

A Case For Public Financing Of Broadband Internet Infrastructure In Ghana

Patrick Ohemeng Gyaase, Augustine Takyi

Abstracts: Ghana identified Information and Communication Technology as an indispensable tool for economic development in the ICT Policy for Accelerated Development (ICT4AD). Since then several ICT related policies have been adopted among which is The National Communication Policy (Government of Ghana, 2004) and The National Broadband Policy. Since high speed Internet connectivity is key to the success of these policies, the targets set these policies may slip by unless policies relating to broadband communication infrastructure and funding strategies are put in place. Lack of funds has been cited as the reason for lack investment in the broadband infrastructure. The government of Ghana has resorted to borrowing and private investment for such vital infrastructure. These methods have evidently not solved the problem of underdeveloped broadband infrastructure. This paper looks at the state of Internet connectivity in Ghana and makes a case for public financing. It then proposes two sustainable funding sources namely the Communication Service Tax (CST) and Proportionate licensing fees scheme. It also outlines the likely challenges to the use of the proposed funding schemes and concludes that a non-credit funding sources such as suggested would yield more benefits from wide spread broadband deployment in Ghana.

Index Terms: Broadband Infrastructure, bandwidth, fibre optic, Public Financing, Wireless Broadband

I INTRODUCTION

Continuing dramatic improvements in Information communication technologies and allied services is transforming many economies from industrial to knowledge based. There is the need to understand the key drivers for this transformation in order to formulate relevant policies and strategies to tap into the potentials they present [1]. Among the key drivers of this knowledge based economies is the development, deployment and use of high speed broadband telecommunication networks as the key information infrastructure [2]. Broadband refers to telecommunication in which a wide band of frequencies is available to transmit information. Because a wide band of frequencies is available, information can be multiplexed and sent on many different frequencies or channels within the band concurrently, allowing more information to be transmitted in a given amount of time. The Organization for Economic Cooperation and Development (OECD) work considers a downstream access of 256 kbps and upstream access of 128 kbps as broadband. These were the most common speeds offered by Digital Subscriber Line (DSL) in OECD countries [3]. With improvement in the multiplexing technology, broadband speed has improved tremendously up to 50 mbps [4].

1.1 Types of Broadband Infrastructure

There are various types of broadband infrastructure in use throughout the world while a few innovative ones are being pioneered with the aim of increasing broadband internet connectivity and reducing the cost of deploying this vital infrastructure. Among the common ones in use are;

- i. **Asynchronous Digital Subscriber Line (ADSL):** ADSL is the most common form of broadband. Provided over fixed telephone networks, it is often up to 40 times faster using a standard telephone dial-up connection to the Internet (www.scotland.gov.uk, 2010). There are various packages of ADSL packages being deployed in the developed countries among which are ADSL+ with technical speed of up to 8 Mbps and ADSL2+ with speed of between 16 Mbps to 24 Mbps depending on the proximity to the telephone exchange [5]. One of the main benefits that ADSL broadband offers home users is that the one telephone line can be used at the same time for Internet access and telephone calls - although you will still have to pay for the actual cost of any telephone calls you make. ADSL is currently being provided by Vodafone Gh Ltd in Ghana.
- ii. **Cable Modem:** Cable television companies can offer Cable modem broadband. Cable modem broadband uses the same cabling in the area where a particular cable television cable company provides telephone and TV services [6]. Cable modem can deliver between 20 Mbps and 50 Mbps [5]. Cable modem broadband is not currently available in Ghana to the best of my knowledge.
- iii. **Fixed Wireless:** Fixed wireless broadband may be delivered to areas where access to other broadband technologies are not currently commercially or technically viable such as rural hilly and isolated regions. Radio signal is used for transmission which provides similar broadband speed. Fixed wireless broadband requires an aerial fitted to the premises with line of sight to the wireless base station which provides the focal point for sending and receiving broadband signals [6].

- Author is Phd Fellow at Center for Communication, Media and Information Technologies (CMI), Aalborg University Copenhagen, Denmark
- Co-Author is Head of Computer Science Section Sunyani Polytechnic, Sunyani

Fixed wireless broadband is a relatively new form of broadband service and holds the key to the provision of broad services in the developing countries where cabling is expensive.

- iv. **Satellite (A Very Small Aperture Terminal (VSAT)):** Satellite broadband is delivered to areas where other broadband technologies are not currently commercially or technically viable and land base infrastructure is not widely available especially in the developing countries [7][8]. Satellite broadband uses a dish fitted to the outside of the premises to link up with a satellite in geo-stationary orbit. The technology works and it has been used and still extensively used in Ghana as it does not depend on a land-based infrastructure[9].
- v. **Fibre- To- The -Home (FTTH):** Fibre To The Home also known as FTTH is Fibre Optic cable being installed from the telephone exchange to the Home and is used to deliver communications such as broadband, digital TV and telephone. Fibre Optic Cable can be installed to replace existing copper wire that is used to originally transfer data from the telephone exchange to the home or premises. Fibre Optic cable offers connection speed of between 50Mbps and 10Gbps which is why fibre broadband is the future to next generation broadband [10].

1.2 Terrestrial Mobile Wireless Internet Infrastructure

- i. Standard mobile subscriptions which can be used to make an Internet data connection via IP. To be counted, the subscription must allow access to the Internet via HTTP and must have been used to make a data connection using the Internet Protocol[11].
- ii. Dedicated MobileData Subscriptions: Subscriptions to dedicated data services over a mobile network which are purchased separately from voice services either as a stand-alone service (modem/dongle) or as an add-on data package to voice services which requires an additional subscription [12].
- iii. Wi-Fi, except for the rare cases when Wi-Fi is used as the transport technology for a fixed wireless Internet service provider. The lines supporting Wi-Fi hotspots are already counted once in the fixed-broadband subscriber methodology.
- iv. WiMAX is an IP based, wireless broadband access technology that provides performance similar to 802.11/Wi-Fi networks with the coverage and QOS (quality of service) of cellular networks. WiMAX is also an acronym meaning "Worldwide Interoperability for Microwave Access [13]. WiMAX is a wireless digital communications system, also known as IEEE 802.16 that is intended for wireless metropolitan area networks. WiMAX can provide broadband wireless access (BWA) up to 30 miles (50 km) for fixed stations, and 3 - 10 miles (5 - 15 km) for mobile stations. In contrast, the WiFi/802.11 wireless local area network standard is limited in most cases to only 100 - 300 feet (30 - 100m)[13]
- v. The more recent Long Term Evolution (LTE) standard is a similar term describing a parallel technology to WiMAX that is being developed by vendors and carriers as a counterpoint to WiMAX[13]

2 Benefits of Broadband Internet Connectivity

The benefits that a municipal broadband project bring to a community are large and numerous. As well as providing better quality of life through greater choice and quality of information communication and entertainment services, high speed broadband lays a foundation for increased productivity and economic development. The world is approaching a seamless communication with fibre connectivity allowing speeds of 100Mbit/s or even 1000Mbit/s in both download and upload directions. Such speeds will be delivered more reliably and with less operating cost and environmental impact than first telephone networks[11][6].

1.3 Economic Benefits

Countries, irrespective in their state of development are now involved in intense competition for investment and growth in a globalised economy. This is a challenge and an opportunity. While many traditional businesses and enterprises are attracted to the economies of scale offered by larger centres, many of the new opportunities in the knowledge economy are location agnostic, that is, as long as the location has world class connectivity. Increasingly the availability of high speed data connectivity will be a critical issue in deciding where people live and work, and where businesses choose to locate[14]. High speed broadband lays the foundation for increasing productivity and stimulating economic development. The availability of high speed broadband will attract knowledge workers and businesses that need large bandwidth, like call centres and engineering companies[15][16]. As well as benefiting larger businesses, high speed broadband connectivity would provide an improved environment for encouraging new, local, home-based business start-ups that operate over the Internet. Local technical jobs will be created to solve youth unemployment and also boost local entrepreneurship to prevent local youth not to migrate to the urban areas the cities to pursue career opportunities. Helping the local economy to prosper, such a network will retain local jobs and businesses. Investment in this infrastructure is an investment in local people, who will in turn support local businesses thereby reducing the rural urban drift with its attendant problems[17].

1.4 Social Benefits

High speed broadband offers opportunities for better lifestyles. With better connectedness people have better access to distant friends and family, more education and work options and often the on-demand nature of broadband allows people to better take control of their lives, to work and play according to their own schedules[3][10]. On cities like Accra and Kumasi, High speed Internet connectivity translates into much increased less congestion and pollution as new families of knowledge workers and telecommuters will be not be compelled to move away from their communities into these cities thereby reducing traffic, housing problems as well as sanitation problems.

1.5 Benefits to Healthcare (E-Health/Tele-Medicine)

With an active and technologically savvy community of health professionals health care delivery stands to gain enormously in terms of the advanced

medical opportunities that could be realised through an advanced broadband network through an enabling environment for E-health delivery[18]. Enabling advanced Tele-health services not only mean residents of cities could get better access to specialist services that were otherwise only available after a long road trip to a larger centre, but also locally resident specialists may be able offer services to a much larger market without feeling pressured to move away to big cities [18]. In Nuenen in Holland, which has had FTTH network for several years, a number of innovative services allow older people to live independently in their own homes. Fibre connectivity provides instant access to family, loved ones and professional care via video consultation and regular check-ins[15].

1.6 Educational Benefits

High bandwidth network means that effective education cannot only be obtained in the classroom and students all over the country would be able to fully engage in learning experience. Students in the rural areas would be able get access to a much larger range of education courses and experiences without having to relocate permanently. Likewise specialist researchers could be located anywhere in the world for research collaboration. Researchers and students can effectively take part in online academic conferences[19][11].

1.7 Environmental Benefits

There are practical applications for more reliable broadband networks to help reduce carbon emissions. Robust infrastructure enables tele-commuters and tele-workers to take advantage significant and measurable cost savings by reducing travel and fuel consumption by utilising telecommuting and video conferencing to create substantial cost savings and productivity enhancements[17][20].

3 State of Internet Connectivity in Ghana

In general, Africa is the continent with the lowest penetration of broadband internet and Ghana is no exception, and also the region where the formulation of ICT strategies has taken place at the slowest pace[21][22]. In terms of broadband connectivity Ghana like many African countries has very low access. Some improvement is being experience with the mobile phone companies providing some form of mobile broadband but the quality of access leave much to be desired. A cursory look at the plan[23] and the current state of internet connectivity confirms the fear of rural areas being excluded as the concentration of the plan is connecting all district capital, showing similar trend as mobile connectivity.

1.8 Cost of Broadband in Ghana

Average Installation fee: \$120 plus Subscription fee of \$65-\$1000 per month 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. Non-GISPA - \$8,000 While Non-ISP -\$12,000 [24]. Both the high cost of a

broadband connection and the price of personal computers puts broadband out of the reach of most Ghanaians. However with competition resulting from termination of a number of under-sea fibre gateways the wholesale prices of international bandwidths has dropped considerable while at the same time capacity has improved by about 65 times[25]. Barely two years ago, e1 bandwidth which Internet Service Providers (ISPs) bought for US\$4,500 now sells at less than US\$1,000. Notwithstanding this Internet users argue that the drop in the wholesale price at which the ISPs buy international bandwidth has not reflected in the retail price for end-users attributing this to the cost of distribution of Internet services inland[26].

1.9 Last Mile Bandwidth Services

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)[27]. 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[26].

1.10 Broadband over Power Line (BPL)

Allterra Gridline Communications Ghana Limited, a company that specializes in cost-effective broadband access, in partnership with the Volta River Authority, has commenced one of the first pilot tests of broadband over power line (BPL) technology in Ghana. The company achieved a successful transmission of data from medium voltage to low voltage lines, enabling every outlet in a subscriber's residence or office to become an Internet access point. By utilising the existing electricity grid as a medium for data transmission, the company can distribute high speed Internet access to offices through their patented modems which have plug and play functionality. The technology is significantly cheaper than other DSL, satellite and T1 connections. The equipment also allows for connection speed over 30 times that of the closest competitor, with a maximum throughput of 200 Mbps[12].

1.11 Mobile Broadband Internet Connectivity

Recently cellular networks have evolved to become a mainstream form of wireless Internet service providers. With an installed cellular network adapter, or by tethering a cell phone to a laptop computer, Internet connectivity can be maintained in any area with cell tower coverage[28]. Older cellular communication protocols allowed for only very low speed networking. Newer 3G and 3.5 cell technologies like EVDO and UMTS as well 4G technologies such as WiMax and LTE deliver speeds closer or more than those of DSL and other wired networks. Many cellular providers in Ghana now sell Internet subscription plans

separate from their voice network contracts[29]. Other ISPs such as IBurst and BusyInternet provides wireless internet services. Generally speaking, mobile broadband service will not function without having an Internet data subscription in place from some other Internet service provider[26].

1.12 National Bandwidth

With termination of various under-sea fibre at the beaches of Ghana, there is the need for connections to the various parts of the Country and currently this is been driven by microwave, satellite or terrestrial fibre to the various regions, regional capitals and districts. National Communications Backbone Company (NCBC) is the only terrestrial fibre infrastructure so must be regulated as an infrastructure provider with fair access and competition to all operators. NCBC is currently owned by Vodafone Ghana which has a ring in the southern sector as well as a central ring with a link to Tamale, which would form the northern ring [29]. The fear among the other telecommunication operators that Vodafone would use it to its advantage is compelling them to also invest in their Fibre backbone[30]

1.13 International Bandwidth

Over the last couple of years two more undersea fibre optic cable have terminated in Ghana in addition to the old SAT3 fibre cable, these are Glo1 from Globacom and Main One fibre cable which has open Ghana up to the rest of the world, this competition has already reduced the cost of internet connectivity tremendously and well as improvement in the speed [31]. MTN is also investing in one of the biggest cable system to ever land on the Africa continent and has 15 terminal stations which anchor along the western coast of Africa, including countries where MTN has operations such as Ghana[32]. However much needs to be done if broadband is to be widely deployed nationwide at competitive prices with the required useful speed.

SEQ Table * ARABIC

Year	Estimated Users	Total Population (Million)	% of Population
2000	30,000	18.9	0.2
2006	401,300	21.8	1.8
2008	880,000	23.4	3.8
2009	997,000	23.8	4.2
2010	1,297,000	24.2	5.3
2011	2,500,000	24.6	10.3
2012	2,880,000	24.9	12.1
2013	3,568,757	25.3	14.0

Table 1: Estimated Internet users in Ghana (dial up and broadband); Source: Adapted from ITU and Ghana Internet Service Providers (GISPA)

4 The National Broadband Internet Connectivity strategy

To transform the current commodity based economy to knowledge economy as envisaged in the ICT4AD,[33][34]. Broadband telecom network connections will be needed in the workplace, home, schools and other centres of activity, just as the telephone is needed now. This new information communication infrastructure will be

the most important public utility of the 21st century economy[2][1]. The universal access requirements established during the telephone era will need to expand in the new knowledge economy to universal access to broadband Internet as people will need not only to communicate, but also access to a variety of public information more so when many governments are adopting E-government [35]. It is view of this that A national broadband strategy has been put in place the facilitate investment and deployment of Broadband Internet Connectivity. The key objectives of the draft National Broadband Strategy are:

- i. To achieve broadband penetration of 10% annually between 2010 and 2015 to ensure 50% Broadband penetration rate from current 0.2%;
- ii. Increase broadband bandwidth from 256 kilo bytes per second (kbps) to 2 megabytes per second (mbps) between 2010 and 2015[23].
- iii. Reduce Customer Premises Equipment (CPE) and Personal Computer cost by 90%

It is envisaged that the achievement of the above objectives will be contribute about 6.9% to our GDP growth over five years, and approximately one in every two Ghanaians would have broadband access[36][31]

1.14 Funding Strategies for Broadband Internet Connectivity

Although the Ghana Broadband policy does not specifically state the funding strategy for such nationwide deployment, studies have outlined the various alternative funding mechanisms including;

- i. Public funding program and investments.
- ii. Investments by private companies other than telecoms operators.
- iii. Funding through non-profit organizations.
- iv. Public private partnerships (PPP).

Given the crucial broadband access plays in economic development of countries, it not surprising that developing countries are exploiting the various means to deploy such infrastructure. In Ghana, The preferred choice has been the investment by the Telecoms Operators and Public Private Partnerships[37]. Public-private partnership (PPP) has been promoted as a novel way optimally allocating resources in terms of funds and expertise for the expansion of telecommunication Infrastructure not only in the developing countries but also in the developed countries[38]. Public Private Partnership (PPP) has been variedly defined depending on the domain of the study. It has been defined as contractual agreement or a cooperative venture between the public and private sectors with shared objectives for the provisioning of public infrastructure or services which otherwise should be provided by the public sector, built on the expertise of each partner, which best meets clearly defined public needs through the appropriate allocation of resources, risks and awards[39][37]. The promotion of PPP gained attention due to the market failures and the need of the public sector to correct the distortion in the markets such as public sector helping to build communications infrastructures where the returns on investment are considered too low to attract private operators[40]. In spite the massive privatization of

the telecom sector, the public interest in the extension of communications infrastructure remains high as this infrastructure constitute society's communication backbone. This therefore call for the public funding where private capital is not investing sufficiently to cover the communication needs as currently pertains in Ghana[26]. The traditional use of PPPs as alternative funding mechanisms foretending infrastructure to areas where profitability is considered low have gone in the opposite direction hence finding private capital to fund public investments in areas as profitable as national communication backbone [37]. While using PPP to fund Telecommunication infrastructure has some benefits, it has been beset with challenging economic-legal issues such as conditions for direct public intervention in terms of performance expectations, potential distortions of competition and crowding-out of private investments and more critically the framework needed for these partnerships to thrive[41]. Although in the short term public private partnerships may improve short-term cost performance in several policy sectors, the long-term calculations are more complicated and could shift the balance in the other direction. Moreover evidence that public-private partnerships can increase access or successfully provide services to vulnerable populations, or that they inevitably improve accountability is vague especially in the developing countries[42]. Finally, public private partnership can introduce greater complexity for developing countries where the maturity of institutional and legal frameworks facilitating PPP is at its infancy[41].

5 A Case for Publicly Funded Broadband Internet Connectivity in Ghana

Of the funding instruments available for broadband connectivity in Ghana and for that matter developing country, supply stimulation through public funding of infrastructure investment is proving the most daunting giving their dependence on donors and adherence to donor prescriptions. However even the most ardent market oriented economies still use public funding in developing telecommunication Infrastructure. In the United States, the government introduced the federal and rural broadband access loan and loan guaranty program. Several regional programs involving public funding also exist[39] In funding the broadband strategy above, the government has two options: The government could wait for serious bottlenecks and areas of insufficient investment to appear before investing, or choose to invest as a way to attract economic activity. In the case of broadband network, the significant time lag between identifying a bottleneck and building a network can delay the vital economic gains, given its positive spillover and network effects. Broadband platform has proven particularly successful in facilitating and creating new private sector activities[15]. Therefore, timely public spending in broadband infrastructure can realize immediate economic and social transformation[43][20]. For this reason broadband infrastructure should be seen as a means not only to enhance service provision to the citizens and to improve communications among people but also to improve the productivity of other economic sectors and the efficiency of the public sector. Many Governments have also identified broadband as a competitive tool that would enable their countries to attract international businesses

and to position their country in the hierarchy of countries internationally. In this globalized environment where countries competing for private capital, it is becoming apparent especially in the developing economies that the private sector is not moving ahead fast enough[40]. In addition, there is the issue of remote and difficult to reach areas where it may not be profitable for commercial operators to build broadband connectivity as has been witnessed even with mobile communication[16]. Some lessons can also be drawn from the experience of mobile services where the market has been able provide wide coverage and is a powerful mechanism for near-universal service distribution however certain rural communities are still not connected since they are deemed not profitable by the market(Currie, 2008). High speed broadband connectivity leads to economic growth. Various studies have confirmed the impact of the expansion of access to broadband infrastructure on a country's economic development among which is a 2009 World Bank Information and Communications for Development analysis of the impact of broadband on growth in 120 countries from 1980 to 2006. It indicated that each 10 percentage points of broadband penetration results in 1.21% increase in per capita Gross Domestic Product (GDP) growth in developed countries, and 1.38% increase in developing countries[15]. Lessons from the developed countries show that even in the matured markets, governments have included measures to expand broadband access and to bolster connection speeds in their planned economic stimulus packages in this era of global economic downturn[15]. Most of these plans seek to speed up existing links to build faster fixed-line and wireless next-generation networks. Another common goal is to expand broadband connections to rural areas where they are currently unavailable, in some cases considering turning broadband into a universal service[16].

Country	Amount To Be Invested (US\$)	Targets
Australia	30 billion	90% broadband penetration at 100Mbps
European Union	1.3 billion	100 % Broad band Coverage
Finland	265 million	Rural coverage at 100 Mbps by 2016
Germany	67 billion	above 75% households at 100Mbps by 2018
USA	7.2 billion	cover underserved and improve Services
South Korea	24.6 billion	1 Gbps by 2012, would create 120,000 jobs

Table 2: Amount of Public Funding of Broadband infrastructure from 2008. Adapted from Qiang, 2009 from various sources.

It is therefore imperative for the government to actively invest in broadband infrastructure if really Ghana wants to benefit from the rapid development of Information Communication Technology not to mention the revenue that would be accrued from the use of such infrastructure by private telecommunication companies. For a developing country like Ghana therefore public funding strategies for infrastructure are essential if the widespread deployment and use of broadband internet could be achieved to transform the economy from commodity based to knowledge based. The resources available to the private sector alone might be insufficient to provide the

infrastructure required as well as regulatory challenges, duplication of infrastructure as well trade disputes as witnessed in Telecommunication sector calls for public investment in passive broadband infrastructure in Ghana[44]. Public Private Partnership projects sometimes defeats the objectives of public funding since the private partner would like to recoup its investment as soon possible thereby affecting the pricing of the end product and hence public access. The slow pace of the Wimax Deployment and its concentration in the large cities in Ghana are ample evidence of the ineffectiveness of this funding strategy towards the achievement of universal access to broadband Internet connectivity[25]. The government of Ghana has taken certain initiatives in this direction. For instance the government has signed a USD150 million contract with Chinese equipment manufacturer Huawei Technologies for the supply of advanced telecoms infrastructure to ensure broadband internet access countrywide within the next two years[9].

6 Proposed Sources of Public Funds

Using loans to finance broadband infrastructure seem attractive to many African governments at the moment, the need to pay back this loan with interests might siphon the returns on the investment of this vital infrastructure to the financiers. This paper is therefore suggesting non-credit funding sources in order to ensure the optimum benefit of such investment in broadband infrastructure.

1.15 Using the Proceeds from the Communication Service Tax

Public investment in passive broadband infrastructure may be another important area where governments could increase access to broadband Internet connectivity. Rather than becoming a network owner, government funding could be used to install passive infrastructure that represent the highest-cost portion of new network investment[38]. In addition, government investment in passive infrastructure may be more efficient than private sector because governments have access to all necessary rights-of-way. Maintenance of the passive infrastructure could be written into the contracts of any operators using it[19]. The notion of governments playing a role in funding ICT sector development is not new, but its application has been controversial. Financing by the state has historically been linked to the ownership and operation of public assets, which reduces independence and increases investment risk. Currently the government has established Ghana investment fund for Electronic Communication (GIFEC). The main objective as provided for in the Act is to provide financial resources for the establishment of universal service and ensure access to ICT and basic telephony, by rural communities in Ghana. This includes facilitating and providing internet, multimedia, broadband service to un-served and underserved rural communities[27]. The Communication Service Tax was introduced by an act of Parliament CST Act 2008, Act 754 which would be paid by consumers to communication service providers would attract charges on internet, broadcasting, cable, maritime and satellite services as well as other services provided through transmissions or signals to produce sounds or visual images. All communication service providers who had obtained a Class 1 Licence from the National

Communications Authority would be notified in writing by the VAT Commissioner before they could charge the Tax. Other free zone enterprises in addition to non-resident service providers also issued with the Class 1 licence would also charge the Tax. The rate of the Tax is 6% of the use of communication Service [45][46] Given the growth in the communication industry and the revenue from the Tax can provide the much needed finance for the provision of Broadband Internet infrastructure to achieve the objectives of Gifec. The Tax had accrued up to GHC 114 Million as at December 2009 (www.ghanamma.com, 2011). Currently it is reported that 20% of the Communication Service tax is used to support the National Youth Employment Program[45][47]. Given the growth that would result from the investment of this amount, a more permanent and quality jobs would be created for the youth rather than the stop gap job that the funds are used to support at the moment.

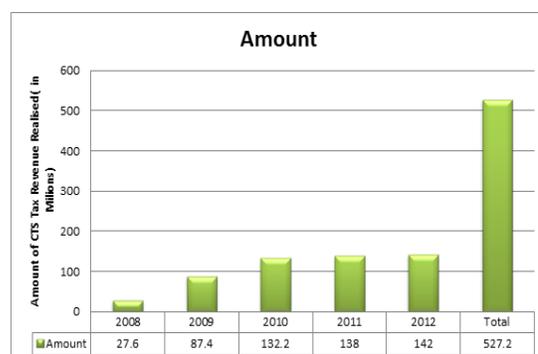


Figure 2 : Proceeds from Communication Service Tax, from 2008 – 2011; Sources: Ghana Internal Revenue Service (CST Desk, GNA, 2011)

1.16 Levying proportionate licensing fees by the National Regulatory Authority (NCA)

Many of the current fees for licences, spectrum, numbers and other resources were arrived at a while ago. Auctioning and fixed licensing fees have been used in the allocation of spectrum licensing. This paper suggests that maybe a fixed fee ought to be waived in favour of recurring fees charged on an annual basis, often as a percentage of revenue generally between 2.5 – 5 % to fund broadband infrastructure especially in areas where the deployment of such infrastructure is not commercially viable[38]. The total revenue from communication services in Ghana for 2010 is estimated at 2.2 billion Cedis¹. 2.5% of this amount would yield about 55 million annually for investment high speed broadband Infrastructure. This licensing scheme has all the advantages in terms of revenue as the Communication Service Tax. In addition it would free up initial capital required or for license renewal for the communication companies to invest in their last mile services.

1.17 Revenue from the Telecommunication Fraud Project

The Electronic Communication Amendment Act, Act 876 fixed incoming international call termination tariff at 19 cents per minutes, out which the state got 6 cents per minute in taxes to the regulatory Authority (NCA). The National Communication Authority (NCA) is said to have generated

revenue in excess of \$143 million from telecom fraud management project implemented two years ago in conjunction with Global Voice Group (GVG) from June 2010 and June 2012, and the NCA boss said that figure was more accurate[48]. With monthly revenue in Excess of Six Million US Dollars, the government can use this for the purpose of developing high speed Internet infrastructure.

1.18 Fines and fees of the telecommunication companies for non-performance

The National Communications Authority (NCA) undertakes a monthly analysis of Quality of Service (QoS) in accordance with the Cellular Mobile License Obligations. The QoS indicators and their respective thresholds are assessed on users' perspective [49]. Telecommunication companies who do not meet these Quality of Service thresholds are fined. Over the last few years, various fines have been imposed on the telecom companies which have accrued thousands of dollars[50]. These fines could also be used to supplement the other sources mentioned for public investment in high speed broadband infrastructure in Ghana.

7 Benefits of sources recommended

The above funding sources are recommended due to the many advantages that they offer and their sustainability. First it is a very reliable revenue source since it is tied to consumers' communication services demand and the demand for communication service is rather on the increase. This growth potential of the Communication Service Tax (CST) revenue very high as both mobile and internet penetration increases, so is their usage and therefore the amount of revenue that would be generated from the tax. There is minimal risk of default and the monthly returning nature of the tax revenue some of these sources means there can be continual funding of Broadband infrastructure until nationwide coverage is achieved. The multiplier effect of using these funding sources to provide broadband infrastructure in turn would result in increasing usage of the internet for other economic activities and therefore the tax revenue growth that can be used for continuous improvement and expansion of other infrastructure. Since they are not another borrowing, they would not attract any interests hence the country would be saved from debt. One would ask what happens to the Youth employment program and other uses for these funds currently applied? The economic growth that would result from the expansion of broadband connectivity and revenue that would accrue from the access to the high speed broadband infrastructure by Telecommunication Company would provide the needed revenue for such projects and would offer more quality jobs for the youth rather than some of the temporal support that the youth employment program offers currently.

8 Challenges for Public Funding

To Use the above funding sources, cooperation of the communication companies would be essential. The government must be able to articulate its value proposition especially with regards to recurrent license charges given some level of resistance that greeted the communication service tax in 2008[51]. Political Will to formulate and coordinate the appropriate policy, and to create and sustain

a coalition strong enough to implement that policy effectively over the time required, given the nature and severity of the operational challenge by not succumbing to vested interest and lobbying. Policy Continuity even when there is change of government. In Ghana, change of government has resulted in changes in policies and other programs sometimes for political expediency rather than the merits. Regulatory and legal frameworks for government to own such infrastructure should be put in place in order to engender confidence, fairness and equal access to all the players in the sector in addition to an effective business model to ensure that the country achieves the optimum benefit from its investment[52]. Transparency, accountability and efficiency of the regulatory institution is important strategic and technical competence of regulatory and judiciary institutions to apply substantive regulatory standards (spectrum allocation, price caps, cost and tariff standards) [8]

9 Conclusion

Even though ICT policies and plans abound in Ghana, lack of funding and effective utilization of the little funds available is hampering the wide spread provision of broadband infrastructure. Two funding complementary strategies have been outlined and the consistency of the approach is important for overall achievement of any success. The strategies outlined can be combined and would require coordination between policy-making agencies including regulatory agencies, legislators in charge of tax policy and other stakeholders of the industry. Although consistent policy design in the ICT environment is challenging, it has the potential to result in better approaches to the provisioning of broadband infrastructure and hence access to if not all, greater number of Ghanaians. This paper opines that the prospects of using the two funding sources are great and the challenges therein are surmountable.

10 Bibliography

- [1]. Willie Currie, "Introduction: Access to Infrastructure," Global Information society Watch, pp. 9-13, 2008.
- [2]. William H Melody, "Markets and Policies in New Knowledge Economies," in Oxford Handbook on ICTs., 2006, p. Chapter 3.
- [3]. OECD. (2010) <http://www.oecd.org>. [Online]. <http://www.oecd.org>
- [4]. ITU, "Measuring the Information Society – The ICT Development Index," International Telecommunication Union, 2009.
- [5]. www.broadband-advisor.co.uk. (2011) <http://www.broadband-advisor.co.uk>. [Online]. <http://www.broadband-advisor.co.uk>
- [6]. www.scotland.gov.uk. (2010) <http://www.scotland.gov.uk>. [Online]. <http://www.scotland.gov.uk>
- [7]. Ministry of Communication, "Community Information Centres (CICs) in the Age of ICT, Ghana's Blue Print for Action," Accra, 2004.

- [8]. Lishan Adam. (2008) www2.aau.org. [Online]. http://www2.aau.org/renu/ws/afren08/docs/broadband_africa.pdf
- [9]. ITU. (2009, August) <http://www.itu.int>. [Online]. <http://www.itu.int>
- [10]. [broadbandwatchdog.co.uk](http://www.broadbandwatchdog.co.uk). (2011) <http://www.broadbandwatchdog.co.uk>. [Online]. <http://www.broadbandwatchdog.co.uk>
- [11]. Rolf Künneke and John Groenewegen. (2010) <http://www.nextgenerationinfrastructures.eu>. [Online]. <http://www.nextgenerationinfrastructures.eu>
- [12]. Russell Southwood, "Trends in Technology," Global Information Society Watch, pp. 27-30, 2009.
- [13]. Wimax.com. <http://www.wimax.com>. [Online]. <http://www.wimax.com>
- [14]. Princely Ifinedo, "Measuring Africa's E-Readiness in the Global Networked Economy, A nine Country Data Analysis," , 2005.
- [15]. Christine Zhen-Wei Qiang and Carlo M Rossotto, "Economic Impacts of Broadband, In Information and Communications for Development 2009, Extending Reach and Increasing Impact," Washington, 2009.
- [16]. Christine Zhen-Wei Qiang, "Broadband Infrastructure Investment in Stimulus Packages: Relevance for Developing Countries," Info, vol. 12, no. 2, 2010.
- [17]. SANE Consulting Inc. (2009) <http://www.sane.ca>. [Online]. <http://www.sane.ca>
- [18]. Arne Kverneland, "National IT-strategy in the Danish Health Care System," Copenhagen, 2007.
- [19]. James Jeffrey, "Bridging the digital divide with low-cost information technologies," Journal of Information Science, 2001.
- [20]. Rahul Tongia, "Why is Connectivity in Developing Regions Expensive: Policy Challenges more than Technical Limitations?," Edinburgh, 2006.
- [21]. Rahul Tongia, "Connectivity and the Digital Divide – Technology, Policy, and Design tradeoffs for Developing Regions," in 34th TPRC, Pittsburg, 2006.
- [22]. Abiodun Jagun, "Regional Report; Africa," Global Information Society Watch, pp. 63-67, 2008.
- [23]. Ghanaconnect. (2009) www.ghanconnect.org.gh. [Online]. http://www.ghanconnect.org.gh/wp-content/uploads/2010/09/Ghana_Broadband_Strategy.pdf
- [24]. Jonnie Akakpo, "Rural Access: Options and Challenges for Connectivity and Energy in Ghana," Accra, 2008.
- [25]. NITA. NITA Website. [Online]. <http://www.nita.gov.gh>
- [26]. GISPA. (2012, Feb) GHISPA Web Site. [Online]. <http://www.gispa.org.gh>
- [27]. GIFEC. (2011) <http://gifec.gov.gh/>. [Online]. <http://gifec.gov.gh/>
- [28]. GNA. (2011, June) www.ghanaweb.com. [Online]. <http://www.ghanaweb.com>
- [29]. NITA, Implementation of E-government Network, 2009.
- [30]. MTNGhana. (2008) www.ghanconnect.org.gh. [Online]. <http://www.ghanconnect.org.gh>
- [31]. GNA. (2011, March) www.ghanaweb.com.
- [32]. Modernghana.com. (2009, September) www.modernghana.com. [Online]. <http://www.modernghana.com/news/236221/1/national-broadband-strategy-launched-in-accra.html>
- [33]. Clement K Dzionu, "An Intergrated ICT-Led Socio-Economic Development Policy Plan Development Framework," Accra, 2003.
- [34]. Governement Ghana, "The Ghana ICT Policy for Acelerated Development,(ICT4AD)," Accra, 2003.
- [35]. Colin Blackman and Simon Forge, "The future of universal service in Europe," Info, vol. 10, no. 5/6, pp. 152-165, 2008.
- [36]. Ghana Connect. (2009) www.ghanconnect.org.gh. [Online]. http://www.ghanconnect.org.gh/wp-content/uploads/2010/09/Ghana_Broadband_Strategy.pdf
- [37]. Ghana National Policy of Public Private Partnerships, June 2011.
- [38]. Johannes M Bauer, "Regulation, publicpolicy, and investment incommunications infrastructure," Telecommunications Policy, pp. 65–79, 2010.
- [39]. Morten Falch and Anders Henten, "Investment dimensions in a universal service perspective: next generation networks, alternative funding mechanisms and public-private partnerships," info, vol. 10, no. 5, pp. 33 - 45, 2008.
- [40]. Morten Falch and Anders Henten, "Public private partnerships as a tool for stimulating investments in broadband," Telecommunications Policy, pp. 496–504, 2010.

- [41]. José Luis Gomez-Barroso and Claudio Feijoo, "A conceptual framework for public-private interplay in the A conceptual framework for public-private interplay in the," Telecommunications Policy, pp. 487-495, 2010.
- [42]. Pauline Vaillancourt Rosenau, Public-Private Policy Partnerships. Cambridge MA: MIT Press, 2000.
- [43]. Christine Zhen-Wei Qiang, "Broadband Infrastructure Investment in Stimulus Packages: Relevance for Developing Countries," 2009.
- [44]. Monika Muylkens, "National e-Strategies for Development Global Status and Perspectives," 2010.
- [45]. Government of Ghana, Communication Service Tax Act 2008, Act 754, March 28, 2008.
- [46]. www.gra.gov.gh. (2008, March) www.gra.gov.gh. [Online]. <http://www.gra.gov.gh/>
- [47]. www.ghanamma.com. (2011, May) Ghana Mma.com. [Online]. <http://www.ghanamma.com>
- [48]. Samuel Nii Narku Dowuona. (2012, June) Myjoyonline Business News. [Online]. <http://business.myjoyonline.com>
- [49]. <http://www.nca.org.gh>. National Communication Authority Website. [Online]. <http://www.nca.org.gh>
- [50]. www.ghanabusinessnews.com. (2009, August) Ghana Business News. [Online]. <http://www.ghanabusinessnews.com>
- [51]. Cynthia Boakye. (2008, March) www.thestatesmanonline.com. [Online]. <http://www.thestatesmanonline.com>
- [52]. Sam Somuah, "E-GOVERNMENT IN GHANA AND THE ADOPTION OF OPEN STANDARDS: EXPERIENCES, CHALLENGES AND PERSPECTIVES," Accra, 2009.