Chapter 5
The Cost of Deploying a Successful Video Broadband Business in Africa and the Cost of Not Deploying: Domestic and Transborder Implications and Applications

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Introduction

Fixed broadband deployment has not experienced much growth in sub-Saharan Africa (SSA) in comparison to Europe and North America (see Fig. 5.1). Recent figures put it at approximately 2 persons in every 1,000 persons compared to 280 in North America and 260 in Europe.

Plausible explanations for this include (a) the absence and obsolescence of fixed network infrastructure in a majority of SSA countries; (b) the increase of mobile access which has taken over as the de facto communication infrastructure; and (c) the increased difficulty and spectrum requirement of using mobile technology for broadband growth and technological advancement.

Mobile broadband "leapfrogs" Africa's last mile infrastructure as indicated by recent uptake figures of nearly 4 per 100 inhabitants of active mobile broadband subscribers in Africa. However, policy, technical, and much broader developmental consideration should be paid to mobile networks in their present form if they are to carry the weight of present and projected bandwidth weight imposed by demanding applications and services.

In Williams' (2010) report "*Broadband for Africa*: *Developing Backbone Communication Networks*," the state of broadband deployment in Africa is conceived

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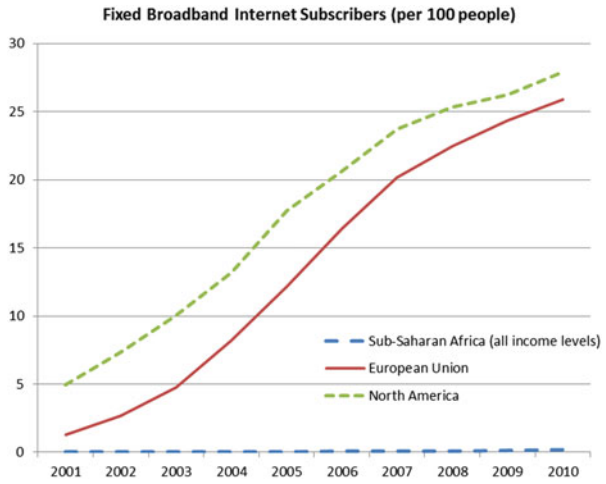

Fig. 5.1 Active mobile broadband subscribers per 100 inhabitants. *Source*: ITU (2011). Retrieved from http://www.itu.int/ITU-D/ict/statistics/material/excel/2011/Mobile_bb_11.xls

purely from a "supply and demand" viewpoint. This view argues for the "build and they will come" mindset which suggests that sufficient bandwidth supply will incentivize development and deployment of backbone infrastructure. A similar view is taken by the International Telecommunication Union (ITU 2012) and Kelly and Rissotto's (2012) leading to the argument for the establishment of (a) policies that create an enabling environment for infrastructure competition and (b) policies that stimulate rollout and deployment. As with most recent research on broadband, recommendations emanating from this view are focused on economic reforms concerning the:

- Removal of regulatory obstacles to investment and competition
- Reduction in the cost of investment
- Reduction in political and commercial risk
- Promotion of effective competition in the market
- Setup of competitive subsidy models
- Development of shared infrastructure/consortium models
- Employment of incentives based on private sector models such as universal service obligations (USOs)

This chapter argues that an economic-only point of view is necessary but insufficient to drive broadband deployment in SSA and that the cost of deployment (or not deploying) should encompass other equally important areas which may originally be perceived as uneconomically viable but are necessary even for sound economic principles to thrive. This chapter is structured into three large parts. The first part discusses the insufficiency of the present econo-centric view for broadband deployment by arguing that it places a limit on possible development of policies that are sustainable over the long run. In the second part, I present a more holistic model of viewing broadband and argue that policies should be based on other equally important development aspects than the present focus on economics.

In the final section, I conclude with three important meta-policy considerations, suggesting that during the process of defining broadband policies certain other broader considerations are required.

The Insufficiency of the Present Argument for Broadband

There are as many definitions of broadband as there are industries, interests, and opinions. One definition is Kelly and Rissotto's (2012) which describe broadband as a

> high capacity ICT platform that improves variety, utility, and value of services and applications offered by a wide range of providers, to the benefit of users, society, and **multiple** [emphasis added] sectors of the economy (p. 4).

Some, such as the World Bank take a specific econo-centric position linked purely to economic growth and development, one that assumes that development and quality of human existence, and as a consequence, life in general, are intrinsically linked to prosperity and financial growth of an economy, state, or people. This West world view may not necessarily hold true in other societies and contexts where development is considered to encompass much broader concepts than just financial.

Although broadband is an emerging area of study, most literature on the subject unfortunately also concentrates research on the economic viewpoint, to the extent that policies and positions taken by countries answer largely to the "economic development" question (Kelly and Rissotto 2012; ITU 2003, 2012; Williams 2010). Kelly and Rissotto (2012) and the International Telecommunication Union (ITU) for instance define their analysis from the impact that broadband has on Gross Domestic Product (GDP) and employment (Kelly and Rissotto 2012, p. 2; ITU 2012, p. 3).

There is no doubt that broadband deployment (video or otherwise) has made significant contributions to economic growth and development. Recent figures indicate a contribution of 1.21 % points to GDP in high-income economies and as much as 1.38 in low-income economies, more than contributions made by the Internet, fixed, and mobile telephony. Even though the data show great degrees of variance (which were explained away by methodological shortfalls, use of dummy variables, and a lack of data) (ITU 2012, p. 5), broadband has nonetheless been shown to directly, indirectly, and serendipitously contribute to job creation and economic development (ITU 2003). This can be seen in Chap. 4 authored by Tim Kelly of the World Bank in this volume.

Proponents of this econo-centric position however fracture it into two: one that favors broadband from a sub-position of volume and the other that favors it from a sub-position of functionality. These sub-positions have influenced how countries and other large international organizations base policy considerations for growth

and development. Consequentially, broadband deployment as we know it today accentuates the gaps between continents, countries, and rural and urban areas.

The first sub-position, which is mostly maintained by countries and international organizations, views broadband based on speed or data transmission rate over a given period of time. As a result, a conceptual limit is placed on broadband deployment by the state. For instance, India and South Africa (DOC 2010) peg their broadband speed at a minimum of 256 kbit/s, while Nigeria's broadband policy suggests a figure of a minimum of 4 Mbits/s (BB4NG 2010) although actual figures are much lower, sometimes at 200 kbits/s. Canada, in its 2011 Broadband Report (CRTC 2011), established 5 Mbit/s downstream and 1 Mbps as target broadband to be available to all Canadians by 2015 [although it defines broadband as a minimum speed of 1.5 Mbits/s (Industry Canada 2012a)], and the US broadband goal is for affordable access of 100 Mbit/s download and 50 Mbit/s uploads to at least 100 million households in the next decade (FCC 2009). International organizations such as the ITU define broadband to mean data rates that "correspond to the user rate of 2 Mbit/s and higher." While these caps attain the objective of achievable targets, they are likewise limiting and may contribute to variable growth across countries in the same region and continent or those within the same purchasing power parity.

In a global economy that is constantly miniaturized by the growth of the Internet and in which trade, relationships, and education are required to take place between nations, capped bandwidth deployment may cripple advancements in these areas. Capping bandwidth begs answers to the questions of how a burgeoning small- and medium-scale business, say in South Africa, India, or Nigeria, with between 200 and 256 kbits/s can effectively engage with its global partner, say in Canada or the USA, with at least 50 Mbits/s. As education goes through its current phases of globalization and internationalization (concepts that describe the extension of dominant education paradigms into other society, cultures, and context) with an associated focus of educating for the global market, students with limited bandwidth would be constrained and disadvantaged from competing in this global economy. Video broadband as a next wave in content deployment requires large bandwidth. Low-capped bandwidths, especially those in SSA, would be unable to meet the demands of heavy video traffic, constituting a large negative cost to broadband deployment in Africa.

The second dominant position views broadband based on its functionality, depending on "what can and cannot be done with a certain type of connection," a position that is likewise problematic and "overly subjective" (Kelly and Rossotto 2012, p. 4). Functionality, as with the prior definitions of speed, is also restrictive and overbearing on research and development and more broadly on economic growth and long-term sustainability. Because applications and services evolve and because uses and users, not previously conceived, emerge, such positions may drive change in one direction only, resulting in large unexplored gaps in other broad areas.

Perhaps, most concerning is that an econo-centric-only view is based on a "low-hanging" fruit model which seeks the easiest path to short-term development over

more rigorous longer term planning and sustainable growth. This model fractures development irrespective of the context—national or regional. In this model, incentives are provided mostly to the members of the economic sector such as the industry, which is only a subsection of the larger population. As a result, consideration for large development stops short of reaching a broader sector of society. To illustrate this point, the Government of Canada incentivizes broadband development mostly to the industry (Industry Canada 2012b). While the intent is to provide equitable and affordable access across the country, residents of large cities who can afford connectivity tend to benefit more than those in the smaller towns, reserves, and remote communities. Incentives for providing broadband access to geographically dispersed populations such as those living in the rural areas and the far north of the country are minimal compared to those living in the cities. Mignone and Henley's (2009) study of the impact of technology across indigenous Canadian communities recommends the recognition of social capital as intrinsically important for long-term sustainability of a project. Social capital is often measured in non-monetary terms and usually not considered in the deployment of technology projects, thus masking these communities from development incentives of state, industry, and investors and excluding them from innovative projects. Recognizing the social capital of local communities necessitates the design and deployment of projects that address specific needs, where those projects address longer term development concerns. Directly or serendipitously, community-based projects that recognize social capital contribute to improving literacy rates, reducing poverty, helping to achieve the millennium development goals, improving transparency in governance, and national health through for instance telemedicine projects.

If the business projections for industry are not promising, there are no incentives to extend infrastructure to these communities and, consequently, no direct or serendipitous benefits. Factors of speed and functionality linked to economic gain, which are an integral part of the current bandwidth pricing model, penalize consumers who live outside the jurisdiction of cheaper and more affordable infrastructure. While they make economic contributions to overall GDP such as in the case of a remote farmer that pays taxes but is barred from reaping the benefits of broadband infrastructure, which when considered as a general-purpose technology leaves an unfair taste behind (*see* the discussion of general-purpose technologies in the concluding section).

There is no denying that economic sustainability is a major driver for broadband deployment and development. However, this view alone could undermine broader development. Economic development, while important, is enforced by other factors such as social and environmental development. If the social factors that enhance societal cohesion are undermined, and stable environmental conditions are inexistent, elements such as civic unrest and harsh environmental and climatic impacts could, for instance, grossly affect economic growth. These other development perspectives should be taken into account and examined collectively as a whole and not in isolation as current econo-centric views of broadband have assumed. In the next section, I shall describe why such a broader and holistic view of broadband could be more appropriate.

A Holistic Model for Costing Broadband

In the previous section, I highlighted the economic context in which current broadband policies and deployment are framed. I argue that the current econocentric view of broadband is insufficient to accomplish an all-encompassing approach to growth and development. I shall expand further on this thought in this section.

It is important to examine broadband from a more comprehensive perspective, one that transcends the economic view only. The sustainable development paradigm is useful, suggesting that for development to be sustainable, it should "meet the needs of the present without compromising the ability of future generations to meet their own needs" (Souter et al. 2010). Such paradigm transcends a low-hanging fruit model, the quick-to-deploy approach, and the capping models discussed earlier and on which most broadband development projects have been implemented and on which dominant broadband policies are based. Arguably, the per price or per function economic argument does not take into consideration these broader and longer term views because price and functions are behavioral attributes of the present. Because technology evolves ever so rapidly, an economic argument alone is a risky proposition that compromises future abilities to respond to future needs. While the question of broadband is often conceptual, in that it is difficult to define the capacity needed for a particular function in the present time or even future time, a paradigm that challenges policy makers to think beyond the present is one that will be more sustainable. The short-term cost of long-term sustainable development planning may be high, but returns over the long term is more rewarding for both the short and long terms.

In the report *ICTs, the Internet and Sustainable Development: Towards a new paradigm*, Souter et al. (2010) presented a framework first developed by the Forum for the Future as a valuable conceptual model for analyzing sustainability impacts of ICTs and specifically broadband (see Fig. 5.2). The component on the vertical axis concerns the three pillars of sustainable development, economic, social, and environmental, while those on the horizontal axis refer to the systemic effects of technology on these pillars and within any particular context.

Economic development is about "reducing and seeking to eradicate income poverty, achieving higher levels of prosperity, and enabling continued gains in economic welfare." Social development concerns "reducing and seeking to eradicate other dimensions of poverty; improving the quality of education, health, housing, and other aspects of welfare of individuals and communities; and enhancing the quality of social interaction, engagement, and empowerment." Environmental protection relates to "reducing pollution and other negative impacts on the environment, mitigating the effects of industrialization and human activity, and seeking to achieve sustainable use of resources in the interest of future generations" (p. 7).

	First order effects	Second order effects	Third order effects
Economic Sustainability			
Social Sustainability			
Environmental Sustainability			

Fig. 5.2 Sustainable development/systemic effects framework. *Source*: Souter et al.

According to the systemic effects listed on the horizontal axes, first-order effects concern "immediate and direct effect"; second order refers to "indirect effects"; and third order refers to "societal effects." Souter et al. suggests:

> The matrix can be applied to the interface between any sector or policy domain and sustainable development, but is particularly helpful to understanding the impact of ICTs on sustainable development. The table as a whole can be applied to ICTs in general, broad areas of ICT development such as the Internet or broadband networks, specific innovations such as cloud computing, or applications such as social networking. Individual cells can also be analyzed in depth, while the results of analysis can also be summarized, cell by cell, as a balance between positive and negative outcomes (p. 13).

These pillars collectively help in a better articulation of present and future requirements for broadband, more so in Africa where the environmental and social components can no longer be ignored. I will examine the cost of deploying or not of broadband using this framework focusing solely on the social and environmental pillars of the sustainable development framework given that the chapter has already argued that existing focus has remained solely on the economic aspect.

The Social Cost of Broadband (First-, Second-, and Third-Order Effects)

Typically, when corrupt government and military administrators take over traditional media in parts of the world such as West Africa, access to information and freedom of expression are muzzled. Radio and television stations are the first to be manned and used to declare *coup d'etats*. New media are shut and opposing newsprints banned from the streets. However, the proliferation of mobile phones and increasing mobile broadband have undermined these restrictive practices. Communication patterns are changing with consequential impact on how government and governance are and should be done.

In recent times, the role that technology, notably mobile phones, social media, and broadband Internet, has played in Africa's social context is consistently strained, disrupted, or strengthened, depending on what side of the government–citizen continuum one stands. From the view of government (some of which may be repressive), the proliferation of mobile Internet has increased the

ability of citizens to engage in the sharing of rumors, information, knowledge, and communication between and amongst themselves, some of which are about governance and government processes. Governments are somewhat forced to provide information to citizens in order to quell impending crises or restrain the public.

In 2012 the Nigerian Federal Ministry of Information announced the use of social media as a communication tool between citizens and the government's information department during a month-long standoff after subsidy removal on petroleum products, a move which allowed government to counter citizen information. The extent to which this approach is successful requires further research; nevertheless, it highlights the importance of available broadband as the medium of communication between citizens and between government and citizens (FMI 2012).

From the view of citizens, increased interaction among themselves about government and governance demands more transparency and accountability from their leaders. Relative peace is disrupted when there is a communication gap between government and citizens. Whereas in the past, access to information was restrained and could only be attained through traditional media such as radio, television, and newsprint and only when provided by the government, citizens in Africa now are able to access information through short messaging services (SMS) or mobile Internet and are able to share video and data, some of which demand government's explanation. Freedom of expression is also enhanced, as citizens become creators of their own content and information, especially of happenings that require government intervention or happenings as a result of government intervention such as the one that triggered the so-called Arab Spring in North Africa mentioned below. This would have been less than successful without broadband Internet, particularly mobile broadband. There is a cost of deploying or not, here.

Increasing broadband has enhanced communication and communication patterns and the demand and supply of information in areas of public administration. Beyond Nigeria, the "Arab Spring" in North Africa and several other incidents in Cote d'Ivoire and Zimbabwe are indicative of the power that social media, mobile devices, and mobile broadband puts in the hands of people.

There is an opportunity here if existing governments can develop established and improved communication channels between themselves and citizens for the exchange of information and knowledge and for creating socially sustainable societies. The cost of broadband as an enabler for increased communication between government and citizens as a contribution to building and enhancing social capital that in turn enhances governance needs to be quantified. Existing bandwidth may not meet the future sustainable needs for video and voice data exchange between government and its people.

The growth of the entertainment industry is also a social driver for broadband. Local African movie production responding to an almost insatiable thirst especially by global African Diaspora is a $72 million dollar revenue-generating movie industry in Nigeria alone as in 2009 (Cartelli 2007; Madichie 2010; Shivers 2010). An industry that is third after Hollywood and Bollywood employs nearly one million people making it "the second largest employer in Nigeria after

agriculture" (Barnard and Tuomi 2008). Barnard and Tuomi, in their comparative studies of the movie making industry in Nigeria and South Africa, postulate that the unsophisticated nature of movie consumers and consumption in Nigeria does not necessitate the need for production of high-quality movies. While this may be a plausible reason for increased demand in the country, it does not answer the question of increased global demand from places like the Caribbean (Cartelli 2007). These researchers argue that the distribution model for such movies, which uses low-cost DVDs at $2 a copy, necessitates increased demand over the traditional *movie-theatre-screening-then-home-video* pattern that Hollywood uses. Local consumption certainly drives demand; the suitability and ease of use of the media of distribution do contribute to this growth. However, as demand and supply increase, new methods of portable and convenient distribution may take over. Already models such as iroko.tv have placed a demand on the need for increased broadband. There is an associated cost for deployment or not, here.

Another important consideration is the demand for news and information by local audiences. While generalization may be difficult across the continent, the most popular types of television programming in the most populous nation on the continent, Nigeria, are news, musical shows, talk shows, and sports, much more than Nollywood movies (Akoh et al. 2012). The growth of other distribution channels besides DVDs such as mobile phones and Internet streaming may have contributed to this growth.

The Environmental Cost of Broadband

As it concerns environmental development, in the report *Africa Transformation-Ready*: *The Strategic Application of Information and Communication Technologies to Climate Change Adaptation in Africa* Akoh et al. (2012) argued the following:

1. Africa's climate is likely to be more severely affected by climate change than other regions. It is warming faster than the global average.
2. Its major economic sectors are climate sensitive.
3. Low levels of human development (income, education, health) and greater presence of other stress factors (such as conflict and disease) constrain adaptive capacity.

The report argues further that the observed and anticipated impacts of climate change in African countries continue to speak to its greater vulnerability. Addressing the impacts of climate change through the use of broadband to, for instance, develop the response capacities of citizens for sharing knowledge and information, has a cost that also needs to be quantified (Fig. 5.3).

Four areas of intervention in which ICTs can be used directly or indirectly are in the following (Akoh et al. 2012):

1. Addressing the drivers of vulnerability (e.g., the application of broadband to the effective deployment of micro-credit schemes or immunization programs): This

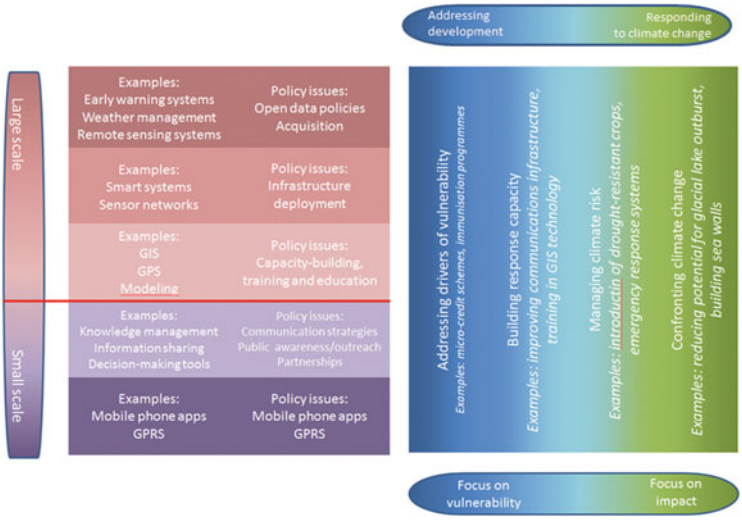

Fig. 5.3 A framework for examining ICT tools and adaptation to climate change. *Source*: Akoh et al. (2011)

intervention is development oriented, where development is directly proportional to vulnerability. Broadband deployed over mobile phones could contribute to developing the welfare of African citizens through schemes that improve their economic, health, and social well-being. These factors contribute to the choices that they can make, from which resilience emerges.

2. Building response capacity of local and regional systems and communities (e.g., using broadband to develop and deliver local-level training to community people on the monitoring of local climate variability): The availability of broadband has contributed to knowledge about climate change and the ability to manage data, information, and local and regional knowledge bases that can be used to enhance the response capacity of citizens. Whereas long-term weather and climatic information may not be readily available, and where it is in limited quantities, citizens are able to augment these with locally generated and stored information and knowledge. Availability of extensive broadband could contribute to enhancing such capacity.
3. Reducing and managing risks related to climate variability and climate change (e.g., using broadband in emergency response systems): Early warning systems generated through satellite data or sensor networks located in different locations that feed critical information to citizens on mobile devices could enhance their abilities to manage and reduce the risk of climate change. Sufficient broadband may be needed to send images and sound that enhances the quality of these decisions.
4. Confronting climate change (e.g., using broadband to manage potential flood outbursts): Data generated from buoys or sensors strategically located to warn of imminent climate-induced happenings could be sent in order to elicit the

appropriate response before they happen. For instance, sensors that send data about the amount of upstream impurities could elicit a response before it gets downstream, or systems that warn of flood could result in the shoring up of the coastal line prior to it happening.

ICTs that can be used range from small-scale applications such as mobile phone apps or online knowledge management and information sharing tools to large-scale deployment such as early warning systems, weather management applications, remote sensing systems, and sensor networks. These applications, if implemented now and with a view of future sustainability, could drive the demand for greater bandwidth through, for instance, large-scale information and data demand by industry needed to make investment decisions in any geographic location or by which citizens decide what crop to plant where. Inherently lies an opportunity for future growth and development, if the continent is to address its present and future vulnerable environmental situations. Broadband development and deployment costs need to be quantified here too.

Transborder Considerations

When social and environmental concerns such as those that have been mentioned are taken into development considerations, the costs of deploying bandwidth ought not to be borne by just one country, but by several countries in a region or across the continent. Climatic variations are not sharply contrasting across borderlines. The key drivers for deployment which include local backbone infrastructure, transboundary implementations, and so on are also applicable across countries as much as they are at the national level.

One significant indicator is the historic trend of negotiating for bandwidth across the continent. The shift from a single-cable to the current multi-cable system in Africa in less than one decade, and from which Africa benefits today, offers a lesson on how to address long-term transborder infrastructural development. Multipurpose vehicles between different groups of stakeholders across borders facilitated the move to the present structure, thereby strengthening the argument for collaborative transborder broadband agreements. Undersea and terrestrial infrastructure is one out of the many others that are needed. Satellite, early warning, and sensor networks are larger scale systems that could be shared across borders. Consortiums of countries and their national telecommunication companies bore the cost and risks associated with submarine cable deployment; this model could also work for these larger scale systems.

Transborder considerations such as right of passage to coastal gateways especially for landlocked countries or those that may have not invested in undersea cable infrastructure but for whom they hold economic and social promise are similarly important. The volatile nature of Africa's boundaries especially during crisis suggests that one country should not bear the cost of running and maintaining

its own infrastructure and that opportunities for shared resource could support longer and sustainable peace in the region.

This is even more true given very porous boundaries between most countries in the different regions in Africa. Already the mechanisms for regional cooperation exist such as ECOWAS in West Africa, COMESA in East Africa, and SADC in the Southern African region, which facilitate transborder trade and migration but could be useful also for advancing the dialogue on collaborative regional responses to climate change or social cohesion. The cost may include sharing a portion of regional bandwidth, human resources such as experts, data, information and knowledge bases, and sometimes response capacities and vulnerabilities. The justification for shared resources has to be made by the different countries in the region. The cost of deploying broadband could form the basis for such dialogues. In the case of Spring Brook in Australia for instance, over 200 individual sensors were installed to monitor temperature and rainfall, an additional 125 sensors were installed to monitor carbon dioxide and cloud cover, and a further 175 nodes were installed to monitor bioacoustic sounds and videos; the collective data generated from these devices provides a richness of information that helps to preserve the environment and further helps in monitoring the restoration of the environment and returning wildlife (Queensland Government 2012). The data from these sensor nodes will require underlying broadband technology for its distribution and analysis. The outcome of this type of application bears on the economic, social, and environmental health of society.

Considering Broadband as a General-Purpose Technology and Its Associated Cost

One major policy argument for broadband deployment in the economic setting is for a consideration as a general-purpose technology (Kelly and Rosotto 2012; Souter et al. 2010). GPTs are technologies that enable new and different opportunities across an entire economy, rather than simply addressing one problem or one sector. It is technology that "initially has much scope for improvement and eventually comes to be widely used, to have many uses, and to have many . . . technological complementarities" (Crafts 2004, quoting Lipsey et al.). The steam engine, ICTs in general, and electricity have been considered as GPTs (Crafts 2004). Recent arguments have elevated broadband to the same level as GPTs because they exhibit three characteristics, namely, the following (Souter et al. 2010):

1. They are pervasive in their use in a wide range of sectors (including sectors that affect social and environmental development).
2. They are technologically dynamic (i.e., they have an inherent potential for technical improvements).
3. They provide general productivity gains as GPTs evolve, improve, and spread through the economy.

The consideration for broadband as a GPT puts it at a level where government and all stakeholders will be obligated to consider its development as important as other GPTs. Because the impact of broadband transcends the economic perspective, any consideration as a GPT should expand its scope beyond this aspect also.

Conclusion

Broadband, particularly on the mobile platform, has been on the increase in SSA with consequences on economic growth and development. Broadband policies have been focused on econo-centric aspects such as the removal of investment barriers and the promotion of competition in the marketplace. Little research and consideration have been placed on development that could occur in the social and environmental aspects of society and how these in turn affect the economic and broader well-being of a nation, region, or context. Development that considers a holistic view of broadband policy and deployment recognizes the social capital inherent in the development context and thus directly or serendipitously produces results that are more long term and sustainable. More research and specific cost implications are required in this area.

Proponents of broadband policies in their current form should step back and conduct a meta-analysis by responding to how this piece of technology directly, indirectly, or serendipitously affects development that is not merely economical but also social and environmental. The current view of elaborating broadband cost is limited and thus does not provide a holistic view of total deployment cost required. The cost of deploying broadband surpasses the economic view only. It should be considered alongside the social and economic dimensions of sustainable development. As a result, the present focus of pegging broadband by speed and functionality which is mostly linked to economic sustainability dimensions is largely insufficient to meet the more holistic demands resulting from these other components of sustainable development. A useful framework is presented that can guide policy makers in formulating broader and more sustainable policies; in incentivizing development investment for the private sector that creates employment and that recognizes the social capital and environmental health of a context; and in contributing to present and future development.

The argument for broadband as a general-purpose technology makes it relevant to broad development policies. Finally, given the broad scope of environmental concerns and the increasingly energetic and highly resourceful societies in SSA, the costs of deploying bandwidth ought not to be borne by just one country, but by several countries in a region or across the continent.

References

Akoh, B., Bizikova, L., Parry, J., Creech, H., Karami, J., Echeverria, D., Hammill, A., & Gass, P. (2011). Africa transformation-ready: The strategic application of information and communication technologies to climate change adaptation. In *World Bank*. Winnipeg: IISD. Available from http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/282822-1346223280837/ClimateChange_Fullreport.pdf

Akoh, B., Jagun, A., Odufuwa, F., & Akanni, T. (2012). *Mapping digital media: Nigeria*. Open Society Foundation. Retrieved from http://www.opensocietyfoundations.org/sites/default/files/mapping-digial-media-nigeria-20120813.pdf

Barnard, H., & Tuomi, K. (2008). How demand sophistication (De-) limits economic upgrading: Comparing the film industries of South Africa and Nigeria (Nollywood). *Industry and Innovation, 15*(6), 647–668.

Broadband for Nigeria [BB4NG]. (2010). *The framework*. Available from http://bb4ng.forum.org.ng/node/13

Canadian Radio-television, & Telecommunications Commission [CRTC]. (2011). *Broadband report*. Available from http://www.crtc.gc.ca/eng/publications/reports/broadband/bbreport1111.htm#n1.0

Cartelli, P. (2007). Nollywood comes to the Caribbean. *Film International, 5*(4), 112–114.

Crafts, N. (2004). Steam as a general purpose technology: A growth accounting perspective. *The Economic Journal, 114*(295), 338–351.

Department of Communications [DOC]. (2010). *Policies and policy directives drafted in terms of section 3(1) of the electronic communications act*, *2005* (Act no. 36 of 2005). Available from http://www.info.gov.za/view/DownloadFileAction?id=127922

Federal Communications Commission [FCC]. (2009). *National broadband plan: Connecting America*. Available from http://www.broadband.gov/plan/executive-summary/

Federal Ministry of Information, Nigeria [FMI]. (2012). Tweet meeting. *Federal ministry of information Nigeria: Facebook page*. Retrieved May 21, 2013 from https://www.facebook.com/FMINigeria/posts/292416917477890

Industry Canada. (2012a). *Broadband Canada: Connecting rural Canadians*. Available from http://www.ic.gc.ca/eic/site/719.nsf/eng/h_00001.html

Industry Canada. (2012b). *Broadband Canada: Connecting rural Canadians—List of projects by province*. Available from http://www.ic.gc.ca/eic/site/719.nsf/eng/00050.html

International Telecommunication Union [ITU]. (2003). *Promoting broadband: Background paper*. Available from http://www.itu.int/osg/spu/ni/promotebroadband/PB03-PromotingBroadband.pdf

ITU. (2012). *Impact of broadband on the economy*. Retrieved from http://www.itu.int/ITU-D/treg/broadband/ITU-BB-Reports_Impact-of-Broadband-on-the-Economy.pdf

Kelly, T., & Rossotto, C. M. (2012). *Broadband strategies handbook*. DC: Worldbank. Retrieved from https://openknowledge.worldbank.org/handle/10986/6009

Madichie, N. O. (2010). The Nigerian movie industry "Nollywood"—A nearly perfect marketing case study. *Marketing Intelligence & Planning, 28*(5), 625–649.

Mignone, J., & Henley, H. (2009). Impact of information and communication technology on social capital in aboriginal communities in Canada. *Journal of Information, Information Technology, and Organizations, 4*, 127–145. Retrieved from http://130.179.16.50/faculties/human_ecology/departments/fss/media/5.pdf

Queensland Government. (2012). *Wireless sensor networks: Springbrook*. Retrieved March 29, 2013 from http://www.qld.gov.au/environment/plants-animals/herbarium/sensor-springbrook/

Shivers, K. N. (2010). Negotiating identity in transnational spaces: Consumption of Nollywood films in the African diaspora of the United States. In *MeCCSA Conference*, *London*.

Souter, D., MacLean, D., Akoh, B., & Creech, H. (2010). *ICTs, the Internet and sustainable development: Towards a new paradigm*. Winnipeg: IISD. Retrieved from http://www.iisd.org/pdf/2010/icts_internet_sd_new_paradigm.pdf

Williams, M. D. J. (2010). *Broadband for Africa: Developing backbone communications networks*. WB. Retrieved from http://www.infodev.org/en/Publication.526.html