responsible parties must work together to eliminate fibre cuts. Indeed, the responsible parties should work with other MDAs and the Government of Ghana to develop specific legislation for Telecoms infrastructure, so that it will be protected against damage, vandalism and threats.

16. Implement regulations that reduce or eliminate sub-standard ICT products and facilitate electronic waste disposal

EPA and Standards Board should develop regulations that clearly define what constitutes sub-standard ICT products and programs should also be developed to ensure there is education of these regulations. Additionally, the matter of the disposal of electronic waste must be addressed with effective policies and education, and a clean-up exercise must be implemented as part of implementing these standards of policies.

17. Setup CERT to protect infrastructure and consumers

The Ministry of Communications should quickly set up a Computer Emergency Response Team (CERT) in order to protect the infrastructure and consumers from internet security threats, risks and other breaches.

18. Implement advocacy group

In order to develop a holistic reviewing system, Ghana Connect should become an advocacy group to ensure all e-

initiatives are implemented within a reasonable timeframe.

19. Develop voice-enabled internet access options

Local software and hardware developers should be encouraged to develop more voice enablement options for Ghanaians to access the internet.

20. Expand incubator program(s)

The Ministry of Communications should expand the Incubator Program to include matured companies, and should fast-track the implementation of the program. Ghana Connect should become more involved in the project.

21. Commercialise affordable, renewable, clean power sources

There should be further development and commercialisation of affordable, renewable, clean power sources. Furthermore, Community Information Centres (CICs) and MMDAs, should be encouraged to use these technologies.

22. Implement tax incentives

There should be the creation of tax incentives and packages for ISPs and particularly for those ISPs who provide bandwidth to Internet cafes.

23. Build local hosting options

The responsible parties should speed up the development of the local internet registry so that more websites and email addresses are hosted locally. If more content and applications are hosted within the country it will reduce the internet traffic that leaves the country and as a result reduce international bandwidth costs.

24. The establishment of an independent body recognized by government and responsible for conducting research, establishing realistic and attainable goals, lobbying with government and consumer education.

1.   An Independent body with no conflict of interest and made up of end-users, should be established and recognized by government. It is the recommendation of the workshop participants that there be nine (9) members in this body. Further details of this body follow. (Responsible: Ghana Connect. Target Date to complete: Q4 2009). The Independent body will:

a.   Conduct research in each area of interest and will engage stakeholders and consumers based on these research findings in order to establish realistic and attainable goals.

b.   Organize demonstration workshops to educate consumers on broadband and Internet usage for their professional ventures. It will also make use of mobile tele-centres to ensure scheduled demonstration access for consumers on-demand. Stakeholders and supporters should help fund the workshops and mobile tele-centres because they will create new markets for them.

c.   Play a coordinating role in the activities of donors in this domain. It will also play a bargaining and lobbying role with the government and its agencies.

d.   Create an online forum and hold seminars and annual conferences as relevant. It will maintain discussion and action through its coordination role as well as through its conferences. It will meet quarterly and hold additional ad hoc meetings when necessary and engage with the media and stakeholders as relevant.

e.   Engage stakeholders including: NCA, Ministries of Communications, Information and Education, suppliers of bandwidth, GISPA, consumer groups, NDPC, GASSCOM, software developers (who are not members of GASSCOM), academic institutions and the police

| 2. | The exact role of Ghana Connect should be defined by developing a coherent and concise mission and vision statement as well as a list of stakeholders and stakeholder responsibilities. |

25. Ensure warnings and penalties are applied if polices and legislature is not followed.

There should be specific penalties for failure to comply with related policies and legislation. For example, warnings and penalties should be issued should ISPs keep rebates instead of passing those benefits onto the consumer. Warnings should be given initially followed by sanctions such as fines and suspensions. Suspension must be firmly implemented to ensure effectiveness. The NCA and Ministry of Communication will be responsible for establishing, monitoring and implementing the sanctions, and Ministry of Communications should empower NCA to carry out the sanctions.

Appendix A: Definitions

Broadband

The term *broadband* commonly refers to high-speed Internet access. The Federal Communications Commission (FCC) defines broadband service as data transmission speeds exceeding 200 kilobits per second (Kbps), or 200,000 bits per second, in at least one direction: downstream (from the Internet to the user's computer) or upstream (from the user's computer to the Internet). (www.fcc.gov)

Broadband is not only an issue of high-speed networks, it also provides a platform for interactive technologies that enable ordinary people to produce, share and distribute content on the Web as well as engage in commerce. The Internet is now a global trading platform enabling transactions in the billions of dollars daily. These technologies are likely to become as ubiquitous on mobile devices as they are on the Internet. This poses challenges and opportunities for local content and commerce industries to generate and distribute content as well engage in commerce with a broadband world.

Broadband can also help facilitate e-citizenship and e-governance and enhance relations between citizens and government to build and strengthen our democracy. Broadband Internet has enormous potential for strengthening community voice in public debate and decision-making and in maintaining transparency and accountability by government

Customer Premise Equipment (CPE)

Any terminal and associated equipment located at a subscriber's premises and connected with a carrier's telecommunication channel(s) at the demarcation point ("demarc") (Wikipedia). Broadband usage is negatively correlated to the cost of CPE because CPE is necessary to access broadband, so if the cost of CPE is too high, the consumer will not be able to access broadband. In Ghana today, CPE costs between $200 and $10,000.

Last Mile Bandwidth

The "last mile" is the final leg of delivering connectivity from a communications provider to a customer. In Ghana, many areas, particularly in the three northern regions, are not connected to the national grid.

e1

A 2.048 Mbps point-to-point dedicated, digital circuit provided by European telephone companies. An e1 line uses two wire pairs (one for transmit, one for receive) and time division multiplexing (TDM) to interleave 32 64-Kbps voice or data channels. As at 2004, an E1 (2 Mbps) connections to ISPs was available from Accra to Portugal for US$12,000 a month. The local loop connection in Accra was $500 a month. A one time charge of $2500 is imposed for a Cisco router[12].

Currently, the Ghana Internet Services Providers Association (GISPA) members buy a dedicated e1 (which is 8 x 256 kilobits per second) from Vodafone's (Ghana Telecom) SAT3 undersea cable at $4500.

SAT3

Currently owned by Vodafone Ghana, this is an undersea cable that links Accra to Portugal. This service is effectively operating as a monopoly.

GLO-1

Undersea cable that links Accra to London and is due to be available in 2010.

Main One

Undersea cable that links Accra to Portugal and is due to be available in 2010.

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[12] Global diffusion of the Internet IV: The Internet In Ghana, 2004, pg. 10

Appendix B: Discussion and Comparative Analysis

Discussion 1: Tunisia

Project Name:	ICT in Tunisia: National Strategy
Objective:	To develop the communications sector
Brief Discussion:	The concerns that prompted Tunisia to propose, in 1998, the organization of a World Summit on the Information Society (www.smsitunis2005.tn) underlie the Tunisian strategy adopted for the development of the communication technologies sector. This strategy revolves around the following axes : ▶ Developing, modernizing and making use of the new technologies, in order to establish a communications infrastructure that meets the needs of an economy increasingly based on knowledge, especially with the reinforcement and extension of fixed and mobile telephone infrastructures and the development of data transmission networks through the use of the available modern technologies ▶ Consolidating the organizational and regulatory platform in order to ensure the openness of the sector to competition, especially with the reinforcement of the regulation function and the consolidation of the presence of private operators ▶ Reinforcing the human, technical and technological capacities, by promoting research, academic training and continued training, and through a wide dissemination of the digital culture that contributes to the establishment of the information and knowledge society ▶ Developing a network of innovative and high-performance enterprises with high added value, capable of achieving integration within the global market and of making Tunisia a regional technological pole of excellence.
Outcomes:	▶ Opening the Tunisian telecommunications market to competition, after granting the first concession for the installation and operation of a public digital mobile telephone network, and a second concession for the installation and operation of a public network for data transmission via satellite (VSAT). ▶ Changing the legal form of the National Telecommunications Office from a public non-administrative establishment to a limited company. ▶ Transferring 35% of the capital of the national telecommunications company to a strategic partner TCOM-DIG. ▶ Reducing the fees due to the Ministry of Communication Technologies (ICT development fund), set at 5% of the incomings, while including the VAT within the total fees. ▶ An Internet network covering the entire country, with 12 Internet Service Providers (7 public and 5 private), ▶ Generalized ADSL access all over the national territory; ▶ VSAT satellite technologies for areas not covered by terrestrial networks; ▶ An Internet access through the currently operational mobile networks ; ▶ A Wireless WI-Max network, established since 2007,covering all the national territory. ▶ Use of modern vocal transmission technology IP; ▶ A public satellite telecommunications network managed by a public operator and a private operator. ▶ An international bandwidth of Internet with a capacity of 8,75 Gb/s;

▶ 369 000 internet subscribers ;

▶ 2340000 internet users ;

▶ 6357 web sites ;

▶ A data transmission network using various technologies: RNIS, X25, Frame Relay, ADSL, LS (192000 subscribers).

E-health :

▶ Development of a website offering access to a database on school and university medicine, basic healthcare, environment protection, and family planning;

▶ Implementation of a number of projects in remote medicine, allowing several hospitals to participate in videoconferences, to make remote diagnoses, and to have access to remote-pathology service;

▶ Development of a hospital computer system, through the reinforcement of applications of analysis and imagery laboratories, the management of consultations, and the follow-up of medical equipments in 34 regional hospitals;

▶ Development of a preventive computer system through the use of applications related to school and university medicine, basic healthcare protection, and environment protection.

E-learning :

▶ The virtual school : a project tested since 2002, and is being gradually generalized;

▶ The virtual school of the Tunisian Post: It offers continued training to the staff of the Office National de la Poste (www.postelearning.poste.tn). In 2006, nearly 1600 cadres and employees, i.e. 27 % of the staff of the Office, received online courses;

▶ Online enrollment : the website offers students the possibility to register in 188 higher education institutions. 320,000 online registrations have been made for the 2007-2008 academic year;

▶ The virtual library, devoted to the sector of communication technologies (www.emaktaba.tn). The content of this library is currently being scanned and digitalized.

E-commerce :

▶ Authentication of electronic documents and signatures;

▶ Platform of electronic signature: PKI infrastructure;

▶ Platform of electronic payment : cash cards, electronic purse and e-dinar;

▶ Enactment of an adapted legislation: Law of August 2000 on electronic transactions and commerce.

Basic ICT training :

▶ Establishing five higher education institutions for the training of ICT specialists in 14 fields of specialization;

▶ Pursuing the generalization of computer teaching in all higher education fields of study, in line with the orientations of the national university innovation program ;

▶ Creating a training Masters for computer security specialists, and complementary training cycles in computer security ;

▶ Increasing the number of students enrolled in ICT specialties. (50000 in 2007-2008; i.e. 13% of the total number of students) ;

▶ Reinforcing ICT specialists training, with 8000 graduates in the 2006-2007; i.e. 13,2 % of the total number of new university graduates.

ICT teaching :

	► Launching the virtual university experience in 18 higher technological studies institutes (ISET);
	► Continuing the integration of ICTs within the curricula of all education cycles, through creating a computer specialty in the 2nd year of secondary education, and a computer science specialty starting from the 3rd year of secondary education, and integrating ICTs in the two cycles of basic education.
Sources:	http://www.infocom.tn/index.php?id=197

Discussion 2: USA

Project Name:	**Broadband Technology Opportunities Program**
Objective:	To establish a grant program designed to increase broadband penetration and adoption in unserved and underserved areas of the United States.
Brief Discussion:	Funded at $4.7 billion, BTOP provides grants to support the deployment of broadband infrastructure in unserved and underserved areas, to enhance broadband capacity at public computer centers, and to encourage sustainable adoption of broadband service. Through this support, BTOP will also advance the Recovery Act's objectives to spur job creation and stimulate long-term economic growth and opportunity. There initiatives are currently being carried out by National Telecommunications and Information Administration Currently, NTIA is working with the FCC and RUS on the mapping initiative. They are currently assessing grant applications and will begin awarding grants during the fourth quarter of 2009.
Outcomes:	
Source:	http://www.ntia.doc.gov/broadbandgrants/quarterly.html

Appendix C: Stakeholder Analysis

Who Are They?	Incentive Factors
Government's Implementing Agencies	► Information will flow more effectively between implementing agencies and centrally-based authorities
Small and Medium Businesses	► Improved access to market-information ► Improved access to the national and global market
District Assemblies	► Improved access to up-to-date information
Internet Service Providers	► Increased potential customer-base ► Decreased production costs in the long-run
Healthcare Centres	► Improved access to up-to-date information
Educational Centres	► Improved access to up-to-date educational resources
All Ghanaian Citizens	► Improved access to information and opportunities ► Improved global and local communications
Foreign Investors	► Return on investment in the short and long term
Research Institutes	► Improved access to up-to-date research and methodologies ► Increased dissemination of research-findings to other research institutes and potential users/beneficiaries of the research