MINISTRY OF TRANSPORT AND COMMUNICATIONS

NATIONAL BROADBAND STRATEGY

June 2018

Table of Contents

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS

3G	Third Generation
4G	Fourth Generation
BIH	Botswana Innovation Hub
BOCRA	Botswana Communications Regulatory Authority
BOCCIM	Botswana Confederation of Commerce, Industry and Manpower
BoFiNet	Botswana Fibre Networks
BPC	Botswana Power Corporation
BTA	Botswana Telecommunications Authority
BTCL	Botswana Telecommunications Corporation Limited
CERT	Computer Emergency Response Team
CBR	Constant Bit Rate
DSL	Digital Subscriber Line
DSLAM	Digital Subscriber Line Access Multiplexer
xDSL	Refers collectively to all types of digital subscriber line
EASSy	Eastern Africa Submarine System
FBOs	Fixed Broadband Operators
FTTx	Fibre-To-The- Home or Business or Cabinet
FWA	Fixed Wireless Access
GIX	Global Internet Exchange
GNI	Gross National Income
IRUs	Indefeasible Right of Use
ICTs	Information Communications Technologies
IPV6	Internet Protocol Version 6
ISP	Internet Service Provider
ITU	International Telecommunications Union
KCs	Kitsong Centres
KPI	Key Performance Indicator
LIAP	Local Internet Access Point
LTE	Long Term Evolution
MDGs	Millennium Development Goals
MOBE	Ministry of Basic Education
MoESD	Ministry of Education and Skills Development
MoTE	Ministry of Tertiary Education, Research, Science and Technology
MTC	Ministry of Transport & Communications
MLGRD	Ministry of Local Government and Rural Development
MYSC	Ministry of Youth, Sports and Culture
NBS	National Broadband Strategy
NB-IoT	Narrow Band Internet of Things
NGA	Next Generation Access
NGO	Non-Governmental Organisation
NREN	National Research and Education Network
PTO	Public Telecommunications Operator
SADC	Southern African Development Community
SDGs	Sustainable Development Goals
SDH	Synchronous Digital Hierarchy
UNESCO	United Nations Educational, Scientific and Cultural Organization
UASF	Universal Access and Service Fund
VANS	Value Added Network Operators
VDC	Village Development Committee
VOIP	Voice over Internet Protocol
WACS	West Africa Cable System

EXECUTIVE SUMMARY

Botswana is a sparsely populated and landlocked country whose major economic drivers are diamonds, beef and tourism. The Information Communications Technologies (ICTs) has been identified as the catalyst for the next wave of economic development, which should benefit every citizen and other sectors as they participate in today's growing digital economy. To this end, the Government has developed the National Broadband Strategy (NBS), which will provide a holistic and coordinated approach to the implementation of the ICTs ecosystem in the country with a view to achieving long-term strategic outcomes. The overall vision of the Broadband Strategy is to connect every citizen, business and communities to a high-speed broadband infrastructure at appropriate quality of services and affordable prices.

The NBS is anchored within broader national and international policies and goals. It was developed with reference to the National ICT Policy of 2007 (Maitlamo), the country's Vision 2016 and the UNESCO and ITU Broadband Commission aspirations. These national and international policies advocate access to high-speed ICTs infrastructure; provision of online services and applications; and promoting a knowledgeable and informed society. The Strategy provides a basis through which the national policy objectives outlined in various Government policy documents, initiatives and interventions can be achieved.

The Broadband Strategy comes at the time when Government has made huge investments on the ICT networks at international and national levels. At the time of entering into agreements with consortiums that deployed undersea cable networks, accessibility of the last mile connectivity to businesses and homes was not fully explored hence it is currently denying consumers the real benefits of ICTs. For the e-Government, e-Education, e-Health, and e-Commerce programmes, among others, to be successfully implemented, they require high capacity and uninterruptable ICT infrastructure and services. To this end, high-speed ICT networks have assumed strategic importance for economic and social development.

Broadband is an enabler for socio-economic growth, which makes it an essential tool that empowers citizens of a country, triggers positive change in business processes and creates an enabling environment that fosters technological and service innovation. The NBS recognises that for the benefits of Broadband to be fully realised there should be investment in the new technologies and migration from traditional networks and services to next generation networks.

This Strategy highlights the current broadband status in the country and indicates a benchmark of how broadband is deployed and utilised in other countries and jurisdictions across the world. In line with international trends, Botswana has adopted an ecosystem based approach for conceptualising broadband. Broadband is defined as an ecosystem encompassing high capacity, high speed and quality electronic networks, the services carried through the networks, the applications they deliver as well as the users. This definition takes into account the continuous evolution of technologies, applications, needs and the variety of requirements of users and the fact that users are mainly interested in the services provided rather than the technology that conveys such services.

The NBS advocates for the development of national infrastructure to enable and facilitate services, applications and content, which are the end results of the digital economy. The Ministry of Transport and Communications at policy level will take a pro-active role at collaborating with

different stakeholders (government, private and civil society) to make use of the ICT infrastructure to enable the digital economy. The different stakeholders should take new approaches in digitising their innovative activities and contents to better utilize Botswana's ICT infrastructure.

The Strategy intends to improve the broadband Internet penetration throughout the country in various areas. The initial target is to offer 50% of citizens a minimum speed of 2 Megabits per second (Mbps) by end of 2014 and 90% of the population having access to 20Mbps broadband by 2018. This Strategy has been developed in a flexible manner that ensures that it is able to adapt to evolving technological advancements in the market.

It goes on to acknowledge that the scale and scope of interventions to be undertaken in Botswana requires investment by both the public and private sectors. Emerging success stories involve public-private interplay where the relative powers and resources of both sectors are used to achieve wide-based access to broadband. An environment conducive to private sector investment should be created through enabling legislation, policies and regulations. Funding will be made available through strong partnership between government, industry and other strategic stakeholders. There are other recommendations geared towards stimulating content production by different stakeholders and enhancing local capacity to benefit from and contribute to the digital revolution.

The Strategy calls for the establishment of a National Broadband Structure made of different key stakeholders, who will spearhead the implementation of the Broadband plan. There are a number of factors that would determine the successful implementation of the Strategy, and these require political support, stakeholder buy-in, comprehensive and clear identification of priorities, implementation, enforceability, monitoring and evaluation. It will be the mandate of the Information Age Council to guide in the implementation of the NBS and monitor progress.

In summary the recommendations cover broadly the following areas:
- Deployment of Mobile Broadband Access Networks (3G/4G/LTE) covering urban centres, major villages, rural areas and agricultural areas;
- Roll out of Fixed broadband and ultra-fast broadband access network (xDSL, FTTx, Fixed Wireless) to cities, towns and some major villages;
- Internet connectivity and access to schools, libraries, health centres and Community Access Points (Kitsong Centres);
- Public Awareness and Education Campaigns;
- ICT research, innovation and development;
- Local Content Development;
- Digital Literacy Education Programme; and
- Funding mechanisms in order to implement the proposed initiatives.

1   INTRODUCTION

Broadband is widely recognised as a key-enabler of knowledge based society. It has been proven by numerous studies that an increase of 10% in broadband penetration accelerates the economic growth by more than 1%. Besides, broadband has other social and political benefits. It promotes and facilitates social and market interaction by connecting consumers, businesses and governments. Politically, broadband enhances accountability and transparency by facilitating easy and fast communications. Furthermore, a number of services such as education, health and financial can be delivered on-line thanks to broadband.

The broadband supply chain is made of all the various network connectivity, which includes international connectivity, national backbone, backhaul links or metropolitan access links, and local access network (whether fixed or mobile, wire-line or wireless). International connectivity is always an issue for landlocked countries such as Botswana, especially when most of the content is hosted abroad. The decision by Government to invest in undersea cables was a major positive step. However, transit costs to reach the landing stations from the country's borders remain high and thus a major constraint.

The national fibre optic backbone that connects all urban centres and major villages constitutes a key asset for the country. Combined with backhaul links, this infrastructure serves the local access networks. The wireless mobile networks cover most of the population and areas of Botswana. The upgrading of these networks to 3G in urban centres and the biggest villages has enabled mobile operators to start catering for broadband as well. The copper local loop that serves all urban centres and major villages is also a major asset as xDSL is a proven and reliable solution to provide high quality broadband services to corporate, enterprises and residential users. However, the cost of deploying it beyond its current extent would be prohibitive.

The implementation of supply-side policies will enable the deployment of next generation access networks with extensive footprint that will provide users with high-speed broadband services together with the best quality of service. This will position Botswana within the class of the most advanced countries in the region in terms of broadband infrastructure and services. Coupled with the above initiatives, making markets work more efficiently by enhancing competition, reducing wholesale prices and making sure that all service providers operate on a level playing field will induce a decrease in the retail price and more innovation in the provision of services. These actions will improve competition in the market and thus improve affordability of broadband services.

In parallel, the demand-side policies should address the need to enhance usage by fostering local content, promoting digital literacy, creating an online environment that is safe for all stakeholders (citizens, households, entrepreneurs, businesses, government bodies, etc.). An important innovation to enhance citizens' access to broadband services is the availability of Kitsong (Information) Centres. These are public access centres which can be used by people who do not have personal access devices and Internet connectivity to access information and communications services. The current model of existing Kitsong Centres should be improved as many of these centres are not properly operated and or managed.

During the development of the National Broadband Strategy, an international benchmarking exercise was conducted to draw appropriate lessons for Botswana. The Benchmarking included

the following countries: Ghana, Rwanda, Mauritius, Morocco, Australia and France. The selection of countries to benchmark against was guided by a number of factors including, but not limited to, population, country size, and the level of development in particular with respect to broadband services was also used as a factor in selecting benchmarking nations.

In terms of usage, the main factors that have been found hindering a wider roll out of broadband infrastructure and services in Botswana are:

- Limited access network which hinders the provision and uptake of ICT services;

- The high level of wholesale prices and the lack of transparency;

- The relatively high level of retail prices; and

- A lack of local ecosystem.

2   *SITUATIONAL ANALYSIS*

This section provides a brief description of the current situation of broadband in Botswana across key thematic areas.

2.1   International Connectivity

The international bandwidth is a limitation for a smooth access to Internet in Botswana. This is because most of the content accessed is hosted abroad (mainly in USA and Europe) and no international global Internet exchange (GIX) is available in Botswana. Accordingly, most of the local Internet traffic is routed through the international connections unnecessarily introducing additional costs. The level of prices for international connectivity has also been identified as one of the major constraints to smooth access to the Internet in Botswana.

Even though the country's investment and connection to two submarine cables of EASSY and WACS has improved the situation, the transit costs from the country's borders to submarine cable landing stations in Namibia and South Africa are still too high. In addition, operators are able to purchase capacity from other undersea cables such as SEACOM. The international connectivity undersea cables serving Africa are shown in Figure 3, Annex 2.

2.2   National Backbone

Botswana has a fibre optic cable backbone network in the form of a ring, which connects all urban centres and major villages as shown in the Figure 4, Annex 2. It constitutes a key asset for the country because such a backbone is required to support the development of access infrastructure throughout the territory. This main backbone is owned by BoFiNet with other private operators having also deployed some national backbone infrastructure, for example Mascom Limited has its own optical cable running along the Gaborone - Francistown main route.

2.3   Backhauling

The backhaul network is the portion of the network that connects the backbone with the access network (e.g. wireless access by collecting traffic from base stations or BSC/RNC). Currently, the backhaul network does not appear to be a major constraint. Operators rely on leased lines, their own microwave links or in the biggest cities on their own fibre metropolitan area network (MAN). However, future evolution of networks and traffic demand will lead to an increase in the demand for more capacity on backhaul links.

2.4   Mobile Coverage

Currently mobile telephone coverage as shown in Figure 6, Annex 2 is relatively satisfactory for most large and medium sized villages. Main roads are also partially covered. 3G coverage, however, is limited to main cities and some major villages. Furthermore, there is generally only one operator available outside densely populated areas. Hence users have to use SIM cards from various PTOs and cannot be certain that they can be reached on their main contact number wherever they are. However, operators are currently improving the 3G reach of their networks and some have even launched 4G Long Term Evolution (LTE) pilot projects.

2.5 Access Network

All urban centres and major villages are covered by the copper local loop. Exchanges are enabled for all types of Digital Subscriber Line (xDSL) service. This is a major asset for the country as xDSL is a proven and reliable solution to provide broadband reaching relatively high speeds with a good quality of service. It can thus cater for corporate, enterprises and residential needs.

Nevertheless, it has to be emphasised that even though a large number of villages are covered with copper local loop, in most cases this is only limited to the centre of the village while extended parts of the respective village generally do not have copper lines.

The current speed rates available in Botswana are relatively low with regards to general xDSL capabilities.

2.6 Satellite

Satellite connections remain expensive in Botswana, even though new offers for cheaper satellite connectivity are emerging. Consequently, this technical solution cannot be considered as a general way to provide broadband services on a large scale in the country. However, it should be considered for most remote areas. Besides, the cost of access to satellite connection should be used as a threshold when assessing the relevance of any terrestrial solution in low-density areas.

2.7 Government Data Network

The provision of government services online is affected by a poor state of the Government Data Network (GDN) and the Government Data Centre (GDC). This is primarily because the GDN and GDC are old, dilapidated and inferior, and lack proper security, resilience, intelligence and capacity. Service disruptions and poor quality in general continue to be experienced. It is also due to overburdening the infrastructure with services it was not designed to connect such as schools and health facilities, as well as carrying other bandwidth intensive applications. Hosting of new services and applications, therefore, cannot be catered for. The business continuity of government systems cannot be guaranteed with the current state of the infrastructure. As a result, connection of new Government offices to the GDN has been scaled down due to its limited capacity, capability and security.

2.8 Community Access Points (Kitsong Centres)

The Government launched an initiative to have communities connected through the use of Kitsong Centres (KCs). These are community access points that have been installed by various operators and Botswana Post. The implementation of Nteletsa II project saw an increase in the number of such centres. These centres mostly provide only basic services (airtime resale, telephony, photocopy services, etc.). The most advanced of these though offer broadband together with related services such as training.

Unfortunately, the current model being implemented for Kitsong Centres does not work properly since the bulk of them are operated by Village Development Committees (VDCs), whose members do not have computer and business skills. As per the Nteletsa II contracts between the

Government and the operators, the operators train personnel to run the Kitsong Centres but some trainees have left the KC's to look for better paying jobs thus rendering the KCs dysfunctional.

2.9 Usage

The international benchmarking done on fixed and mobile broadband penetration showed that while mobile telephony penetration is high, both fixed and mobile broadband penetrations are relatively low in Botswana, compared to other African, European or Middle-East countries. This situation needs to be addressed, since the success of the National Broadband Strategy depends on the provision of affordable access and on the capacity of the population to find utility for broadband services.

There are other conditions for broadband adoption than those linked to the service offering and prices. These include the capacity of the services to be of real value to consumers, whether mass market or business. It does not matter how low the prices may be if the potential users do not get any value from the service or do not have the capacity to use or exploit the service.

One of the key issues that was identified during discussions with many stakeholders is the lack of local or national content. Despite the current development of national projects (e.g. e-Government, e-Health, e-Education), there is currently very little locally produced content. The small size of the population is one of the factors that explain this lack of content. The larger the population, the lower the cost of content production, due to economies of scale.

Content provision is a complex ecosystem involving many different players, financial flows and business models. The emergence and development of local applications and content which can bring real value to customers (business or mass market) is the result of a complex combination of private and public investment as well as the ability to choose the best segment or domain.

It has also been observed that one of the barriers that the population encounters in relation to access to data services was the lack of computer skills. There have, nevertheless, been some efforts to lower this barrier (for instance computerising all libraries in the country through the Sesigo Project, equipping schools with computers, providing Internet in Post Office, Kitsong Centres, etc.). These efforts should be intensified and coordinated to facilitate public access to computer skills.

2.10 Affordability

The international benchmarking showed that prices for mobile and fixed broadband services in Botswana are high compared to other African, European or Middle East countries. Since the comparisons took into account the differences of purchasing power (purchasing power parity) in the countries involved in the benchmarking study, the situation in Botswana really reflects high prices for broadband services.

Prices need to decrease to affordable levels in order for the objectives of the strategy to be realised. The key question is what should be taken as an affordable price for broadband services in Botswana. There is no direct answer to this question. It is impossible to determine *ex ante* what would be the right level of price. Moreover, people will be able to spend money for such services only if they see the utility for the service.

However, the international benchmarking brought some light to the absolute level of prices that would meet the demand. For broadband to be affordable in developing countries the ITU has set a target for entry-level broadband services to amount to less than 5% of monthly Gross National Income (GNI) per capita. Currently Botswana stands at 9.2% for fixed broadband services and 9% for mobile broadband service. The major factors that lead to the current level of retail prices are:

    i.   The cost of the international bandwidth;

    ii.   The cost of national bandwidth, which is distance based; and

    iii.   The current wholesale ADSL price structure, where Internet services providers are resellers of the services provided by BTCL.

To reach the levels of affordability target as set out by the ITU, significant decreases in retail tariffs by operators is required. Having said that, it will be important to find a balance so that operators can decrease tariffs and but still make sufficient revenues to continue investing in the network expansion and service delivery required for Botswana. Changing cost structures and reducing the cost of rolling out business must be an imperative.

3   DEFINITION AND RATIONALE

Traditionally broadband is defined in terms of data transmission speed. However, there is no universally agreed definition of which speed amounts to broadband. Each country generally adopts a definition that reflects its unique needs and challenges.

The definition of broadband in terms of speed has its advantages. The approach assists policy makers understand broadband. Targets for the country can easily be set and achievement thereof measured. The data transfer rate determines whether users are able to access basic or more advanced types of content, services, and applications over the Internet. It also determines the cost of accessing such services. However, the main disadvantage of defining broadband in terms of speed is that there is no universal agreement on the broadband data rate as it varies among countries and international organizations. Limiting the definition to speed may not keep pace with technological advancements and applications required for broadband to bring the desired benefits.

3.1   Broadband as an Ecosystem

Broadband is seen as an ecosystem rather than the traditional notion of a specific type of network connectivity or minimum transmission speed. Conceptualizing broadband as an ecosystem makes it possible to define it by including all its core elements. These are networks, the services, the applications they deliver, as well as users. It also makes it possible to factor the transformative elements of broadband such as technological, business and market developments.

The ecosystem approach includes both the supply and demand sides of the market. In particular, an ecosystem based approach enables policy makers to appreciate that it is critical to create an enabling environment for the supply-side growth in terms of access to networks and services as well as facilitating demand for and adoption of broadband services (demand-side). Figure 1 in Annex 2 provides a high level representation of a general broadband ecosystem.

3.2   Principles

Botswana's National Broadband Strategy is underpinned by a number of critical principles that ensure the Strategy fosters extensive deployment and usage of broadband across all parts of the Botswana society, on top of enabling the achievement of Botswana's national vision and aspirations. These following principles would enable effective implementation of the Strategy:

a) **Achieving Botswana's National Vision and Aspirations.** Botswana's National Broadband Strategy is aligned to the National Vision and Aspirations of the country and should facilitate their achievement.

b) **Broadband Technology.** Botswana's considers Broadband as an ecosystem comprising of high capacity, speed and quality networks, services, content and applications that provide high-value information and communications for the variety of users. Consequently, Broadband can be deployed, delivered or accessed through a range of technologies that are cost effective, interoperable, and efficient. The Broadband strategy will focus on the effectiveness and practicality of these technologies while recognising the

variety of technologies. Botswana will seek to promote interoperability enabling broadband users and service providers to benefit from cost-based and non-discriminatory interconnection with other users, service providers, networks, etc.

c) **Promoting Socio-economic Development in Botswana.** The National Broadband Strategy is expected to enhance socio-economic development across Botswana, especially education, health, and economic diversification which should result in greater self-reliance across the society.

d) **Unity, Tolerance and Equity**. Broadband should enhance unity across Botswana and ensure all Botswana citizens access and benefit from Broadband irrespective of religion, race or ethnicity, location, language, political suasion, gender, economic status, etc. The broadband strategy will seek to ensure that broadband is affordable across the nation and widely accessible to all citizens.

e) **Innovation**. Broadband should enable innovation across the Botswana nation, hence the strategy should promote the application of broadband for innovation and education, research, development, adoption and usage of broadband-enabled innovations in education, software, content development, technology, engineering, government, etc.

f) **Cooperation and Responsiveness.** The Broadband Strategy will aim to facilitate cooperation between the government, public sector, private sector, relevant stakeholders, etc in the deployment, adoption and usage of broadband. The Strategy will also seek to make sure that broadband projects, programmes, or policies are undertaken or implemented in collaboration with other national development projects, and are responsive to the rapid changes that tend to occur in the ICT sector.

g) **Economic Diversification, Competition and Investments.** The Strategy will not only encourage the competitive deployment and usage of broadband in the traditional industries that underpin Botswana's economy and which include: mining, agriculture, and tourism, but will also enhance the attractiveness of Botswana for investment, and create a vibrant and competitive private sector which should result in the successful export-led, diversification of Botswana's economy.

h) **Democracy, Accountability and Tolerance.** The Strategy will enhance democracy, accountability of residents, and tolerance in the Botswana society.

3.3 Defining Broadband for Botswana

While the ecosystem conceptualisation of broadband provides a framework for the development of effective broadband strategies and policies, it does not do away with the need to have measurable outputs. The proposed definition for broadband in Botswana is:

> *"Broadband is an ecosystem comprising of high capacity, speed and quality networks, services, content and applications that provides high value information and communications for the variety of users"*

Recommendation 1 Defining Broadband for Botswana

Botswana should adopt a predominantly ecosystem based approach of broadband. Broadband shall be defined as "**an ecosystem comprising of high capacity, high speed and high quality networks, services, content and applications that provides high value information and communications for the variety of users**"

Recommendation 2 Minimum Target Speeds

The minimum broadband access speeds targets for Botswana shall be as follows:

a) **Urban Areas**
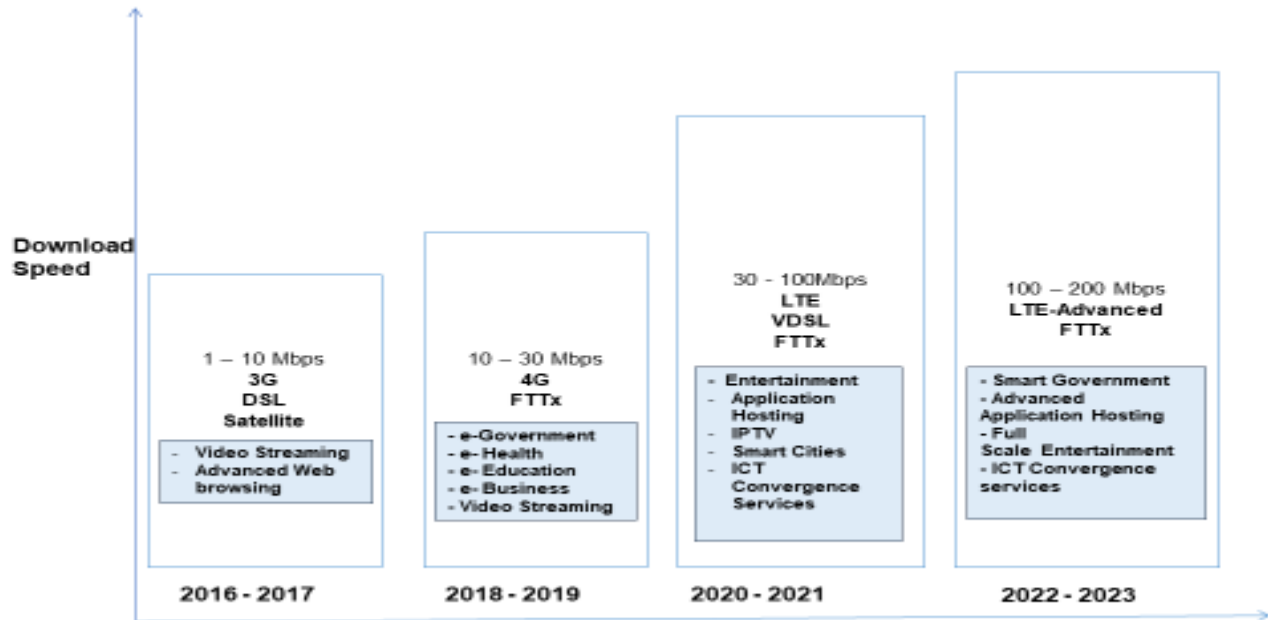
b) **Rural Areas**
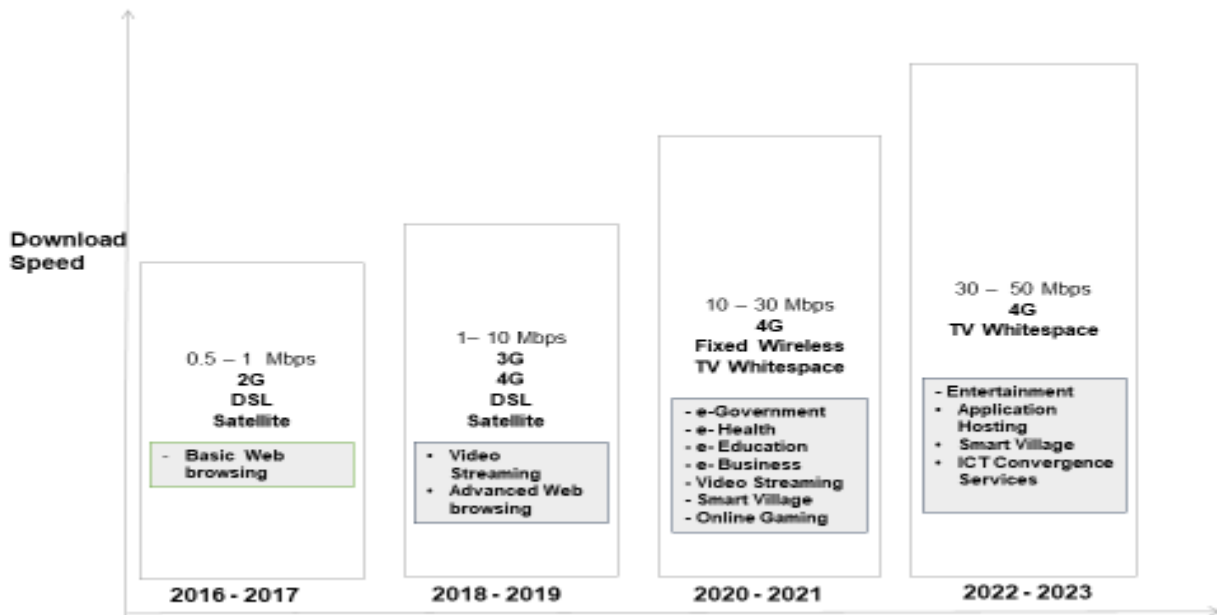
c) Agricultural Areas
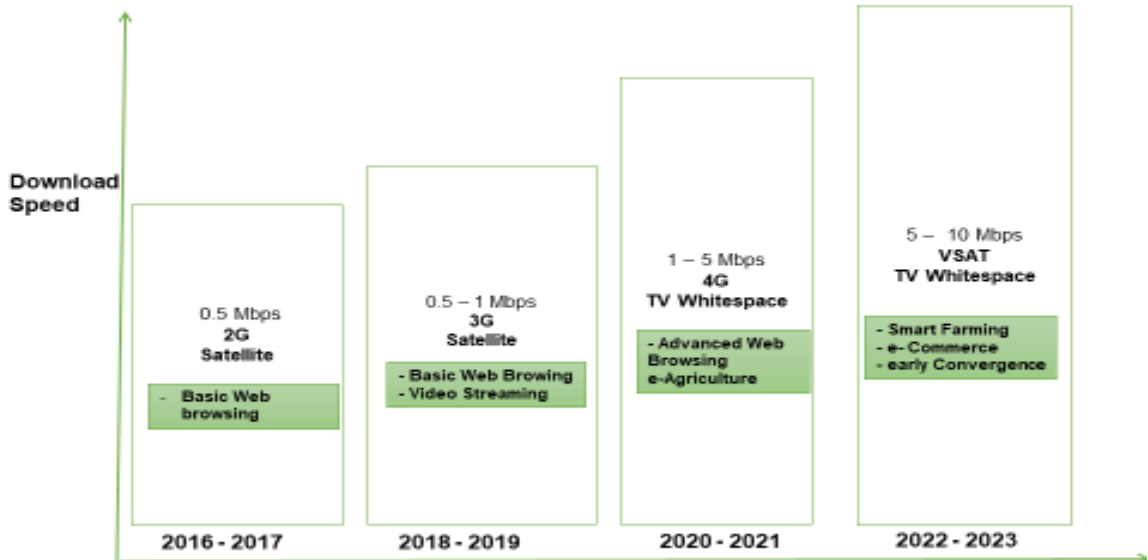
- The lowest and highest figures on the speed range in Urban Areas and Rural Areas represent minimum speeds of households and businesses respectively on each category.

- The lowest and highest figures on the speed range in Agricultural Areas represent minimum speeds of subsistence farms and commercial farms respectively on each category.

- Attainment of the set minimum target speeds should be facilitated by ensuring that:

  I. The development of infrastructure and services should be conceived jointly with enabling demand side strategies and initiatives that will ensure deployed networks are utilised, in order to attain the ecosystem definition of broadband;

  II. Broadband networks and technologies continuously evolve for Botswana to reach the desired target speeds;

  III. Service providers continuously align their networks capabilities to achieve the set target speeds;

  IV. There is sufficient investment by both the Government and private sector; and

  V. Monitoring of compliance to set target speeds is done on a regular and continuous basis.

- Listed technologies are not exhaustive.

- Examples of services to be accessed at the proposed minimum speeds are shown in the inner box.

4 GOALS AND OBJECTIVES

The National Broadband Strategy is anchored within broader national priorities, goals and objectives.

4.1 GOALS

The overall policy goals of the Strategy are to:

a) establish a coordinated approach to ensure that reliable high-speed networks are universally accessible throughout the country; and

b) ensuring equitable and affordable access to broadband infrastructure and services by all people over time.

4.2 OBJECTIVES

In particular, the objectives of the Strategy are to:

a) Create an enabling environment for the deployment, accessibility, availability and utilisation of broadband infrastructure and services for diverse uses.

b) Ensure universal access to broadband services by development of appropriate funding mechanism that involves public private sector partnerships and or targeted subsidies.

c) Create an enabling environment that:
   i.   Encourages and ensures increased uptake and usage of broadband services by all citizens;
   ii. Ensures the integrity and security of the broadband networks to promote confidence and trust in electronic commerce and transactions;
   iii. Promotes the protection and respect of privacy and personal dignity through appropriate instruments for regulation of personal data;
   iv. Introduces and promotes flexibility in the use of scarce resources such as spectrum to ensure the broader availability of broadband services.

d) To facilitate and encourage economic diversification *inter alia* by promoting and facilitating:
   i.   Implementation of Maitlamo (e-Government, e-Health, e-Education and e-Commerce) initiatives;
   ii. Creation of appropriate and relevant local content;
   iii. Implementation of diverse Government programmes and initiatives that are conditional upon the availability of broadband infrastructure and services; and
   iv. Innovation, research and development.

5 DEMAND SIDE POLICIES

The availability of content is of prime importance to the development of broadband services in Botswana. A successful content provision is a complex ecosystem with many players and can be achieved through interaction of the market players. National programmes such as e-government, e-health and e-education play an important role in creating a momentum of the content value chain.

The National Broadband Strategy is therefore intended to provide the best possible ground for market players by providing necessary incentives for such players to create and provide attractive content under natural market conditions. This, in general, can be done without any top-down directive for content creation. The bottom-up approach should be supplemented by the development of national public programmes in education, health or other domains of general interest.

5.1 Digital Literacy Programme

One of the usefulness of adopting an ecosystem based approach for defining broadband is that it enables a correct appreciation of the demand side of the equation. Building a state of the art broadband infrastructure while the majority of the people in the country lack the basic skills to access broadband services is of no benefit to the country. As the benchmarking exercise revealed, countries that were successful in transforming their economies from resource to service based economies through increased adoption of broadband services invested heavily not just in the deployment of broadband infrastructure but also in building capacity of the citizenry to spur demand.

ICT capacity building among the population is a key requirement for a wider penetration of broadband usage. Broadband Internet access is essential, but access alone is not enough. Basic computer skills and high-level cognitive skills for finding, evaluating, ethically using, creating, and sharing information are also required for digitally inclusive communities.

Recommendation 3 : **Digital Literacy Programme**
  i.   A structured mass Digital Literacy programme should be developed and launched as an integral part of the roll out of broadband.
  ii.   The delivery of the programme should be through a public private partnership model to be spearheaded by the Ministry of Basic Education (MoBE) and Ministry of Tertiary Education, Research, Science and Technology (MoTE) in consultation with the Ministry of Employment, Labour and Skills Development (MELSD); Ministry of Local Government and Rural Development (MLG&RD); Ministry of Youth, Sports and Culture Development (MYSC); Ministry of Investment, Trade and Industry (MITI); Ministry of Health and Wellness; Ministry of Transport and Communications; BOCRA, HRDC, BQA and BIH.

The Digital Literacy campaign could take various forms and target different categories of people and users such as:
- Learning the basic use of computers, mobile devices in rural areas (access to the web, CV writing, etc.);
- Advanced ICT training (for example establishment of ICT Clubs in schools could be used to facilitate the teaching of ICT services);

- The use of websites and e-services for small and medium companies and associations;
- Funding for Sesigo Project to provide basic computer training in public libraries;
- Funding for Kitsong Centres to provide basic computer training;
- Training of teachers in order to facilitate delivery of curriculum using ICT; and
- Training of Health Practitioners in order to bring efficiency in the Health system by using ICT.

Such training would also provide an opportunity to identify local community champions. People's leadership and skills would make them valuable agents for the promotion of the uptake and adoption of broadband services. They would also provide support to other people in their communities. This would also be a way to revitalise some of the Kitsong Centres while at the same time identifying potential sources of relevant local content that would ensure that trainees keep and maintain the usage of broadband services.

In parallel with the training of people, it is important to ensure that people who do not have personal devices for accessing broadband services can use public facilities such as Kitsong Centres, post offices and public libraries which have such devices.

<div style="border:1px solid black; padding:8px;">

Recommendation 4 : Public access to broadband facilities should be intensified through:

i. Provision of computers with internet connectivity and access in post offices, public libraries, schools, health centres and Kitsong Centres;

ii. Provision of Internet connectivity and access in public libraries, Kitsong Centres and schools should be subsidised through the Universal Access and Service Fund.

iii. Provision of Internet connectivity and access to libraries, schools, Kitsong Centres and health facilities should be offered at discounted tariffs.

</div>

5.2 Digital Literacy "Trainers for Trainers"

Consideration should be given to training a group of "Trainer for Trainers". This should comprise all centres where Government have funded Internet access such as schools, libraries, health centres, post offices and Kitsong Centres. These establishments must be on the front lines of digital literacy and digital inclusion, and these efforts must be carried out nationwide. They are uniquely positioned to provide access to technology and support digital literacy development. The trainers for trainers must be trained in delivering basic digital literacy curriculum.

5.3 Online Digital Literacy Portal

As part of the implementation of the National Broadband Strategy, Government should consider the creation of an Online Digital Literacy Portal. The portal should include high-quality online lessons that users can access and use at their own pace. Offline resources should be made available for printing or ordering and distributed by libraries, schools and Kitsong Centres, Post Offices and Health Centres. The Ministry of Basic Education (MoBE), Ministry of Tertiary Education, Science and Technology (MoTE), Botswana Innovation Hub (BIH) and Human Resources Development Council (HRDC) will be responsible for developing the Digital Literacy Portal and offline materials; as well as providing capacity building and technical support for these portals.

> **Recommendation 5   Online Digital Literacy Portal**
> *i.* Online Digital Literacy Portal include high-quality online and offline lessons materials are to be developed and spearheaded by the Ministry of Basic Education (MoBE), Ministry of Tertiary Education, Science and Technology (MoTE), Botswana Innovation Hub (BIH) and Human Resources Development Council (HRDC);
> *ii.* Offline resources should be made available for printing or ordering and distributed by libraries, schools and Kitsong Centres, Post Offices and Health Centres;
> *iii.* Training of group of "Trainer for Trainers" must be carried out nationwide in all centres such as schools, libraries, health centres, post offices and Kitsong Centres. The trainers for trainers must be trained in delivering basic digital literacy curriculum; and
> *iv.* The centres must also be used to provide access to technology and support digital literacy development and digital inclusion.

5.4 Consumer Awareness & Information

The ICT sector is highly technical and evolves at a fast pace. Communication is therefore essential in ensuring that customers are aware of the different services and products on offer and more importantly how to access them. It is therefore very important that relevant information on products, services and associated tariffs is disseminated in a coordinated and coherent manner for consumers to make informed and rational decisions.

Service Providers should disclose information related to the available products, services and their respective costs as required by the Communication Regulatory Authority Act, 2012 (CRA Act) and the Authority has to ensure that they comply. In addition, Regulatory Authority should carry out awareness campaigns to sensitise the public about the available broadband products and services. The Regulator should also collate and publish information on various products and services offered by different operators.

> **Recommendation 6   Improving Customer Information**
> i. BOCRA should ensure operators and ISPs comply with publishing products, services and price information on their standard offers, on their websites or in other easily accessible means.
> ii. BOCRA should also collect and collate this information from different operators, publish online and through other means, for price comparisons of equivalent services.

5.5 Digital Content

Broadband services can provide a variety of benefits for the population as described in the Sustainable Development Goals (SDGs) for 2015 programme of the United Nations. The ITU has also described some examples of initiatives that have already taken place that contribute to some of the SDGs. These include ITU and World Bank programmes in the fields of Education, Health and Agriculture, involving partnerships with local players, governments, Non-Governmental Organisations (NGOs), etc.

Content is part of a complex system which forms a value chain necessary for the development of broadband services. Content will emerge only if it can be hosted, transported by networks,

accessed through operating systems and handsets, financed via the end user, advertising or other sources. A simplified representation of the value chain is shown at Figure 2 in Annex 2.

There are two areas were national initiatives would bring potential high value and these are web hosting (as part of the infrastructure component of the value chain) and Content Creation. There are at least three major domains were content creation could be supported through national initiatives.

a) Local Content Development

The development of local content shall be inspired by the desire to fulfil the national ICT policy objective which aims to position Botswana as a globally competitive, knowledge and information society where lasting improvement in social economic and cultural development is achieved through enhanced use of ICT. Indigenous knowledge shall be leveraged for the purpose of cultural preservation, economic diversification and social integration through the use of ICT as a means of information sharing and a platform for economic transaction. Transition of the local content to technological platform shall facilitate lasting preservation of cultural heritages for educational purposes and their transformation into a means of commerce for various communities. Transitioning of indigenous knowledge to the technological platform shall be done in such a way to enhance the country's competitiveness in the areas of agriculture, tourism, mining and financial services.

b) Electronic Commerce and Mobile Commerce

Another important field of development is electronic commerce (e-Commerce) and mobile commerce (m-commerce). E-commerce has become a common practice in many countries and m-Commerce is now facing a similar development.

Botswana should follow similar trends in the growth of e-commerce and m-commerce, provided that some prerequisite conditions are satisfied, such as the existence of proper legislation to ensure security for the transactions, and an appropriate access to online banking or online payment. On the other hand, electronic and mobile commerce are additional drivers for getting connected to a broadband network.

Furthermore, to drive local content development and consumption, there will be need for development of robust and affordable data hosting facilities (data centres) to improve reliability of access to services.

c) Electronic Services

In Botswana, Government plays a major role in the provision of services to the public. It is the largest employer as well as the largest buyer of goods and services. Almost everyone in the country interacts with Government, and uses its services at various times throughout their lives. Government is thus an important driver of demand for broadband services.

As e-Government, e-Health and e-Education mature and more information and services become available online (in a convenient and user-friendly manner), more and more citizens and businesses will begin to embrace ICTs to access this information and services. This will increase

the uptake of ICTs across all segments of society. The success of this Strategy therefore depends on the leadership of the Government at all levels and within various ministries and departments in the adoption and promotion of the uptake of broadband services as well as in the delivery of Government services and information online.

In order to effectively leverage e-Government, e-Health, e-Agriculture, e-Education, and e-Commerce services as a driver for demand for broadband services a number of conditions should be fulfilled:

- Botswana should leverage on its high mobile penetration rate and ensure availability of e-Government, e-Health, e-Agriculture, e-Education and e-Commerce services as mobile applications. Mobile phones and or devices should be used as the main Internet access devices.
- Accessibility to personal computers and smart phones must be increased. It is therefore critical that appropriate incentives are put in place to make personal computers and smart phones in general affordable and to provide e-Government, e-Health, e-Education and e-Commerce services in a format suitable for such devices (development of Applications).
- The deployment of broadband infrastructure must be aligned to the e-Government, e-Health, e-Agriculture and e-Education programme implementation plan. Operators and service providers should adjust to this new demand by extending the reach of their broadband networks and services.

Recommendation 7   In order to drive local content development and consumption:
  i. There is a need to accelerate the implementation of e-government, e-health, e-commerce and e-education services in order to ensure there is relevant content online for the general public. The availability of the relevant content would promote uptake of the broadband services,
 ii. MTC must facilitate development of robust and reliable data hosting facilities (data centres) to improve affordability and security of access to services, and
iii. BIH must facilitate skills and entrepreneurship development in ICT to assist developers and innovators to take their ideas to working and viable solutions and move them to market as new innovations.

---

d) Open Data

Open Data is a key driver for ICT innovations and digital economy. Open Data entails releasing of non-sensitive Government data that is useful to others. Open Data requires the Government to make the non-sensitive data which it collects in the course of its operations and make it available to ICT Developers as much as it is available for re-use for commercial and non-commercial purposes, for example, *Matimela* data to develop cattle tracking systems; survey and mapping data to develop local GPS systems and so forth. The data should be available in raw form. Open data is relatively new but where other Governments have already started it, there have been benefits in local content development, economic growth in terms of creation of new innovative businesses, and job creation.

> **Recommendation 8**   Public investments and resources should be allocated to actions geared towards the development of local content with a particular focus on:
>   *i.* Implementation of e-Government, e-Health, e-Commerce and e-Education programmes,
>   *ii.* Government classifying its data so that non-confidential and non-sensitive data is opened and shared with Innovators and Content Developers who will in turn develop solution for citizens. e.g. *Matimela* Data, Survey and Mapping Data,
>   *iii.* Development of Web Hosting and Web agencies,
>   *iv.* Development of appropriate content and applications, and
>   *v.* Amending the PPAD Act, Regulations and rules to allow direct sourcing for relevant and purposeful ICT Innovative Content.

> **Recommendation 9**   The Government should communicate what information and services will be made available online and by what dates, and accelerate the implementation of the plan so as to create the need as well as the demand for e-Government, e-Health and e-Education services.

Considering the number and variety of possible initiatives, some priorities have been established that will drive the development of content in Botswana. However, it must be noted that:

- Content services in the fields of Education, Health and Commerce are recognized by international organizations such as the ITU as being of paramount importance to contribute to Sustainable Development Goals (SDGs) and therefore have a maximum potential impact. The cost of these initiatives may vary from limited cost (e.g. corresponding to the procurement of software platforms already developed in other countries) to high cost (involving hardware deployment or vast digitalization of existing content, or developing specific medical applications such as tele-surgery);
- The e-Government, e-Health, e-Commerce and e-Education initiatives have a number of projects related to putting Government services online, using broadband services to improve the delivery of Government services and generally transforming the way Government interacts with business community, citizens and visitors.
- The cost of development of electronic and mobile Commerce is essentially software for front and backend systems, as well as the development of on-line catalogues, and the usage of these services is highly dependent on consumption patterns;
- M-banking requires the participation of banks or financial institutions and development and or utilization of security software and protocols as well as appropriate legislation;
- Web hosting and software development requires appropriate infrastructure and competencies, which may be costly, but are a prerequisite for the development of local content and services.

5.6 Research and Innovation

Innovation needs a thriving private-sector-led broadband industry with multiple players competing for customers through unique value propositions. This will spur advanced technologies and businesses in areas such as Internet-Of-Things. Access to broadband is an essential ingredient that stimulates innovation and supports research and development. Broadband access has been identified by 2007 ICT Policy (Maitlamo) and the National Science Technology and Innovation Policy of 2012 as key for the success of research and innovation in Botswana. Under

the National Policy on Research Science Technology and Innovation, government committed to improving the national and international connectivity of research centres. The Maitlamo ICT Policy places emphasis on rolling out e-libraries for research and educational purposes.

a) National Research and Education Network

In order to connect the learning institutions and research centres to the internet, there is a need to establish a National Research and Education Network (NREN). NREN is a specialised non-profit service provider dedicated to supporting the Internet connectivity needs of the research and education communities within a country. NREN capitalises on the emergence of optical fibre and other terrestrial technologies to establish a high-speed research and education backbone which will ultimately interconnects to other countries National Research and Education Networks (NRENs) in the region to advance research.

Tertiary education and research institutions throughout the rest of the world are connected to the Internet and to each other using fast low-cost fibre connections provided by NRENs. This gives them a huge research and learning bonus as they are able to share resources across locations easily. Until recently, most of African countries has been missing from this interconnected world. However, this is changing with the emergence of UbuntuNet Alliance, which is an association of regional NREN, which enjoys close linkages with the Association of African Universities and the regional higher education bodies.

Botswana should ensure that all the local learning and research institutions are connected and join the international research backbone infrastructure in order to advance research and innovation locally. The Ministry of Transport and Communication (MTC), Ministry of Basic Education (MoBE) and Ministry of Tertiary Education, Research, Science and Technology (MoTE) should work together to establish the Botswana National Research Education Networks.

Recommendation 10 Establishment of NREN
The Ministry of Basic Education (MoBE); the Ministry of Tertiary Education, Research, Science and Technology (MoTE); and the Ministry of Transport and Communications (MTC) should work together to establish the Botswana National Research and Education Networks.

5.7 Legal Framework

An appropriate legal framework is critical for effective implementation of the Broadband Strategy. Such a framework will facilitate the deployment and utilisation of the broadband infrastructure as well as engender trust and confidence in the uptake of broadband services.

Legal review and reform is therefore necessary. In some areas, reform is already underway. Botswana should also consider the adoption of appropriate legislation in terms of international best practice such as the SADC Model Laws which have built the necessary foundation on which Botswana should elaborate its legal framework to promote the uptake of broadband services. This would be in line with the recommendations of the National ICT Policy as well as laying the legislative foundation for the implementation of the National Broadband Strategy.

The Strategy will impact different sectors of the economy and society in different ways. It is not practical to address all the legal issues that may emerge as a consequence of the implementation of the Strategy. Some issues could best be addressed by community education and training (public awareness campaigns), amongst others. Reform should be targeted at those areas without which full benefits may not accrue from the adoption of broadband.

a) Electronic Commerce and Signatures

Broadband usage may be depressed if there is no legislation regulating electronic commerce and signatures. An appropriate law on these two areas would give consumers confidence in using broadband services. The principles underlying the general law are based on face-to-face transactions and not online transactions. The overall objective of e-commerce and transaction legislation should, therefore, be to remove obstacles and uncertainties about the use of electronic documents and electronic communication arising out of the general law, which is biased towards face to face or paper based transactions. Botswana has recently enacted the Electronic Communication and Transaction Act and the Electronic Evidence Act. The two Acts will facilitate the e-commerce activities.

b) Consumer Protection

The e-legislation must provide protection to consumers who would otherwise not be provided with appropriate remedies by the common law and or the traditional paper base legislation. Key features of such legislation should include the following minimum elements:

- The creation of an accessible, predictable, safe and transparent trading environment, which operates across territorial borders and jurisdictions.
- Promotion and protection of party autonomy with respect to e-transactions.
- Obligations of on-line suppliers clearly spelt out in legislation.
- Addresses the liability of service providers.
- The authentication of e-signatures.

Recommendation 11 The Consumer Protection Act should be revised to ensure that it covers the online transactions and e-commerce activities.

---

c) Protection of Personal Data

One of the key policy concerns in any country that desires to encourage increased uptake of broadband service is how to address privacy concerns raised by online transactions. Unless members of the public have confidence that personal information they provide online is secure, the uptake of broadband services may be depressed. It is critical to ensure that the use of broadband services should not weaken the protection of personal data.

Botswana faces the same challenges in this regard. While different pieces of legislation attempt to protect personal privacy, there is no legislation that deals specifically within the context of increased use of online communication and or transactions. However, the Communications Regulatory Authority Act of 2012 has provisions intended to protect personal privacy and data to some extent. Section 54 makes it an offence for a provider of telecommunications services to intercept customer messages, disclose to any person the contents of any messages, disclose to

any person information about a customer, and disclose any information about the customer for its benefits.

Section 54 exempts information that was required for criminal investigations and or for criminal proceedings. Section 55 also addresses some aspects of personal privacy by stating that 'It is an offence to send an electronic message that is indecent, obscene and intended to cause annoyance, inconvenience or anxiety to another person'.

The Communications Regulatory Authority Act of 2012 however, does not deal with key issues related to protection of privacy in the context of e-transactions. The key legal principles to be incorporated in privacy legislation dealing with e-commerce include the following:

a) The collection, storage and processing of personal data must be necessary for a specified and declared purpose.
b) An obligation to update the data and a limitation in collection and treatment of such data must be in place.
c) Disclosure of personal data must only be pursuant to legal power and or consent of the subject.
d) Effective and capacitated institutions are critical to ensure the safety of the collection and storage of personal data.
e) The entities overseeing personal data must be accountable.
f) Proper categorization and treatment of data.
g) An individual should have control over his/her own data.
h) Clear rules for cross border transfers of data are necessary to ensure the protection of personal data.
i) The establishment of a protection regime for personal data in the form of a regulatory agency is crucial.

Recommendation 12 The promulgation of personal data protection law should be based on the SADC Model Law on Data Protection.

---

d) Cyber Crimes

The increased use of computers and smart phones and particularly broadband services has the potential to facilitate the commission of cybercrimes. Cybercrime can be divided into two areas. These are the ones where a computer or computer technology is used in the commission of a more traditional crime (such as theft, fraud) and one where the crime is intrinsically related to the computer or computer technology (such as the introduction of a virus, altering data or hacking). Botswana legislation adequately addresses the first type of cybercrimes. However, there is a need for reform with respect to the second type of cybercrime. Attempts are under way to address some of the challenges in this area through the on-going discussions on the possible amendment of the Cybercrime and Computer Related Crimes Act of 2007. The review should take account the best practice principles, including principles contained in the relevant legislation such as the African Union Convention on Cybersecurity and the SADC Model law amongst others.

5.8 Security of Systems and Networks

The full implementation of the National Broadband Strategy will depend, among other matters, on secure systems and networks. Legislation on secure networks protects personal privacy as

well as enabling Government to address security issues. As clearly emerges from the benchmarking exercise, it is necessary to have legislation that regulates lawful access and the necessary guidelines for cryptology including the rules relating to encrypted data. While the Communications Regulatory Authority Act of 2012 deals with some aspects of network security (See in this regard section 56 of the Act that seeks to protect networks by outlawing the damaging or obstruction of construction or maintenance of communications networks), it does not provide for a comprehensive framework for network security.

As the country is looking into implementing the National Broadband Strategy, measures should be in place to ensure networks are interoperable and secure from cyber threats. A National Cybersecurity Strategy should be developed that will cover cybersecurity issues in Botswana. A national Computer Incident Response Team (CIRT) needs to be established that will be able to detect and respond to cyber incidents on national Critical Infrastructure and even ensure citizens are protected online. The CIRT should also collaborate with regional and international CIRTs for effective response to threats and for sharing information on new threats. Efforts are underway to develop a Cybersecurity Strategy and establish a national CIRT for Botswana.

<div style="border:1px solid black; padding:8px;">

Recommendation 13 Cyber Security Measures to be put in place
  i.   The Cyber and Computer related Crimes Act, 2007 should be reviewed to align it to best practice including the African Union Convention on Cybersecurity and SADC Model Law on Computer Crime and Cybercrime. The review of the Act must also cover the areas on network and systems security.
  ii. The development of the national Cybersecurity Strategy and the establishment of the National Computer Incident Response Team should be accelerated to ensure broadband networks to be deployed are secured.

</div>

6 SUPPLY-SIDE POLICIES

The actions that the Government and the Regulatory Authority can take on the supply side are of different nature:

- Spurring or funding (directly or indirectly) of the deployment of networks (upgrades, extension, etc.) in order to increase the accessibility;
- Facilitating access to the networks, infrastructure and wholesale services for all players on the market in order to enhance competition on a level playing field, to foster the emergence of new services and their affordability; and
- Act directly on the costs for the access to networks and for the purchase of IT equipment to improve affordability.

6.1 Wholesale Catalogue (standard offers)

A condition precedent to the establishment of a dynamic and competitive telecommunications market is the presence of transparency in the wholesale offers made available to third party Telecommunications Operators and Internet Service Providers.

> **Recommendation 14** The FBO, PTOs and Value Added Network Operators (VANS) should publish their catalogues (standard offers) detailing their wholesale offers, containing the key technical and contractual terms and conditions to be committed to, between the FBO or PTO acting as a wholesaler and its PTO or VAN customers.

Such a catalogue would provide transparency as regards conditions of contract as well as on prices. It should be subject to comment by affected wholesale customers before being adopted. In the event of major disagreement, BOCRA should make a determination of matters under dispute. Typical items to be covered by such a catalogue include but not limited to:

- Wholesale Leased Lines Offers;
- Wholesale Ethernet transport Offer;
- ADSL;
- Wholesale Infrastructure sharing (e.g. each operator should be required to provide the cost of collocation); and
- Call termination rates.

As per market situation today, this will be relevant for VANS only if they are interconnected to PTOs for voice telephony, as they would have to publish their call termination rates. Improving the transparency and the replicability of prices would enhance the competition level between players on the market and then indirectly improve the affordability of broadband services for end-users.

6.2 Wholesale Pricing structure

The overall objective is to ensure that wholesale prices are effectively cost oriented (to the cost of an efficient operator) and sufficiently unbundled. This is a necessary condition to make the playground effective for fair competition, so as to foster competition on the retail market for the benefit of the end user, with lower prices and more innovative services.

a) International and National Bandwidth Pricing

International bandwidth is accessible with Botsgate services from BTCL. In view of BTCL's dominant position with respect to international bandwidth, these tariffs should be cost oriented. Moreover, the recent increase in international capacities made possible by access to the WACS and EASSY submarine cables has dramatically reduced prices in international bandwidth. This benefit should be passed on to national operators and finally to the end user. However, the current cost model does not seem to reflect cost orientation of Botsgate prices.

Besides, transit tariffs from the border to landing stations are strategic for the country as they impact the whole chain of broadband supply. A review of the total cost of international bandwidth through the two undersea cables shows that transit charges through Namibia and South Africa constitute from 43% to 68% of the total charge for bandwidth from the Botswana border to London. Clearly these short distances should not constitute such high proportions of the total costs.

The country will not benefit from the investments which the Government has put in the development of undersea cables if the transit charges from the border to the landing ports remain prohibitively high. Senior management of all operators with connections to the undersea cables should take the lead in negotiating lower transit charges from their counterparts in South Africa and Namibia where the undersea cables terminate. It is true that lately transit charges in South Africa have started to decrease as competition in the provision of international connectivity in the country increases. However, more can still be done and this matter cannot be left to commercial negotiations only. The operators should consider other options and innovations such as negotiating Indefeasible Right of Use (IRUs), capacity swapping where they can offer to carry costal countries' traffic to other landlocked countries in return for access to the undersea cables at no cost, issuing public or open international tenders for international operators to bid to carry their traffic to the undersea cables at the end of every contract (instead of negotiating contract extensions), not signing long term contracts which put them at a disadvantage when new opportunities arise elsewhere with better terms and condition, etc.

In addition to the above suggestions, BOCRA and the Government should also make concerted efforts to make the issue of high transit charges an agenda item at appropriate regional fora such as SADC ICT Ministers' Conferences, SADC regulators' conferences, etc. and to solicit support from other landlocked countries that also face similar problems. Therefore, some form of monitoring should take place and the negotiation of prices should not be left solely to operators. The Southern African Development Community (SADC) countries have as a key objective economic integration, amongst others. Needless to say that the high transit charges paid by landlocked countries lead to high charges for ICT services in these countries and thus stifle development.

> **Recommendation 15** Operators with direct access to the undersea cables should:
>   *i.* Negotiate much lower transit charges with their counterparts in Namibia or South Africa or any other country with landing station for access to the undersea cables;
>   *ii.* Consider negotiating IRUs and or capacity swaps with their counterparts in these countries in lieu of transit charges;
>   *iii.* Sign short term contracts for connectivity to the undersea cable in order to benefit from the increased competition in market segment and thus avoid being stuck with prohibitively expensive contracts; and
>   *iv.* Issue open or public international tenders at the end of each contract for international connectivity to the undersea cables (instead of negotiating contract extensions) so as to benefit from increasing competition in this market segment.

> **Recommendation 16** The Government should discuss transit charges imposed by operators in Namibia and South Africa with its counterparts in these countries, either at bilateral or at regional level, with a view to having such tariffs reviewed. The intention should be to have these tariffs regulated by the respective national regulators. Such regulation can be achieved, once agreed at Government level, by ensuring that the tariffs are cost oriented and are subject to review by the respective national regulators. The SADC regulator's forum could initiate a study to develop a cost model which should be put to public comment by all regional services providers, operators and other stakeholders before it is adopted and for implementation across the SADC Region.

The cost of bandwidth in Botswana is much more sensitive to distance. This situation might impede the development of competition in large areas of the country, since the provision of broadband services in remote areas may result being uneconomic. This is linked to the current cost models, which reproduces previous price structures for national leased lines. However, the technological evolution has dramatically reduced the dependency of costs on distance, as a result of the use of optical fibre and transmission systems with fewer signal regenerators and IP based transmission systems which are far more flexible and efficient and can be configured to cater for individual requirements in contrast to legacy SDH systems with granular capacities.

> **Recommendation 17** BOCRA should conduct an appropriate study in order to realign BTCL's existing cost models developed in the recent past with a view to:
>   *i.* Understand the effect of decrease in international bandwidth and access to submarine cables; and
>   *ii.* Ensure the said models are more aligned to current transmission technologies and less sensitive to distance. The level and structure of wholesale tariffs for national bandwidth (leased lines) should be adapted in view of technological evolution.

b) Wholesale ADSL Price Structure

The current ADSL wholesale price structure is based on an access charge, paid directly by the customer to BTCL; and a bandwidth charge, paid by the ISP to BTCL.

The access charge covers the cost of the local loop line and ADSL equipment (DSLAM, modem) and the backhaul, whereas the bandwidth charge covers the cost of the backbone. The current situation where the customer pays the access charge to BTCL must be changed such that the customer will pay the charge to ISP.

The current situation compels the end customer to keep on paying a bill to BTCL. Two drawbacks result from this situation:

- The first one is that it makes life more complex for the customer, who has to manage two different bills;
- The second one is that it does not provide a fair playground for competition, since BTCL keeps a commercial link with the customer whereas the Internet service is provided by the ISP.

> **Recommendation 18** Both the access charge and the bandwidth charge should be paid by the ISP to BTCL (as it is done in other countries), in order for the end customer to deal with a single bill for Internet access and service.

- Split the access charge in relation to costs

The current structure of the access charge is a unique price per access covering the local loop and the backbone. This structure is relevant for Internet service to the mass market, but does not allow service differentiation, such as VOIP or constant bit rate (CBR) services for business customers. The simplest way to address this issue, and also the most used worldwide according to the results of the benchmarking study, would be to separate the local loop (pure access) and backhaul: local loop price would not depend on bandwidth and backhaul price would depend on quality of service requirements.

Moreover, the copper local loop is an essential facility and should be priced on a cost-oriented basis. BTCL has expanded its offers to enable retail operators to resell 7 different levels of access speed. This is a welcome development that should be extended, as copper has proven worldwide to be a transmission medium capable of growing together with the increase of users' needs.

> **Recommendation 19** The access charge should be split between pure access and backhaul charge. Pure access should be based on BTCL actual costs for the local loop and not dependent on bandwidth while backhaul should be related to bandwidth and quality of service.

6.3 Replicability tests on retail services

Following a general trend, the telecommunications market in Botswana has led to the emergence of new players that have managed to acquire and keep sustainable positions on the market. This changing structure of the market has created new problems. In particular, one of the tasks of the regulator is to prevent operators from engaging in unfair competition by abusing their dominant position or collective dominant position.

The model of *ex ante* regulation has been adopted in Europe and many African countries. This model focuses regulation on identification of market power, based on the definition of relevant markets. In particular, the existence of vertically integrated operators providing services on competitive and non-competitive markets should be specifically scrutinized, as these operators may benefit from unfair cross subsidization between non-competitive and competitive markets. One simple tool used by regulators to monitor this situation is to carry-out replicability tests of retail services from dominant operators, to check whether other operators would be able to reproduce the retail offers from dominant operators using the same wholesale services, and avoiding squeeze effects.

In practice, the objective of bringing prices down through a stronger but fair competition requires that no player should benefit from its dominant position, in particular in the case where there is vertical integration between fixed and broadband or mobile services.

> **Recommendation 20** BOCRA should undertake a study to put in place replicability tests on retail services in order to avoid the possibility of squeeze effects for small players. The study should rely on a relevant market and significant market power analysis in order to focus replicability tests only on players with significant market power.

6.4 ICT Infrastructure Sharing

The ICT sector in Botswana is not growing at a pace that is commensurate with the investments made in the sector. Some of the debilitating factors include the huge costs incurred by ICT service providers in the acquisition of sites (land acquisition), building of infrastructure necessary for the service provision and regulatory restrictions on building new sites and infrastructure. Because of the above factors, infrastructure has become an artificial barrier to market entry. This is true, especially for small and or new businesses that do not have financial muscle to build the necessary infrastructure. This tends to distort competition in the sector, by giving undue focus to bureaucratic aspects of infrastructure development; instead of giving the needed emphasis to the desired outcomes in the form of service delivery and innovation.

a) ICT Infrastructure Sharing Among the Operators

BOCRA, through the former BTA, issued Guidelines on Passive Infrastructure Sharing which came into effect on October 2012. The Guidelines encourage sharing of passive infrastructure amongst all licensed operators. During public consultations, stakeholders expressed strong reservations about efficacy of mandating infrastructure sharing through guidelines as opposed to regulations issued under the relevant law.

Infrastructure sharing could be extended to sharing active components, i.e. Radio Access Network (RAN) equipment. In this case, operators can share the cost of rolling out the broadband infrastructure and dimension the capacity of each node to cater for their combined requirements. Each operator keeps their identity, and traffic from their respective customers will be routed and billed by the respective operators.

The structuring scheme for property rights over the shared infrastructure has to be studied and clearly defined: infrastructure could belong to a single operator, with lease agreements to others, including long term agreements such as Indefeasible Rights of Use (IRUs), or it could be placed in a joint venture between operators.

As stated above each PTOs should publish a catalogue (reference offer), which should be subject to public comment, for its infrastructure sharing offers with applicable tariffs and standard conditions.

> **Recommendation 21 ICT Infrastructure Sharing**
> *i.* The Passive Infrastructure Sharing Guidelines should be given legal effect by promulgating them as regulations under the CRA Act.
> *ii.* BOCRA should intervene in the event of disputes.
> *iii.* RAN sharing should be encouraged but not made compulsory on account of the complexities associated with its implementation. Where there is subsidy, sharing should be compulsory unless where this is not technologically possible.
> *iv.* Government should consider partner utilities service providers (such as water, electricity and roads) in order to share infrastructure for fibre deployment.
> *v.* There must be alignment of policies and regulation of construction industry to provide fibre ready infrastructure to enable last mile fibre deployment.

b) Government ICT Infrastructure

Government has made a lot of investment in putting up ICT infrastructure through its various Departments, Security Agencies and state owned agencies. Currently, most of the private service providers build and operate infrastructure, which is parallel and in duplication of already existing and underutilised Government infrastructure. This is despite the Government's infrastructure being capable of providing services; both for its primary Government use as well as use by the private service providers.

While appreciable and acknowledged, in certain cases, the duplication of resources presents challenges, which ought or can be managed differently – in aid of better national utility. Given that a number of infrastructure projects is dependent on and complement each other, there is the need for the Government to share her infrastructure. Rationalisation and sharing of the public infrastructure is part of a sustainable means to eliminating any duplication of operational mandates, enhancing oversight and reducing public expenditure. The Government by allowing infrastructure sharing of her assets, will contribute to sustainable economic growth and diversity, while allowing Government to maximise returns and value of her previous and future investments.

The Government established Botswana Fibre Networks, (BoFiNet), during the privatisation of BTC, with the sole intention of, among others, securing critical national ICT infrastructure for greater public good as well as fostering market growth through service competition. The Government made this deliberate decision and restricted BoFiNet to providing wholesale telecommunication infrastructure and services to other operators on an equitable, cost effective, non-discriminatory and open access principles. BoFiNet is, therefore, well placed as a wholesale provider to manage rationalised and consolidated national ICT infrastructure. The above building blocks represents an existing investment on which a return in the form of universal access, the ease of doing business and as one stop accountable organisation can be realised seamlessly.

Recommendation 22 Rationalisation and Sharing of Government ICT Infrastructure
i. In recognition of a limitation in resources and in aid of effective economic collaboration between the public and the private sector, Government owned Information and Communications Technology infrastructure should be shared with private sector in order to facilitate economic development.
ii. In pursuance of (i) above, ICT infrastructure owned by certain Government Departments and state agencies must be rationalised and consolidated under Botswana Fibre Networks (BoFiNet) for easier management and operations of such assets as well as availing the infrastructure to be shared with other ICT service providers.

c) Botswana Power Corporation and Water Utilities Corporation Telecommunications Network

The Botswana Power Corporation (BPC) and Water Utilities Corporation (WUC) owns more than 850 km of combined fibre optic cable which covers most of the major urban areas and large villages on the eastern side of the country. The BPC and WUC excess fibre optic cable networks should be used to provide telecommunications services.

The BPC and WUC excess dark fibres should be leased to the Telecoms operators on non-discriminatory terms and conditions, fair and open principles. This should be subject to a simple authorisation from Government in order to put this valuable national resource to use, for the benefit of consumers, increase the available capacity, provide redundancy and in some cases provide new fibre infrastructure.

Recommendation 23 BPC and WUC Telecommunications Network:
i. Government should authorise the use of BPC and WUC excess dark fibre optic cables[1] to Telecoms Operators to make use of this valuable national asset, increase the extent of the national backbone and access network, and provide redundancy for improved network security.
ii. The BPC and WUC excess dark fibres should be leased to the Telecoms operators on non-discriminatory terms and conditions, fair and open principles.
iii. Government should consider consolidating the BPC and WUC telecommunications assets with other Government owned ICT assets under a single entity (BoFiNet) for easier management and operations of such assets as well as availing the infrastructure to be shared with other ICT service providers.

d) The Department of Broadcasting Services Television and Radio Digital Studios and Terrestrial Network

The Department of Broadcasting Services (DBS) owns and operate a state of the art digital television and radio studios and terrestrial network. The digital terrestrial network has been deployed throughout the country solely for the distribution of the public broadcasting services.

---

[1] Government should encourage BPC to build fibre ducts or aerial fibre routes which could be leased to the Telecoms Operators.

The DBS terrestrial network and studios are highly underutilised. It has been further observed that the development of broadcasting content to fill up the capacity of the DTT is quite a challenge for DBS and indeed other broadcasters in general.

The DBS excess capacity on the television and radio terrestrial network and studios should be leased to broadcasters and content producers on non-discriminatory terms and conditions, fair and open principles. This should be subject to a simple authorisation from Government in order to put this valuable national resource to use, for the benefit of broadcasters, content producers, consumers, the government and the economy in general.

Recommendation 24 DBS Digital Terrestrial Network and Studios:
i. Government should authorise the use of DBS excess capacity on the television and radio terrestrial network and studios to other broadcasters and content producers to make use of this valuable national asset, for the benefit of broadcasters, content producers, consumers, the government and the economy in general.
ii. The DBS excess capacity on the television and radio terrestrial network and studios should be leased to broadcasters on non-discriminatory terms and conditions, fair and open principles.
iii. Government should consider consolidating the DBS television and radio terrestrial network assets with other Government owned ICT assets under a single entity (BoFiNet) for easier management and operations of such assets as well as availing the infrastructure to be shared with other ICT service providers.

6.5 Digital Divided

Mobile broadband requires the appropriate spectrum, in particular in rural areas lower frequencies are required for widest coverage. The radio spectrum is a valuable and scarce resource which should be put to good use to provide services which would otherwise be unavailable to consumers. The manner in which spectrum is allocated, managed and used is therefore of paramount importance. The framework for spectrum licensing should fully take account of this importance by having appropriate regulations and spectrum licence conditions. There should in particular be the legal right on the Regulator to:

- Repossess any unused spectrum in accordance with conditions under which it was allocated, and
- Re-allocate it to operators who are prepared to use it to meet Government's policy objectives of providing broadband services to all parts of the country.

Recommendation 25 Digital Dividend
Botswana and its neighbours should discuss and agree measures to accelerate the digital TV migration process so as to release the 800 MHz ("Digital Divided") band which is most suitable for delivering mobile broadband services in rural areas. The emphasis should be on clearing border areas of television transmitters in this band[2].

---

[2] For urban and suburban areas, Wireless Broadband is a strong complementary technology for Fixed Broadband. Using 4.5G (beyond LTE) will bring definite advantages to the deployment of the networks. More spectrum could be allocated (2.3G, 2.5G, 2.6G) to operators in preparation of 4.5G. Deployment of NB-IoT for Mobile agriculture purposes in the

This spectrum band is particularly suited for rural areas due to its bigger coverage range. Therefore, the digital television migration process should be accelerated so as to facilitate the rollout of next generation access networks in rural areas.

6.6 International Connectivity

Currently Botswana has access to sufficient international capacity to meet her medium to long term needs as shown in Figure 3, Annex 2. However, the Government must always look out for investment in the undersea cables that will be constructed in the near future. The responsibility to invest in these cables should lie with BoFiNet as the wholesale provider wholly owned by the Government. BoFiNet shall also establish points of presence globally to ensure that Botswana communicates seamlessly with the rest of the world without going through third parties in a bid to bring cost of services down. Other operators are also free to invest and or buy international capacities for their own use. However, if these infrastructure and facilities are to be provided to other operators, they should be provided on fair, open and non-discriminatory terms and conditions principles.

6.7 Backbone Network

Even though Botswana has redundant national fibre backbone networks, which connects most parts of the country, there are still some villages that are not connected to the fibre optic network such as Central, Ghanzi, Kgalagadi, Kgatleng, North West and Southern Districts. BoFiNet shall be responsible for expansion of the backbone network to connect villages and localities to the network, as shown in Figure 4 of Annex 2, in order to facilitate the development of the fibre backbone network throughout the country. Other operators are also free to deploy and own national backbone infrastructure. However, if these infrastructure and facilities are to be provided to other operators, they should be provided on Open Access Network (OAN) Principles.

Recommendation 26 International Connectivity and Backbone Networks
In cases where the international connectivity and backbone infrastructure cannot be economically duplicated, it should be owned by Botswana Fibre Networks, which is wholly owned by Government. These infrastructure, facilities and services should be provided to other operators on non-discriminatory terms and conditions, and on fair and open principles.

6.8 Mobile Broadband Services

Mobile network provides the quickest and most cost effective means of providing broadband services especially in rural areas where the availability of copper network is not widespread. Mobile network therefore remains the most viable and preferred method of ensuring speedy and affordable way of expanding access to broadband service in Botswana.

900M GSM 0r 800M LTE on a national level, with applicable regulation rules in place, will be to great benefit to network penetration targets**.**

6.8.1 Mobile Broadband Services to Urban Areas

The analysis conducted shows that villages and towns with populations of more than 5, 000 inhabitants would be profitable for an operator with a significant customer base and thus would not require any subsidy from the Government. There could be an operator that does not meet the profitability requirement in the above villages and towns on account of having a smaller customer base. However, it would be wrong to subsidize such an operator while others are required to bear the full cost of deployment in the same areas at their cost because such an arrangement would distort the market.

As a policy position all mobile operators should be required to provide mobile broadband services to all cities, towns and villages with more than 5, 000 inhabitants on a competitive basis and without any subsidy from Government. Thus the granting of additional spectrum licenses should be conditional upon such operators providing broadband services in the said areas without any subsidy.

Recommendation 27 4G/LTE spectrum will only be granted subject to the following conditions:

  i. The operator shall provide services in cities, towns and villages with more than 5, 000 inhabitants at their own cost;

  ii. The operator shall complete the rollout within a period to be specified in the spectrum licence;

  iii. The operator will be allowed to use either 3G or 4G/LTE spectrum in any city, town or village if they choose to (See Recommendation 2); and

  iv. The 4G/LTE spectrum for broadband infrastructure will be national and the operator may use it at any other location beyond those in areas with more than 5, 000 inhabitants at their discretion.

6.8.2 Rural Mobile Broadband Systems

The rollout of mobile broadband infrastructure and services in villages or locations with a population of less than 5000 inhabitants will require some form of subsidy on account of the fact that these are non-profitable areas. The approach for allocation of subsidy should be similar to the one adopted during Nteletsa II programme, following a reverse auction model with the tender going to the operator requiring the least subsidy. It is recommended that the country be divided into areas as shown in Figure 5 of Annex 2 and a tenders be issued for rollout of broadband using reverse auction method for each region.

In summary, the subsidy should be based on the following principles.
- Open and Competitive Principle - any operator should be authorised to compete to be granted subsidies;
- Necessity Principle - subsidy should be necessary in the sense of it compensating only the additional or net costs related to the characteristics of the investment that would be prone to hinder such investment;
- Proportionality Principle - the subsidy should be proportionate to the identified additional costs; and
- Transparency Principle - the conditions for the provision of subsidies should not put any candidate at an advantage over others.

Operators who have a spectrum licence should be authorised to bid using any technology applicable to that spectrum, subject to whatever restrictions that may be applicable to their Service and Spectrum Licences.

In addition to providing coverage to the villages and towns specified in the respective regions, the winner will be required to provide broadband services at tourist camps and lodges (whose locations will be specified in the tender documents) using whatever technology (including satellite) that they deem most appropriate in their respective areas. The reverse auction tender for each area will apply to both the mobile broadband infrastructure and whatever technology that the winner may propose for tourist camps and lodges, subject to the said technology meeting the minimum requirements that will be specified in the tender.

Recommendation 28 Provision of Broadband Services in Rural Areas
i. The country should be divided into areas for purposes of issuing a tender for reverse auction to provide broadband infrastructure and services in villages with less than 5000 inhabitants in each region and associated tourist camps and lodges.[3]
ii. The provision of broadband solution in rural areas will be funded through the Universal Access and Service Fund and Government Grants where necessary.
iii. The resulting infrastructure must be shared with other operators on non-discriminatory terms and conditions, and on fair and open principles.

6.9 Agricultural Broadband Infrastructure

The Government wants to roll out telecommunications infrastructure to agricultural areas as per the Agricultural Infrastructure Development Initiative studies done by Botswana Institute for Development Policy Analysis (BIDPA) in 2004 and revised in 2009. Broadband services would therefore be provided in all agricultural areas as shown in Figure 6 of Annex 2.

The rolling-out of telecommunications infrastructures in farming areas should be done in collaboration with the rollout of other facilities, such as power, roads and water. Power and roads are required for proper operation and maintenance of telecommunications infrastructure.

For remote farms with larger surface areas, alternative technologies should be reviewed at implementation, taking into account the level of development on the farms in the area under consideration, the availability of commercial power in the area or the feasibility of using solar power, actual or potential agricultural production levels as assessed by the Ministry responsible for Agriculture, and the specific needs in terms of bandwidth required, whether mobility of the broadband service is a necessity or not, whether the system provided must have terminals that are compatible with the public networks, etc. Thus the provision of broadband infrastructure in the farms that are far from existing telecommunications infrastructure should be assessed on a case-by-case basis at implementation to avoid the potential of developing infrastructure at a high cost which may end up being underutilised or worse still, being completely not utilised.

---

[3] In order to achieve rural high speed mobile broadband, operators are recommended to modernize existing wireless sites to be LTE compatible as per a decided roll-out schedule that aligns with the broadband implementation timelines.

> **Recommendation 29 Broadband Infrastructure for Agricultural Areas**
>   *i.* Farms which are already covered by existing wireless networks should be included within the scope of coverage of villages with less than 5000 inhabitants as addressed by Recommendation 28.
>   *ii.* BOCRA should conduct a specific needs analysis for all farms or farming areas which are far from existing network coverage. The analysis should take into account the development status and agricultural production level of each farm area as assessed by the Ministry responsible for Agriculture. The outcome of this assessment should be used to prepare a tender for provision of coverage of such farming area and Bidders should be allowed to propose the most suitable technical solution for each place.
>   *iii.* The funding of broadband infrastructure and services in agricultural areas will be provided by Ministry responsible for Agriculture.
>   *iv.* The resulting infrastructure must be shared with other operators on non-discriminatory terms and conditions, and fair and open principles.

6.10 Local Access Loop (Copper)

Most of BTCL's telephone exchanges are equipped with ADSL 2+/Re-ADSL. The cost of deploying copper is very high and its rollout takes a long time. SDSL (symmetric-DSL) is a proven and robust technical solution that gives possibilities to provide very good bandwidth, without the limitation in uplink experienced with most of the xDSL technologies in use. It can be implemented on the short term, together with service level agreements compliant with international standards for connectivity.

> **Recommendation 30 Upgrading of xDSL Infrastructure**
>   *i.* BTCL should upgrade its xDSL infrastructure to incorporate SDSL so as to provide symmetrical broadband speed for households, businesses and Government institutions (symmetrical upload/download data).
>   *ii.* In relation with the above, guaranteed capacities (no best effort) should be offered together with Guaranteed fault repair time.
>   *iii.* Since BTCL has no competitor in this market segment, BTCL should cover all costs associated with upgrading the xDSL infrastructure with its own funds. However, as with the case for ADSL, wholesale conditions should make it possible for all ISPs to build competitive SDSL retail offers.
>   *iv.* The infrastructure must be offered to other operators on non-discriminatory terms and conditions, and on fair and open principles.

Part (iii) of Recommendation 30 should be implemented in line with the replicability principle mentioned in Recommendation 20.

6.11 Fibre-To-The-premises (FTTx)

Deployments of Fibre-to-the-x (FTTx, where x stands for home, office, or building) have started worldwide and in the future, fibre optic networks will replace copper in the access network and create a new local loop. Actually, FTTx can even be categorised as Ultra-Fast Broadband. As a policy position, the importance of FTTx is acknowledged. However, given the high cost associated

with its deployment, it is proposed that its deployment be limited to targeted geographic areas and or services:

- The geographic areas should include the urban centres and major villages in the country listed in the Table 1, Annex 2. As a matter of policy, FTTX should be extended to industrial areas, commercial centres, central business districts, civic centres, economic zones, community centres and public facilities in urban areas and major villages.

- In principle, residential areas should also be covered with FTTx infrastructure. However, the feasibility, in terms of costs of including residential areas in the rollout of FTTx should be done on a case-by-case basis at implementation. This will involve developing some criteria for selecting which residential areas should be included in the rollout that is underpinned by the provision of a subsidy.

On account of the cost that makes the FTTx a natural monopoly, the possibility of operators funding the deployment of a large FTTx network in many localities of the country on their own is almost non-existent. Accordingly funding for the deployment of the FTTx infrastructure in many areas would have to be either funded by the Government directly and or through its wholly owned entities, or heavily subsidised through the Universal Access and Service Fund. In this regard, BoFiNet is perfectly placed to play this role, as a wholly Government owned entity involved in the provision of wholesale communications infrastructure and services. To ensure that all Service Providers and consumers benefit from it and to foster competition, the services delivered on the FTTx infrastructure should be provided on Open Access Network (OAN) Principles. The basic principles of an OAN are that:

a) Consumers must be free to choose any service provider on the OAN;
b) Any authorised Service Provider must be free to deliver services over the OAN;
c) Any licensed Service Provider should be allowed to add access points to the OAN, subject to technical feasibility and the service provider paying for the cost of establishing the access point;
d) Service Providers should be offered Transport Layer services at various levels depending on their requirements;
e) All Service Providers must be offered services on non-discriminatory terms and conditions, and fair and open principles; and
f) The OAN operator should not compete with its customers (Service Providers) by offering retail services (directly to end users).

Even though BoFiNet is the designated operator responsible for rolling out FTTx, other operators are allowed to build their own FTTx infrastructure at their own cost, as such an undertaking would increase the availability of the best broadband infrastructure in the country.

Recommendation 31 Development of FTTx in Urban Areas
i. BoFiNet should be designated as the operator responsible for the deployment of FTTx network. However, other operators are allowed to build their own FTTx infrastructure at their own cost.
ii. BoFiNet and or any operator shall be obligated to allow other operators to access the FTTx on non-discriminatory terms and conditions, and on fair and open access principles.
iii. The rollout of FTTx should in the short to medium term must give priority to connecting public facilities, Commercial, Industrial, Civic and Community Areas in urban and major rural centres.
iv. Deployment in residential areas shall also be considered subject to developing some criteria at implementation for selecting which residential should be included. The said criteria should take into account both the cost and expected demand for the FTTx infrastructure in the targeted residential areas. However, FTTx must be rolled out to residential areas in all cities.

6.12 Satellite Broadband Systems

Satellite connectivity in Botswana is only suitable for remote locations and not for mass market. Nevertheless, in areas where the roll-out of a terrestrial network is not affordable, this technology could provide solutions for specific cases such as enterprise connections, Community Access Centres, farms, lodges and game reserves, etc.

Recommendation 32 Provision of Service Using Satellite
Satellite broadband access should be supported through specific subsidies to be granted on a case-by-case basis, when no other solution providing the same level of service is (or foreseen to be) available.

6.13 Government Data Network

The GDN must be redesigned, stabilised, optimised and transformed into a borderless converged network that will bring together routing, switching, wireless and security capabilities and support data, video and voice in order to modernise the operations and management of Government IT services. This will allow the network to be ready for provisioning of bandwidth intensive and jitter-intolerant applications such as telemedicine, telecommuting and telepresence. The GDN should be able to offer a whole range of unified and new communications services such as instant messaging, video conferencing and streaming.

Recommendation 33 Government Data Network
i. MTC must upgrade and transform GDN into a borderless converged network that will provide data, video and voice in order to modernise the operations and management of Government IT services.
ii. The GDN should be able to offer a whole range of unified and new communications services such as instant messaging, video conferencing and streaming.

The Department of Information Technology (DIT) is providing Internet services to all the Ministries, Government Departments, Schools, Land Boards and public health facilities. As a result, DIT is an Internet Service Provider for the entire government. However, DIT has outsourced

provision and maintenance of internet and bandwidth services to BTC. It has been observed that the outsourcing of internet and bandwidth services to one company is inhibiting the growth of the internet businesses in particular in villages. This is mainly due to the fact that the internet business derives its revenue mainly from corporate customers, with limited revenue from residential customers. Therefore, for the ISP business to be successful, it requires corporate customers. But, in most villages, about 80% of the corporate market are mainly Government offices, schools, Council offices, Land Boards and Tribal Offices, which are all serviced by DIT.

To create more business opportunity for the private sector and create employment it is proposed that the Government should outsource the provision of internet services and maintenance of the GDN to deserving citizen owned ISPs.

Recommendation 34 Outsourcing of Government Data Network
   i.   The GDN must be separated into various networks of Education Data Network, Health Data Network as has been recommended by the National ICT Policy;
   ii.   the Government should outsource the provision of internet services and maintenance of the GDN to deserving citizen owned ISPs to create business opportunity for the private sector and employment creation.

6.14 Public Internet Access Points

Currently Internet usage in rural areas is in its infancy. The rollout of e-Government, e-Education, e-Agriculture and e-Health services will only have a positive impact on the lives of the majority of people if rural areas can have access to internet as well. Access to broadband services for the rural areas is not just a matter of convenience. It would have immediate and practical benefits in terms of saving rural inhabitants time and the cost of travelling from their respective villages to major urban centres where such Government services may currently be available.

The extension and upgrade of mobile networks (to 3G/4G) will increase the accessibility of broadband. In addition to the catalogue from the main PTOs, reinforcing the presence of Value Added Network Services (VANS) in rural areas would widen the range of available offers for citizens, fostering competition between service providers and making sure that people can chose the best suited solution for their usage.

The main challenge for Internet Service Providers to establish service in rural areas is the cost of national leased lines which are distance based. In certain areas, the unavailability of the local access network hinders the delivery of internet to the end users. In order to address this challenge, the provision of Internet in rural areas must be left to the ISPs (who are more suitable) while PTOs focus on the bigger tasks of developing and operating the national broadband infrastructure.

The regulatory framework should facilitate the deployment of broadband in the rural areas using the fixed wireless technology. Therefore, the fixed access spectrum should be made available for the provision of broadband in rural areas. This must be implemented together with Recommendation 25.

> **Recommendation 35** To improve the access to Internet and broadband:
> - *i.* The regulatory Authority should avail the spectrum for the deployment of Fixed Wireless Access system both in urban and rural areas; and
> - *ii.* A detail rollout schedule for the deployment of Fixed Wireless Access system should be developed starting with urban areas and large villages and eventually smaller villages as the demand for broadband service develops.

The presence of Community Access Centres remains critical due to limited access to terminals on one hand and the lack of digital literacy on the other. The necessity for Government intervention through the provision of appropriate subsidies to incentivise the roll out of Local Internet Access Points (LIAP) in all rural areas is accepted as a reality. The current Kitsong Centres would have to be upgraded to provide broadband services and also include equipment that would upgrade them into wireless LIAPs to enable residents of such villages to subscribe directly with ISPs that will be operating such facilities. The provision of Internet in rural areas is more suitable for the ISPs in collaboration with the communities.

In order for the Kitsong Centres to be transformed such that they offer community access as well as LIAPS, a number of challenges such as lack of a harmonised approach to ownership and operation of these centres would have to be overcome. In addition, the issue of sustainability of these centres must be addressed.

> **Recommendation 36 Community Access Centres**
> - *i.* Ministry responsible for Communications Sector should conduct an audit of all existing local community centres such as the Nteletsa II Kitsong Centres, other related projects such as Sesigo and the Kitsong Centres implemented by Botswana Post. The outcome of such a study should provide useful lessons that could be taken on board during the rollout of community access centres as part of the broadband infrastructure.
> - *ii.* The Kitsong Centres must be upgraded to provide broadband services including the equipment that will enable them to offer wireless local Internet access points (LIAP).
> - *iii.* Appropriate subsidies must be provided to incentivise the roll out of Local Internet Access Points (LIAP) in all rural areas. Consideration must also be made to harmonise the ownership and operation of these centres with a view to be given to ISPs in collaboration with the communities.

6.15 ICT Customer Devices

The availability of low cost laptops and smart devices will be a critical success factor for the development of Broadband in Botswana. In particular, smart devices will be the main access device to broadband for rural inhabitants who are very sensitive to price levels. Reducing their cost would then improve the overall affordability of broadband for the largest part of the population.

7   *FUNDING*

The scale and scope of the broadband interventions and initiatives to be undertaken requires investment by both the public and private sectors. A total budget estimate of more than P11 billion is required to implement the recommendations of the Strategy over a period of nine (9) years starting from 2014/15 financial year as indicated in Annex 3.

will be the Universal Access and Service Fund for those projects in areas, which are not commercially viable. Government funds may also be required directly or indirectly to supplement the Universal Access and Service Fund for certain projects. A direct subsidy from Government would in most cases, involve, a direct allocation from public funds for certain projects. Operators will be required to implement broadband initiatives and projects in areas where it is commercially viable.

7.1   Commercial Funding

In areas where it is commercially viable, the operators should deploy the broadband infrastructure without any subsidy. It is proposed that the operators should be responsible for funding the mobile broadband wireless access systems in areas with at least 5 000 inhabitants. These areas have been found to be commercial viable (techno-economic analysis of the study) to provide the mobile broadband access solution without subsidy.

7.2   Public Funding

Some countries such as Australia have taken a view that the broadband fibre access is an essential facility just like roads or water supply, railways, power necessary to enable the economy. Therefore, it cannot be supplied in a competitive manner but rather it is government funded. It is very important that the broadband fibre access is considered in the same manner since it facilitated the economy in the knowledge society.

Botswana should therefore adopt the same principle where the deployment of the fibre to the home/business is government funded and be the responsibility of Botswana Fibre Networks. The broadband fibre network should be leased to other operators at wholesale level on an open access principle and non-discriminatory. However, private investors will be allowed to construct their own broadband fibre if they so which.

7.3   Public Private Partnership

In most countries, Universal Access and Service Funds have been established to address the digital divide by funding the investment of ICT infrastructure and provision of ICT services in underserved areas. Operators contribute to the fund through a levy as well as Government contribute as a grant. Just like the implementation of Nteletsa II project, operators are requested to bid for the fund to deploy the networks in the identified areas. The operator which requires less subsidy is awarded the fund to provide the service in remote areas. This is truly a public private partnership funding mechanism.

It is proposed that the public-private partnership funding mechanism should be used for the funding of broadband access solution in areas with less than 5000 inhabitants.

7.4 Localised Funding

Localised funding approach is normally adopted to address a selected area on a smaller scale. For example, Local Government (Councils) can invest in the deployment of fibre in their local authority and lease it to operators to provide services. This approach has been done in Sweden, Stockholm where local municipalities have helped with fibre deployments to help the local economy. The funding is typically at the lowest levels covering provision of ducts and fibre cable. Other operators then lease these infrastructures to deliver the service to the end users. Likewise, in certain areas the property developers may install ducts and fibre during the servicing of plots and lease them to operators.

Some Local Authority has established Investment Companies, therefore if they consider the deployment of broadband access fibre in their council areas they should be allowed. The licensing framework should enable or allow public private partnership funding should local authorities and property developers wish to deploy the broadband infrastructure within their localised areas.

7.5 Universal Access and Service Fund (UASF)

The Universal Access and Service Fund should be set up and used as vehicle for funding the development of the communications sector, with all licensed Service Providers regularly contributing to the Fund. The Fund should be used to facilitate the rollout of broadband solution in areas which are not commercially viable. Public funds may be required to complement the contributions to the Universal Access and Service Fund.

The Fund will also be used to implement some of the projects such as provision of public Internet Access points; the Digital Literacy Programme; public awareness and educational campaigns; ICT research, innovation and development to improve the development, usage and adoption of the ICT services.

Recommendation 37 Funding for Implementation of Broadband
  i. Government funds should be used to fund certain projects, which are of national interest to drive the economy such as the international connectivity, national backbone and fibre to the homes, businesses and commercial areas.
  ii. In areas where it is commercially viable to provide the broadband infrastructure and services, licensed operators should provide the services without any subsidy.
  iii. The public private partnership funding mechanism should also be considered for implementation of broadband infrastructure and services in certain areas.
  iv. Public funds (Government contributions) should be allocated to complement the contributions made by selected licensed operators to the Universal Access and Service Fund.

---

8 IMPLEMENTATION ARRANGEMENTS

The implementation of the NBS is a huge national undertaking which requires the buy-in, commitment, cooperation and participation of all the stakeholders. All stakeholders are required to participate and contribute towards the successful implementation, utilisation and uptake of broadband infrastructure and services.

The proper and successful implementation of the National Broadband Strategy depends to a greater extent on a well-coordinated implementation framework.

8.1 Roles and Responsibilities

The National Broadband Strategy cuts across all Government ministries and institutions, private sector and the public in general. The following are the roles and responsibilities of key stakeholders:

a) Government

In view of the broad, complexity, challenges and the importance of the broadband infrastructure and services in the economy of Botswana, several Ministries shall individually and collectively place themselves ready for sectoral implementation of the strategy as it affects them. Government Ministries, Independent Departments and Agencies shall ensure that they put in place plans and strategies at sectoral level to effectively promote, develop and utilise broadband infrastructure and services in order to achieve the Sustainable Development Goals (SDGs), realise the ideals of Vision 2036, and National Development Plan 11 (NDP 11).

Several Ministries are key in the implementation of NBS. Their roles and responsibilities are as follows:

i) Ministry Responsible for Communications Sector

The Ministry responsible for Communications sector is key in delivery of broadband infrastructure and services. The Ministry shall continue to manage the policy environment in the sector to create an enabling environment for the private sector and to actively encourage it to become a driving force of and the main investor of delivering the broadband infrastructure and services. The Ministry is appropriately invited to enhance supervision, monitoring and coordination efforts between ministries, departments, private sector, civil society and all other stakeholders in a bid to boost efficiency and popularise broadband. It must establish a monitoring and evaluation mechanism for the operators, the Fund, the regulator, private sector, government agencies so as to measure the effectiveness of the broadband strategy and asses if its goals and objectives are being met. The Ministry must also provide a global vision of where the country should be in terms of broadband development by putting in place multi-sectoral programmes for multiple uses of ICT in areas such as government, commerce, education, health, agriculture, tourism and financial services.

The Ministry must therefore be rationalised and adequately resourced to carry out the mandate of delivering ICT in Botswana. The Ministry should be able to effectively provide national coordination for delivery of ICT, drive the planning, implementation, monitoring and evaluation of the ICT programmes, projects and initiatives in the country. The rationalisation of MTC should include the enhancement of:

➤ Department of Telecommunications and Postal Services (DTPS) to provide policy direction for the converged communications sector. The communications sector covers telecommunications, postal and courier services, commercial and community broadcasting and media, internet and ICT, and other emerging issues including cyber security and smart economy in accordance with international best practices and standards; and

➤ Department of Information Technology (DIT) to be the Government ICT Service Provider responsible for delivering core Government ICT projects, services and standards. Some Government IT functions must also be decentralised to Ministries and Independent Departments so that they can implement their own IT services with guidance and support provided by DIT;

ii) **Ministry Responsible for Education**

Ministries responsible for education sector have a critical role in the cultivating the culture of information society through the school system and on training experts by provision of training opportunities. The Ministries shall also develop and introduce ICT syllabus into the school curriculum. The Ministries shall also identify the ICT needs and requirements for the schools and training institutions and therefore develop programmes aimed at the effective implementation of the strategy.

iii) **Ministry Responsible for Health**

The Ministry shall identify the ICT needs and requirements for the health facilities (hospitals, clinics & health posts) and develop specific programmes aimed at increasing quality, safety, timeliness and efficiency of health services in order to promote healthy lifestyles and practices through the use of broadband infrastructure and services.

iv) **Ministry Responsible for Trade**

The Ministry shall facilitate and promote the diffusion and use of broadband infrastructure and services across all commercial activities of sectors of the economy. The Ministry shall, therefore, identify the ICT needs and requirements for all sectors of economy and develop specific programmes aimed at promoting and using ICT throughout Botswana's commercial sphere in order to increase the efficiency, global

competitiveness, wealth generation capacity, and diversification and growth of the economy, and create employment.

v) **Ministry Responsible Finance**

With the massive investment required to meet the unsatisfied demand, market forces alone will not make the provision of service to the satisfactory level required by the government. Funding and resource mobilisation is of critical importance for the overall and effective implementation of this strategy. The Ministry responsible for finance shall ensure ICT facilitates national development, economy diversification, attracts foreign direct investment and contribute to the economy of the country. The Ministry shall therefore facilitate an enabling environment for increased resource provisioning and prioritisation for the development and access to ICT infrastructure and services through the development and recurrent budgets.

b) **Communications Regulator**

The regulator should introduce license conditions and other regulatory requirements for service providers to meet and achieve broadband infrastructure deployment (penetration) and social obligations targets. The regulator shall continuously track the operators' territorial coverage and investment obligations of developing and expanding the necessary infrastructure and services throughout Botswana. The regulator will also make sure that the programs are equitable to all parties and allow for quick and efficient dispute resolutions.

c) **Botswana Fibre Networks Limited**

The Government established Botswana Fibre Networks Limited (BoFiNet) during the privatisation of BTC, with the sole intention of, among others, securing critical national ICT infrastructure for greater public good as well as fostering market growth through service competition. The Government made this deliberate decision and restricted BoFiNet to providing wholesale telecommunication infrastructure and services to other operators on an equitable, cost effective, non-discriminatory and open access principles. BoFiNet is, therefore, well placed as a wholesale provider to manage rationalised and consolidated national ICT infrastructure. The above building blocks represents an existing investment on which a return in the form of universal access, the ease of doing business and as one stop accountable organisation can be realised seamlessly.

The mandate of BoFiNet must therefore be reviewed and extended to include management of rationalised and consolidated Government owned ICT infrastructure covering telecommunications, internet and broadcasting. BoFiNet must also provide services to research and educational institutions as per Recommendation 4 part (iii), as well as Security Agencies.

d) **Universal Access and Service Fund**

The role of the Fund is to promote and explain to the industry and to consumers the objectives, targets, rules, obligations and mechanisms established by this strategy. The

Fund will assume a significant responsibility for the program's effectiveness and ultimate success. Furthermore, the Fund shall carry out whatever studies and investigations are necessary to monitor the achievement of UA and US in the country and to design the projects of the program in consultation with the Government, private sector and the public. The Fund shall also carry on a dialogue with the industry to secure both their collaboration in achieving the objectives of the UAS program and their active participation in the subsidy program of the UASF.

e) Statistics Botswana

Statistics Botswana shall collect and analyse data and disseminate information on the adoption, utilisation, uptake and impact of broadband services on the economy on annual basis. This information shall be used to measure the contribution of the Communications sector into the economy as well as providing direction and support for future considerations.

f) Private Sector

The private sector should explore and take advantage of investment opportunities offered by broadband and ICT sector in general. The private sector shall provide Communications infrastructure and services and its associated investment in order to achieve digital inclusion. They are also expected to provide business expertise and know-how, and create the necessary employment which will go a long way in alleviating poverty and diversification of the economy.

The operators shall diversify services and develop competition, pushing each other towards innovation in order to allow expansion of the supply of Communications services, and improve the utilisation and sharing of the existing Communications infrastructure. In addition, the private sector shall focus on delivering attractive TCO that meet customer needs and affordable services that are relevant to the low-income citizens.

Participation of citizen owned companies and individual citizens, and obligations to create employment for Batswana should be promoted and encouraged.

g) Consumers and the Public

The consumer and the public participation in shaping the development of the Communications Sector will ensure sustained development, guarantee of high quality, affordability and availability of services and protection of customers. The consumers shall embrace and effectively utilise these services in order to improve their standard of living. This will involve assisting with the cost recovery and development of a sustainable solution by paying for the services used.

8.2 NBS Coordination

The nature of broadband suggests that the Government should establish a multi-sector committee with representatives from public and private sectors to coordinate and prioritize the rollout of broadband infrastructure and services. The structure as shown in Figure 7 at Annex 2, should be

put in place for the coordination of the National Broadband Strategy. Coordination is required for several fundamental reasons:

i) There is need for coordination with respect to provision of critical services such as the provision of power/electricity in schools, libraries, border offices, etc. as well as the supply of IT equipment to these and other facilities;

ii) Coordination is also required to ensure that the deployment is aligned to the implementation of e-commerce, e-government, e-health and e-education programmes and other Government initiatives that require broadband infrastructure and services; and

iii) Coordination is necessary to consider all aspects (supply-side and demand-side policies) of broadband ecosystem.

a) Broadband Coordination Committee

The Broadband Coordination Committee (the Committee) shall be chaired by a representative from the Ministry responsible for Communications with BOCRA providing secretarial services to the Committee. The Minister responsible for Communications (hereinafter called the Minister) will appoint representatives to the Committee. The Committee shall be responsible for high-level coordination of all national projects that the Minister, in consultation with the Committee, deems to form part of the National Broadband Strategy, from time to time.

The Committee shall:

i) Review all current national projects and recommend to the Minister those that he should be considered for inclusion in the ambit of the National Broadband Strategy;

ii) Align the broadband initiatives to other programmes such as e-Government, e-Health, e-Education, e-Commerce and or any initiative that relies on provision of broadband infrastructure and or services;

iii) Define and justify future NBS projects such as ICT Training initiatives, local content development projects, auditing of the Kitsong Centres, etc. for inclusion in the NBS and identify applicable implementing agencies/institutions;

iv) Not deal directly with any projects. Instead, relevant implementing agencies and or institution under which the specific projects fall shall be responsible for projects execution activities. The said agencies or institutions will provide regular progress reports on their respective projects to the Committee. The Committee will give the

implementing agencies whatever assistance and guidance they may need to ensure that NBS projects are executed in a coordinated manner;

v) Provide regular reports to the Minister responsible for Communications as regards the execution and challenges related to the NBS projects and seek assistance as necessary;

vi) Coordinate the review of the National Broadband Strategy as per Recommendation 40**Error! Reference source not found.** and submit a report to the Minister responsible for Communications as regards their findings and recommendations;

vii) Report progress on the implementation on the relevant National ICT policy pillars (i.e. Connecting Botswana and Community Access and Development) to the Information Age Council; and

viii) Undertake any other tasks as may be assigned by the Minister responsible for Communications.

Recommendation 38 Broadband Coordination Committee
The National Broadband Implementation Structure should be set-up to ensure an efficient implementation of the strategy and a coordinated and aligned approach with respect to the provision of broadband infrastructure and services including power, equipment and e-government, e-health, e-education and e-commerce services.

---

b) Members of the Coordination Committee

The Committee should consist of representatives from:
i) Ministries responsible for Agriculture, Communications, Education, Finance, Health, Local Government, Trade and Tourism sectors;

ii) State owned enterprise and regulators such as Botswana Communications Regulatory Authority (BOCRA), HRDC, BOT, Bank of Botswana, BIH;

iii) Academia and Research Institutions;

iv) Business Botswana;

v) Consumers and;

vi) Other institutions as the Committee may co-opt from time to time as necessary.

9 PERFORMANCE MONITORING AND EVALUATION

The continuous monitoring and evaluation of the results provided by the Strategy is of paramount importance to assess the successes, identify projects that do not provide the expected outputs, take into account changes in the ecosystem, etc. By defining metrics and Key Performance Indicators (KPI) that will be assessed on a regular basis (e.g. every year), an observatory would then have the possibility to measure the progress made in Botswana for the diffusion of Broadband.

9.1 NBS Monitoring and Evaluation

Tracking of NBS progress should be made against set targets in order to re-align as and when needed. The key elements of the monitoring and evaluation approach advocated in this Strategy are:

- The Broadband Coordination Committee will oversee the implementation of the NBS and will establish performance targets for various ministerial or governmental departments, institutions, or individuals responsible for specific aspects of the strategy or projects

- Performance plans, which will be based on the KPIs, Targets and Deadlines provided in the Implementation Log frames in Annex 2, will provide details on what is to be achieved, how it is to be achieved and how resources would be managed to ensure success will be developed.

- Quarterly monitoring and reporting will be undertaken by Ministry responsible for Communications Sector. [R40]

- Performance of ministerial or governmental departments, institutions, or individuals would be evaluated against established performance targets (during annual reviews). These reviews would also identify any operational issues linked to implementation, and if necessary effect remedial actions to keep implementation on track. The review will also gauge the impacts of implementation of the Strategy. [R40]

- An independent party would be commissioned to undertake the mid-term and long - term review of the strategy to determine the long-term impact and outcomes of the strategy based on periodic reviews, and if necessary effect remedial actions to keep implementation on track. The mid-term review will be undertaken at the end of 1st Quarter of Year 4 of the Strategy and the long term review at the end of the 5th year. [R40]

> **Recommendation 39 Broadband Observatory Tool**
> BOCRA should setup a broadband observatory tool that will be used to monitor the evolution of Key Performance Indicators as outlined in Annexure 3 showing the progress in the execution of the National Broadband Strategy.

9.2 NBS Review

In order to ensure that the Strategy remains relevant to the country's needs, it is necessary that it be subjected to review at regular intervals. The purpose of the review is to:

- Assess the extent to which the broadband access and usage targets set out in the National Broadband Strategy are being achieved and identify and resolve challenges if any;

- Assess the impact of the implementation of the strategy on different sectors of the economy; and

- Review the regulatory impact on the implementation of the Strategy

In order to obtain an objective assessment of the performance of the Strategy, the review shall be carried out by an independent third party entity outside of the Government.

Recommendation 40 Review of National Broadband Strategy
The NBS should be subjected to review at least every five years by an independent third party appointed by the Ministry responsible for Communications sector provided that the first of such a review should take place during the second quarter of 2020.

ANNEXURE 1 - IMPLEMENTATION MATRIX

The Implementation Matrix provides details on Strategic Objectives, Expected Outcomes and Strategies to be adopted in order to promote Broadband in Botswana. It also provides specific targets, expected outcomes, specific KPIs, assumptions, roles and responsibilities of all Stakeholders that are required for successful delivery of Broadband. The Implementation Matrix is structured in a manner that ensures an efficient implementation of the strategy, and a coordinated and aligned approach with respect to the provision of services including power, equipment and e-government, e-health, e-education and e-commerce services.

The implementation matrix details specific Strategies to be undertaken in each of the five key focus areas (where each focus area relates to **Issues** that are critical to national broadband development):

- Infrastructure, Connectivity, and Devices

- Policy, Legal, and Regulation

- Capacity Building, Awareness

- Content & Applications

- Finance and investment

PART I: Infrastructure, Connectivity, Devices Implementation Log-Frame

This focus area addresses the key requirements necessary to deploy broadband network infrastructure, connectivity, and end-user devices (computers, smartphones, etc.) to all parts of the Botswana and all the different types of users in Botswana.

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
1.1 Infrastructure, Connectivity	**1.1.1** Ensure broadband connectivity for all, including remote, rural, agriculture, underserved and unserved areas in Botswana	**1.1.1.1** High quality and reliable broadband connectivity for citizens across the whole nation, especially in rural and agriculture areas, which will enhance education, work, business, access to information, health, for all citizens of Botswana	60% of population with fixed broadband coverage by 2022 95% population have access to broadband connectivity by 2022 86% of geographical areas have access to broadband connectivity by 2022 Broadband infrastructure specific needs analysis for all farms or farming areas completed within 12 to 24 months of start of implementation of NBS	Percentage of broadband users/subscribers Quality of Service Minimum broadband speed Percentage of population coverage Percentage of geographic coverage (rural and unserved areas)	BOCRA disburses funds from USAF for relevant broadband projects, and manages such projects; raises funds or utilises OPEX/CAPEX budget to implement NBS related projects that fall within its purview Private Sector - provides finance and undertakes broadband related projects that are commercially viable; participates in PPPs to finance and implement projects that are not wholly commercially viable BoFiNet uses its CAPEX/OPEX to fund and implement	Social, economic and political conditions are responsive, and that sufficient demand materialises Cooperation between private sector and government nationally, as well as governments and private sector across the SADC region Sufficient market interest and financing Cost-effective development & upgrading of broadband networks	Extension of BoFiNet National Backbone Network Implementation of backhaul links to undersea cables landing stations Upgrade of capacities at the undersea cable Upgrade and Leasing of BTC xDSL Upgrade and leasing of excess dark fibre Infrastructure Broadband infrastructure specific needs analysis for all farming areas which are far from existing	Universal Access and Service Fund BOCRA OPEX/CAPEX Budget Spectrum Auctions and Licensing Fees BoFiNet OPEX/CAPEX Budget BTCL OPEX/CAPEX Budget MTC OPEX/CAPEX Budget Operators CAPEX/OPEX Donors, Private Sector, Banks, Venture Capital Coordinated and co-funded National

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
					broadband projects that fall within its purview BTCL uses its CAPEX/OPEX to fund and implement its xDSL network All operators use their CAPEX/OPEX to fund and implement broadband projects that fall within their purview MTC coordinates NBS implementation activities, progress and challenges; raises CAPEX budget to implement identified national broadband projects		network coverage Roll out of Fixed (copper & fibre) Broadband network Roll out of Wireless (3G/4G/LTE) Broadband network Coordination of Infrastructure Deployment Completion of Digital Switchover Broadband for Rural and Agricultural Areas rollout programme Development of New Spectrum Frequency and Allocation Plan National Fibre and Wireless Broadband Coverage Map	Infrastructure Projects Funding and Financial Incentives Plan for Broadband Rollout

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
		1.1.1.2 Reductions in cost of broadband infrastructure deployment, maintenance and operations as well as in costs of broadband as a percentage of gross national income per capita	Fair cost based pricing model across the sector Spectrum plan detailing availability and allocation of spectrum for broadband	Number of interconnection and sharing agreements Number of mobile broadband service providers of service Number of service providers in major cities and regions Number of major cities or regions with broadband access and networks Cost of interconnection or access to shared infrastructure, especially international bandwidth Cost per Mbps	Department of Roads & Other Utility Companies collaborate with broadband deploying entities during major infrastructure projects under their purview BOCRA raises funds or uses its OPEX/CAPEX budget to undertake NBS related projects that fall within its purview such as the development and enforcement of Open Access and Infrastructure Sharing Framework, Cost and Pricing Model Framework		Review of BTCL's Cost and Business Models Review and update of bilateral and regional cost effective transit cost models Coordination of Infrastructure Deployment Development and implementation of Cost and Pricing Model	Funding and Financial Incentives Plan for Broadband Rollout Infrastructure Sharing
	1.1.2 Increasing broadband access to homes, businesses and government premises	**1.1.2.1** All citizens in Botswana can access quality and affordable broadband through mobile networks **1.1.2.2** Fixed broadband	Mobile broadband network coverage of 100% of population by 2023 Minimum broadband speed by 2022: 100 Mbps Urban, 50 Mbps	Number of government offices connected to broadband network Number of schools connected to	All mobile operators use their CAPEX/OPEX to fund and implement mobile broadband projects that fall within their purview		Roll out of mobile broadband network (3G/4G) Roll out of FTTx Network	Operators CAPEX/OPEX BTCL CAPEX/OPEX BOFINET CAPEX/OPEX

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
		access networks providing reasonable priced broadband services in cities, towns and major villages **1.1.2.3** National government broadband data network connecting all offices	Rural, 10 Mbps Agriculture[4] All government offices, business, schools, health facilities in 34 cities/towns/villages are connected to fibre broadband by 2021 100% broadband connectivity to all government (Central & Local) offices by 2022	broadband network Number of health facilities connected to broadband network % of broadband subscriptions by households and businesses % of broadband subscriptions by geographic coverage (population) Cost per Mbps Quality of Service	All operators use their CAPEX/OPEX to fund and implement broadband projects that fall within their purview BOCRA disburses funds from USAF for relevant broadband projects, and manages such projects; raises funds or utilises OPEX/CAPEX budget to implement NBS related projects that fall within its purview MoBE, MoTE, MELSD & MoHW use their CAPEX/OPEX to fund and implement broadband projects that fall within their purview (schools, health facilities) MTC uses its CAPEX/OPEX to		Roll out of wireless fixed broadband network (LTE) Roll out of xDSL Network Roll out of Government Data Network Roll out of Health Data Network Roll out of Education Data Network	MTC CAPEX/OPEX

---

[4] Adoption of targets is dependent on BOCRA releasing the spectrum planning and the bandwidth

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
					fund and implement government data network			
	1.1.3 Set up public access broadband facilities in communities across Botswana	**1.1.3.1** Post offices, public libraries, schools, and other ICT facilities provide sustainable public access broadband in all cities, rural, agriculture and unserved areas, available to majority of citizens	100% of strategic public areas (bus ranks, shopping malls, airports, hospitals, stadia, libraries) provided with Wi-Fi access by 2022

public access points across 100% of nation, especially in rural and unserved areas | Number of public access points

Number of PPPs or partnerships operating public access centres | Private Sector provides finance and undertakes public access centres;

Operators and private sector participate in PPPs to finance and implement Wi-Fi projects | | Roll out of Wi-Fi projects

Roll out public access points (Kitsong Centres)

Roll out of Sesigo Project | USAF

Operators CAPEX/OPEX

BOFINET CAPEX/OPEX

MYSC CAPEX/OPEX

Donors, Private Sector, Banks, Venture Capital |
| **1.2 Devices** | **1.2.1** Increase affordability and demand for ICT smart devices | **1.2.1.1** Increased demand and usage of broadband services | 75% of users possess and use smart devices by 2022

100% of population demand and use broadband services by 2022 | Number or Percentage of people with smart devices in the country

Number of broadband users in the country | BOCRA disburses funds from USAF for relevant broadband projects, and manages such projects; utilises its budget to implement NBS related projects that fall within its purview

MTC coordinates NBS implementation activities, progress and challenges; utilises its budget to implement NBS | Assumes citizens will buy low-cost smart devices | Device subsidy support program under USF

Employers' Device/Internet Subsidy Schemes | Universal Access and Service Fund

Developmental Loans, Grants

Public Servant Loan Scheme

Banks' Device Loan Schemes

Unions' Members' Device/Internet Schemes |
| | **1.2.2** Increase affordability and use of advanced broadband enabled ICT devices for target user groups | **1.2.2.1** Increased usage of broadband enabled ICT devices for target user groups | 100% increase in usage of broadband devices and services by target groups including women, youth, health practitioners, etc. by 2022 | Percentage of women using smart devices

Percentage increase of penetration by health facilities | | Assumes target user groups will buy cheap smart devices | | |

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
				Percentage increase of youth and students using smart devices Percentage of public servants using smart devices	related projects that fall within its purview Public sector - provides finance for public servants to purchase smart devices Private Sector - provides finance and undertakes broadband related projects that are commercially viable; participates in PPPs to finance and implement projects			

PART II: Policy, Legal, Regulatory Implementation Log-Frame

This section presents policy, regulatory and legislative priorities that should be addressed in order to create an enabling environment to enhance broadband in Botswana. Most policies can be established and enforced at the Ministry and Regulator level, while some may depend upon new legislative mandates as well.

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
2.1 Policy, Legal and Regulatory	**2.1.1** Create an enabling environment that encourages and ensures increased deployment, uptake and usage of broadband services	**2.1.1.1** Further liberalisation of ICT sector with strong and fair competition; Ease of market entry for new players, including small operators, local ISPs, etc Increased sharing of facilities which should result in lower prices and market expansion **2.1.1.2** Increase in active infrastructure sharing **2.1.1.3** Reductions to deployment and operation costs of	25% increase of ICT sector contribution of GDP by 2022 Diffusion of new services Infrastructure sharing agreements (Active) Enforcement of Quality of service standards All by 2022	Number of licensees and service providers Scope of competitive choices of service providers Minimum number of active licensees (level of competition) Number of infrastructure sharing agreements (Active & Passive) Percentage of infrastructure shared (Active & Passive) [Net average costs of wholesale capacity]	BOCRA raises funds or uses its OPEX/CAPEX budget to undertake NBS related projects that fall within its purview such as the development and enforcement of QoS Regulations or Open Access and Infrastructure Sharing Framework	Operators will invest in broadband sector and will obtain licenses to provide broadband Industry will subscribe to open access, interconnection, and infrastructure sharing framework BOCRA is able to enforce compliance and monitor the sector	Revision of Licensing Framework Development and Implementation of Open Access and Infrastructure Sharing Framework QoS Regulations for Broadband Pricing and Cost model framework Infrastructure sharing model (active and passive)	Universal Access and Service Fund BOCRA OPEX/CAPEX Budget Spectrum Auctions and Licensing Fees MTC OPEX/CAPEX Budget Financial Penalties collected from enforcement activities Operators OPEX/CAPEX Budget

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
		broadband networks **2.1.1.4** Reductions in cost of broadband as a percentage of gross national income per capita **2.1.1.5** Users enjoy an uninterrupted quality and rich broadband experience		Outcomes of enforcement actions Number of quality of service complaints Number of recorded/resolved consumer complaints Average time of complaint resolution Measures of compliance and instances of violations Reports on monitoring activities and findings				
	2.1.2 Create an environment that introduces and promotes flexibility in the use of scarce resources such as spectrum to ensure the broader	**2.1.2.1** Efficient spectrum usage to facilitate delivery of Broadband services	Allocation of at least 50% released spectrum frequency to delivery of broadband services by 2022	Amount of digital dividend spectrum available for new licensees Completed Digital switchover plan Revised Frequency band plan	BOCRA raises funds or utilises operational budget to implement NBS related projects that fall within purview such as development of new Spectrum Frequency and Allocation Plan MOPAGPA raises funds or utilises OPEX/CAPEX Budget to implement NBS related projects that	Operators will be interested in new frequencies Operators willingness to migrate their services from old to new frequencies	Review of existing national frequency plan Allocation of released frequency spectrum Revision of Licensing Framework	BOCRA OPEX/CAPEX Budget MOPAGPA OPEX/CAPEX Budget Operators OPEX/CAPEX Budget

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
	availability of broadband services			Dissemination of updated spectrum and frequency plans	fall within its purview such as the implementation of Digital switchover Plan		Completion of Digital Switchover	
	2.1.3 Create an enabling environment that ensures the integrity and security of the broadband networks and services to promote confidence and trust in electronic transactions, and promotes the protection and respect of privacy and personal dignity through appropriate instruments for regulation of personal data	**2.1.3.1** Increased security of, and trust in broadband infrastructure and services that instils confidence in citizens and drives demand and usage of broadband **2.1.3.2** Increased demand for, and usage of broadband devices, services, applications in Botswana	Consumer Protection Act, Data Protection Act and other relevant Legislation, Regulations, Strategies, that address privacy, data protection, cybersecurity, critical national infrastructure, and assure the security of financial systems, online transactions and e-commerce activities are promulgated by 2018	Enactment/ Implementation of relevant legislation, regulations and strategies by end of 2018	BOCRA raises funds or utilises OPEX/CAPEX budget to implement NBS related projects that fall within its purview such as contributing to the review or development of relevant legislation or Strategies MTC coordinates NBS implementation activities, progress and challenges MTC, MITI, MOPAGPA, MDJS raise funds or utilises OPEX/CAPEX budget to implement NBS related projects that fall within their purview such as contributing to the review or development of relevant legislation or strategies Legislature enacts relevant legislation	Legislature, BOCRA and MTC, MITI, MOPAGPA, MDJS are able to develop, and enforce various laws, regulations and strategies	Review of Consumer Protection Act, Cyber Crime and Computer Related Crimes Act, Evidence Act Development of Data Protection and Privacy legislation and other relevant Legislation and Regulations that address issues relating to privacy, data protection, cybersecurity Develop Strategies that address issues relating to cybersecurity, critical national infrastructure, and assure the security of financial systems, online transactions and	BOCRA OPEX/CAPEX Budget MTC, MITI, MOPAGPA, MDJS OPEX/CAPEX Budget Legislature Operational Budget Financial Penalties collected from enforcement activities

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
							e-commerce activities Establish National Computer Incidence and Response Team Establish Computer Forensic Lab	

PART III: Awareness & Capacity Building Implementation Log-Frame

This part addresses the goals of enhancing the understanding and capabilities of the public in the use of broadband and ICTs, to stimulate demand and promote more valuable deployment of ICT resources.

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
3.1 Awareness, Capacity Development	**3.1.1** Improve Broadband uptake through public education and awareness programmes	**3.1.1.1** Improved awareness on the availability of broadband technologies, services and applications and their benefits, capacity building initiatives, support, etc., in the sector. **3.1.1.2** Increased demand for, and usage of broadband devices, services, applications in Botswana	100% of population in Botswana are aware, on a continuous/periodic basis, of the availability of broadband technologies, services and applications, their benefits, capacity building initiatives, support, etc., in the sector by 2022	Survey results regarding outcomes of awareness campaigns % increase in population, business, women, youth using broadband	BOCRA conducts awareness raising campaigns Operators conduct awareness raising campaigns on their broadband products and services MTC conducts awareness raising campaigns & other Governmental agencies Civil Society and Consumer Groups use grants from different sources to implement broadband projects that fall within their purview	Cooperation of consumers and consumer groups	Awareness Campaign on Broadband Publication of FBO, PTOs and Value Added Network Operators (VANS) catalogues	Universal Access and Service Fund BOCRA and Operators OPEX/CAPEX Budget Private Sector, Banks, Venture Capital Development and Capacity Building Grants Corporate Social Responsibility

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
3.2 Capacity Building	**3.2.1** Develop and or enhance digital literacy skills	**3.2.1.1** Botswana has a digital literate society	Coordination of capacity building initiatives between public, private sectors from 2017 onwards Improved access to and awareness of digital literacy initiatives by 2019 One end user device per child and per teacher by 2019 Increased digital literacy in women & PWDs from 2017 onwards	% of population that are digitally literate according to digital literacy index (standardized measures) % of people engaged in digital literacy capacity building programs annually % of women and PWDs that are digitally literate	BOCRA disburses funds from USAF for relevant broadband projects, and manages such projects; raises funds or utilises OPEX/CAPEX budget to implement NBS related projects that fall within its purview such as contributing to the development of digital literacy MoBE together with MoTE coordinate the implementation of NBS activities related to development of digital literacy, their progress and challenges; MTC, MoBE, MoTE, MYSC, MELSD, MOPAGPA raise funds or utilise their CAPEX/OPEX budget, loans, grants, to implement NBS related projects	Cooperation of consumers, and consumer groups Cooperation of the private sector, education sector, and other relevant public sector bodies	Digital Literacy Program Broadband/ ICT Curriculum, Technical Training and Capacity Building Programme ICDL incorporated within school curriculum (primary, secondary) – early adopters The Botswana National Research Education Networks Sesigo (Library) Project Schools connectivity project Development and maintenance of online Digital Literacy Portal Train Trainers Program	Private Sector, Banks, Venture Capital MTC, MoTE, MoBE, MELSD, MYSC, MOPAGPA OPEX/CAPEX Budget Universal Access and Service Fund BOCRA OPEX/CAPEX Budget Coordinated and co-funded National Infrastructure Projects Human Resource Development Fund Tertiary Education Fund

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
					that fall within their purview such as contributing to the development of digital literacy Universities and Training Institutions receive grants or use their CAPEX/OPEX budget to implement NBS related projects that fall within their purview such as contributing to the development of digital literacy Private Sector provides finance and undertakes broadband related projects that are commercially viable; Civil Society, private sector and communities participate in PPPs to finance and implement projects that are not so			

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
					commercially viable			
	3.2.2 Develop local expertise and build capacity in broadband related technologies	**3.2.2.1** A local technical talent pool capable of developing, managing and maintaining broadband and broadband enabled services in the country	Established Market related ICT skills Accredited and world recognized ICT technical training programs and curricula Structured Internship programs & career development programs Increased participation of women & PWDs in ICTs All by 2020	% of ICT graduates in technical competency programs Accredited and implemented standards for ICT technical training Number of graduates from Institute of Excellence % of the population participating in capacity building initiatives % of ICT graduates who are women and PWDs	MoBE, MoTE, MOPAGPA, MYSC use their OPEX/CAPEX budget to implement NBS projects, that fall within their purview, related to the development of local expertise and capacity building in digital economy MoBE and MoTE coordinate implementation of NBS activities related to development of local expertise and capacity building, their progress and challenges; Universities and Training Institutions receive grants or use their CAPEX/OPEX budget to implement NBS projects, that fall within their	Interest and cooperation of MOBE, MoTE, training and education institutions, private sector and other stakeholders Cooperation of consumers and consumer groups	Legislation to implement ICT technical competency programs & career development programs by industry Retool existing ICT graduates by HRMC Develop Incentives scheme for industry to have technical competency programs & career development programs Institute of Excellence for ICT Technical Training and capacity building Awareness Campaign on Broadband Broadband/ ICT Curriculum	Private Sector, Banks, Venture Capital MTC, MoBE, MoTE OPEX/CAPEX Budget Universal Access and Service Fund BOCRA OPEX/CAPEX Budget Coordinated and co-funded National Infrastructure Projects

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
					purview, related to the development of expertise in digital economy Private Sector provides finance and undertakes broadband related projects that are commercially viable; Civil Society, private sector and communities participates in PPPs to finance and implement projects that are not so commercially viable		Broadband/ICT Technical Training and Capacity Building Programme Botswana National Research Education Networks	

PART IV: Application & Content Implementation Log-Frame

This part provides support for the development of useful and relevant local content, applications and services, in the public, private and civil society sectors, to reinforce the benefits of broadband for all.

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
4.1 Facilitating and promoting electronic and mobile services to grow and diversify the economy	**4.1.1** Transform the public service by automating the government business processes and services in order to improve service quality, reduce red-tape and realise greater efficiencies in the public service.	**4.1.1.1** Improved access to quality and affordable broadband electronic and mobile services in general **4.1.1.2** Improved access to quality and reliable Government services **4.1.1.3** Increased use of broadband enabled e-Government services **4.1.1.4** Improved government-to-government, government-to-business and government-to-citizen transactions	All government offices are connected to broadband network by 2021 All government departments with core services online by 2022 All government departments provide core services and transactions online by 2022 100% of National population having access to e-Government services by 2020	Number of Government Departments with core services online Number of government services online % of population accessing government services and interacting with government through online/broadband channels	MTC coordinates implementation of NBS activities related to automation of government business processes and services, their progress and challenges; All Ministries and Independent Departments raise funds or utilise OPEX/CAPEX budget to implement NBS projects, that fall within their purview, related to the automation of their business processes and services Private Sector provides finance and undertakes broadband related projects that are commercially viable;	Government prioritise ICT and avail the required resources (funding and skilled people) Prioritisation of Government ICT projects Legislative and regulatory framework is in place to provide trust for users Cooperation of Ministries and Independent Departments Demand and interest in Government ICT services Availability of reliable national broadband/ICT infrastructure and services	Government Data Network Government Data Centre Government e-Services Platform Government ICT Security Project Government Enterprise Architecture Government Skills Transformation Government Governance Project Government CIRT National e-Government Awareness and Education Campaign	MTC OPEX/CAPEX Ministries and Independent Departments CAPEX/OPEX Private Sector, Banks, Venture Capital Developmental Loans and Grants

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
	4.1.2 Transform national education system by offering lifelong e-learning skills in children and young adults which will lead to sustainable broadband/ICT–driven transformation and national growth	**4.1.2.1** Improved access to quality and affordable electronic and mobile Education **4.1.3.2** Use of ICTs/broadband based applications and services to access educational services **4.1.3.3** Improved teacher-to-teacher, student-to-teacher and student-to-student transactions **4.1.3.4** Improved education outcomes throughout Botswana, especially in remote, rural, agricultural and under-developed areas due to broadband enabled e-education services	Approved e-Education Strategy by 2018 All schools and libraries are connected to broadband network by 2021 ICT curriculum is developed and adopted by 2018 All schools and libraries are connected to power by 2019 All teachers, instructors and librarians are trained as trainers by end of NDP 11 Digital Literacy Programme is developed by 2018 Digital literacy curriculum is developed	Number of schools connected to broadband network Number of teachers, instructors, librarians trained as trainers Number of teachers, instructors and librarians delivering learning and teaching using ICT Number of students receiving learning and education using ICT Number of Kitsong Centres and public libraries offering basic ICT training Number of schools with ICT clubs	MoBE, MoTE and MELSD coordinate implementation of NBS activities related to development and delivery of e-learning, their progress and challenges MTC, MOBE, MoTE, MELSD, MYSC raise funds or utilise OPEX/CAPEX budget to implement NBS projects, that fall within their purview, related to development and delivery of e-learning HRDC, BQA, and BEC raise funds or utilise OPEX/CAPEX budget to implement NBS projects, that fall within their purview, related to development and delivery of e-learning Schools, Universities and Training	Government prioritise ICT and avail the required resources (funding and skilled people) Prioritisation of e-Education projects Legislative and regulatory framework is in place to provide trust for users Cooperation of Ministries responsible for education, education regulators, education sector unions, parents, teachers and students Demand and interest in e-Education services Availability of reliable national broadband/ICT infrastructure and services Cooperation among the education sector, private sector, and other	Development of e-Education Strategy Schools Connectivity Sesigo Project Training of Trainers Program Digital Literacy Program Digital Literacy Curriculum Online Digital Literacy Portal Implementation of e-Education services Botswana National Research Education Network National e-Education Awareness and Education Campaign Education Data Network	MoBE, MoTE, MELSD, MTC CAPEX/OPEX HRDC, BQA, BEC CAPEX/OPEX Private Sector, Banks, Venture Capital Developmental Loans & Grants, Corporate Social Responsibilities Universal Access and Service Fund Tertiary Education Fund Human Resource Development Fund

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
			and adopted by 2018 Online digital literacy portal is developed by 2018		Institutions receive grants or use their CAPEX/OPEX budget to implement NBS projects, that fall within their purview, related to the development and delivery of e-learning Private Sector provides finance and undertakes broadband related e-learning projects that are commercially viable; Civil society, Private sector and community participates in PPPs to finance and implement e-learning projects that are not commercially viable	relevant stakeholders		
	4.1.3 Transforming health systems and business practices through the use of broadband/ICTs in order to	**4.1.3.1** Improved access to quality and affordable electronic and mobile Health **4.1.3.2** Use of ICTs/broadband based applications	Approved e-Health Strategy by 2018 All health centres are connected to broadband	Number of health centres connected to the broadband network Number of health workers trained of the use of ICT	MoHW coordinate implementation of NBS activities related to development and delivery of e-health, their progress and challenges	Government prioritise ICT and avail the required resources (funding and skilled people) Prioritisation of e-Health projects	Development of e-Health Strategy Health Data Network	MoHW, MoBE, MoTE, MELSD, MLG&RD, MTC CAPEX/OPEX Health Council CAPEX/OPEX

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
	increase quality, safety, timeliness and efficiency of health services to all Batswana	and services to access health services **4.1.3.3** Improved health outcomes throughout Botswana, especially in remote, rural, agricultural and under-developed areas due to broadband enabled health services	networks by end of NDP 11 Availability of online health portal by 2018 All health centres offer e-health services by end of NDP 11 Number of health services online by end of NDP 11 All health practitioners are trained on the use of ICT to deliver health services Availability and scope of e-health services	Number of online health services Number of health centres offering e-health services % of populations with access to and using e-health services	MoHW, MoBE, MoTE, MLG&RD, MTC raise funds or utilise OPEX/CAPEX budget to implement NBS projects, that fall within their purview, related to development and delivery of e-health Health Council raise funds or utilise OPEX/CAPEX budget to implement NBS projects, that fall within their purview, related to development and delivery of e-health Hospitals, Health Centres, Schools, Universities and Training Institutions receive grants or use their CAPEX/OPEX budget to implement NBS projects, that fall within their purview, related to the development	Legislative and regulatory framework is in place to provide trust for users Cooperation of Ministries responsible for health, health regulators and health sector unions Demand and interest in e-Health services Availability of reliable national broadband/ICT infrastructure and services Cooperation among the health sector, private sector, civil society and other relevant stakeholders	Training of Health Practitioners Online Health portal Implementation of e-health services National e-Health Awareness and Education Campaign	Private Sector, Banks, Venture Capital Developmental Loans & Grants Corporate Social Responsibilities Universal Access and Service Fund

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
					and delivery of e-health Private Sector provides finance and undertakes broadband related e-health projects that are commercially viable; Civil society, Private sector and community participates in PPPs to finance and implement e-health projects that are not commercially viable			
	4.1.4 Promoting and facilitating e-Commerce, including the development and usage of ICT Financial services and applications	**4.1.4.1** Improved access to quality and affordable electronic and mobile commerce (tourism, finance, agriculture, trade etc.) **4.1.4.2** Improved doing business and competitiveness throughout Botswana, especially in rural, agricultural and underserved areas due to broadband	Approved e-Commerce Strategy by 2018 Development, and launch of national payment system by 2020 Development and launch of online business registration	Number of commercial services offered online Number of e-transactions Number of companies offering services online Number of SMME with websites and portals	MITI coordinate implementation of NBS activities related to development and delivery of e-commerce, their progress and challenges MITI, MFED, MoA, MDJS, MOPAGPA, MWET use their OPEX/CAPEX budget, loans, grants, to implement NBS projects, that fall	Government prioritise ICT and avail the required resources (funding and skilled people) Prioritisation of e-Commerce projects Legislative and regulatory framework is in place to provide trust for users Cooperation of Ministries responsible for	Development of e-Commerce Strategy ICT Financial Services and e-Commerce Incentive Program Development of websites and portals Development of suitable and relevant	MITI, MFED, MoA, MDJS, MOPAGPA, MWET, MTC OPEX/CAPEX BOT, BotswanaPost, BURS, CA, CIPA CAPEX/OPEX Universal Access and Service Fund

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
		enabled e-commerce services **4.1.4.3** Increased demand for, and usage of broadband devices, services, applications in Botswana **4.1.4.4** Increased use of broadband enabled e-Commerce services and improved ICT entrepreneurship to improve business-to-business, business-to-government and business-to-consumer transactions **4.1.4.5** Use of ICTs/broadband based applications and services to access business services	portal by 2020 Development of online tax registration and clearance portal by 2017 Development and hosting of websites and portals in Botswana by 2019 Develop appropriate legislative and regulatory environment for secure electronic transactions by 2017 Tax incentives offered to ICT companies who want to set up manufacturing in Botswana by 2017	% of population transacting online	within their purview, related to development and delivery of e-commerce services BTO, BURS, CA, CIPA, BotswanaPost raise funds or utilise OPEX/CAPEX budget to implement NBS projects, that fall within their purview, related to development and delivery of e-commerce services Private Sector provides finance and undertakes broadband related e-commerce projects that are commercially viable; Civil society, Private sector and community participates in PPPs to finance and implement e-commerce projects that are not commercially viable	commerce, commerce regulators and business sector unions Demand and interest in e-commerce services Availability of reliable national broadband/ICT infrastructure and services Cooperation among the commercial sector, private sector, civil society and other relevant stakeholders Commercial sector interest in using ICT/broadband services and applications	applications and services Development of hosting facilities in Botswana Establishment of ICT Manufacturing facilities National e-Commerce Awareness and Education Campaign Digitisation of business services and content Enact e-Signature and e-commerce legislation Review Consumer Protection Act Enact personal data protection legislation	Developmental Loans & Grants Private Sector, Banks, Venture Capital

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
4.2 Applications, Content, Services	**4.2.1** Promote the availability and accessibility of relevant local content in digital format	**4.2.1.1** Increased availability of local digital content, and applications that serve digital content **4.2.1.2** Increased production of Indigenous knowledge, cultural preservation and social integration **4.2.1.3** Increased demand for and utilisation of Botswana based local content **4.2.1.4** Increased employment creation in the creative industries	100% local news media and print content is available and accessible online by 2020 Local content providers have resources and incentives to develop online content by 2020	% of local media and print content online Number of applications and services produced locally % of existing content converted to digital format	MoTE coordinates implementation of NBS activities related to development of relevant local content, their progress and challenges BIH disburses funds from the Innovation Fund for relevant broadband projects, and manages such projects; All Ministries use their OPEX/CAPEX budget, loans, grants, to implement NBS projects, that fall within their purview, related to development and delivery of local content, applications and services BTO, BURS, CA, CIPA, BIH, BotswanaPost raise funds or utilise OPEX/CAPEX budget to implement NBS	Government prioritise ICT and avail the required resources (funding and skilled people) Prioritisation of local content projects Legislative and regulatory framework is in place to provide trust for users Cooperation of Ministries responsible for delivery of local content, developer community, private sector and telecommunications operators Demand and interest in local content, applications and services Availability of reliable national broadband/ICT infrastructure and services Cooperation among the commercial sector, private	Development of e-Commerce Strategy Content Digitisation Incentive and Funding plan Develop appropriate local content, applications and services Development of hosting facilities in Botswana Digitisation of local content National Local Content Development Awareness and Education Campaign	All Ministries OPEX/CAPEX BTO, BURS, CA, CIPA, BIH BotswanaPost CAPEX/OPEX Universal Access and Service Fund Innovation Fund Developmental Loans & Grants Private Sector, Banks, Venture Capital

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
					projects, that fall within their purview, related to development and delivery of local content, applications and services Private Sector provides finance and undertakes broadband related local content projects that are commercially viable; Civil society, Donor Agencies, Private sector and community participates in PPPs to finance and implement local content projects that are not commercially viable	sector, civil society and other relevant stakeholders Interest in using ICT/broadband services and applications		
	4.2.2 Promote innovation, incubation, research and development in the Botswana's ICT sector	**4.2.2.1** Increased adoption of locally produced products and services by the market **4.2.2.2** Well-funded and well thought-out environment that fosters innovation	ICT Incubators established in 12 major locations (cities, towns and villages) of Botswana by 2020	Number of successful ICT incubators Number of funded innovations or awards % of graduated start-ups	MoTE coordinates implementation of NBS activities related to ICT innovation, research and incubation; and their progress and challenges	Cooperation between the private sector, universities, research and training institutions, developer community and other relevant stakeholders	ICT Incubators Innovation and Research Incentive and Funding plan Development of quality standards and	Innovation Fund Private Sector, Banks, Venture Capital Funds for innovation Universal Access and Service Fund

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
		in the broadband/ICT sector **4.2.2.3** Increased presence/availability of a range of commercial and innovative ICT entrepreneurs and service providers in Botswana	Quality standards and accreditation framework for ICT incubators by 2020 Successfully enrolled incubated start-ups by 2020 Successful graduated start-ups by 2020 Innovation funds and award plan by 2019 Certification criteria and guidelines for incubators	Number of products and services successfully taken to market	BIH disburses funds from the Innovation Fund for relevant broadband projects, and manages such projects; MoTE, MoBE, MTC raise funds or utilise OPEX/CAPEX budget to implement NBS projects, that fall within their purview, related to development and delivery of ICT research, innovation and incubation Universities, Research and Training Institutions raise funds or utilise OPEX/CAPEX budget to implement NBS projects, that fall within their purview, related to ICT innovation, research and incubation Private Sector provides finance	Interest from developer community to participate in incubation and research in order to develop innovative services Availability of innovation funding and support	accreditation framework Open Data for Local Content and Applications Development project ICT Procurement Model	MOBE, MoTE, MTC CAPEX/OPEX Budget Developmental Loans & Grants Corporate Social Responsibility

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
					and undertakes broadband related innovation and research projects that are commercially viable; Private sector, participates in PPPs to finance and implement research and innovation projects that have no funding BIH provides finance/investment and support for local start ups			

# PART V: Finance & Investment Implementation Log-Frame

This part addresses options and objectives for developing financial instruments and mechanisms associated with broadband services, including the direct financing of broadband/ICT related investments.

| Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
Finance and Investment	Ensure universal access to broadband services by development of appropriate funding mechanism and private investment that involves public private sector partnerships and or targeted subsidies	Increased investments and finances in the ICT sector Projects and programmes are all fully funded in timely fashion.	A minimum of 10% increase in Finances and Investment in the broadband sector per annum	% increase of private investments in the ICT sector No of projects and programmes fully funded	BOCRA - disburses funds from USAF for relevant broadband projects MTC coordinates NBS implementation activities, progress and challenges; MTC raises funds or utilises OPEX/CAPEX budget to implement NBS related projects that fall within purview Private Sector provides finance and undertakes broadband related projects that are commercially viable; Private sector, civil society and	Interest in investing in the broadband sector Cooperation between the private sector, public sector and other relevant stakeholder	Financial Sector Investment and Incentive Programme for Broadband Broadband Investment Opportunity Awareness Campaign Co-funded national broadband Infrastructure Projects	Universal Access and Service Fund Private Sector, Banks, Venture Capital Localised funding from Local Authorities Developmental Loans and Grants MTC OPEX/CAPEX Budget Corporate Social Responsibility

Sub-Focus Area (s)	Strategic Objectives	Expected Outcome	Targets	Key Performance Indicators	Lead Implementing Agency and Responsibility	Assumptions	Flagship Projects	Possible Funding Sources and Mechanisms
					community participate in PPPs to finance and implement broadband projects			
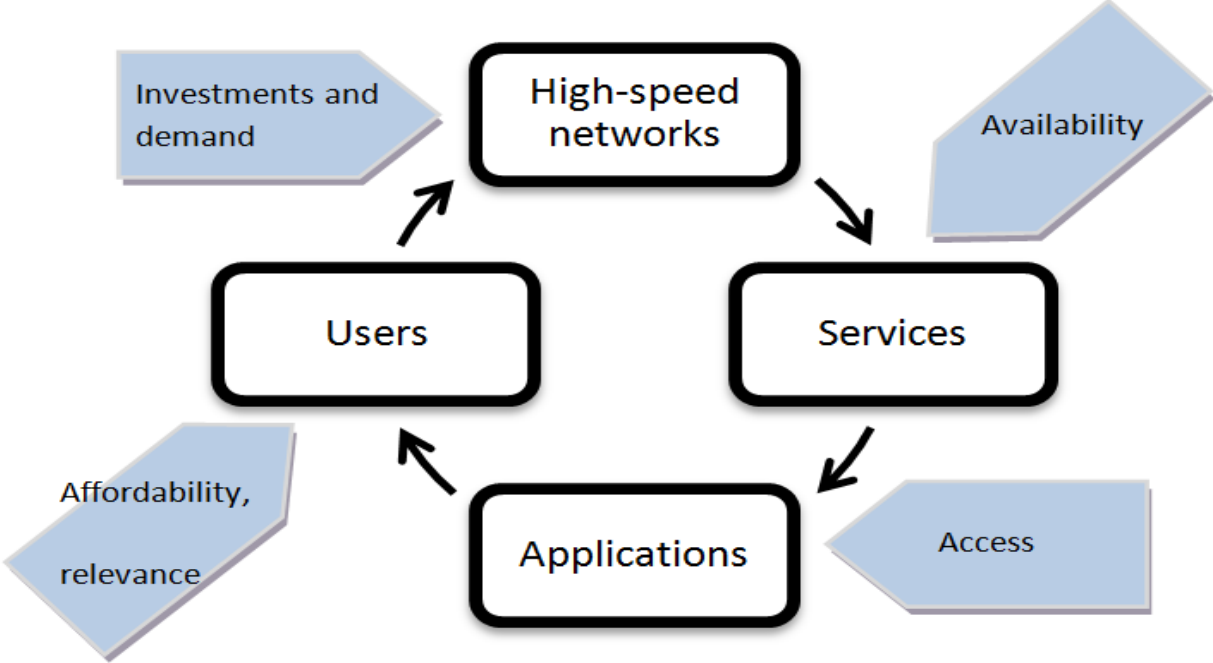
Source: World Bank
Figure 1: The Concept of Broadband Ecosystem
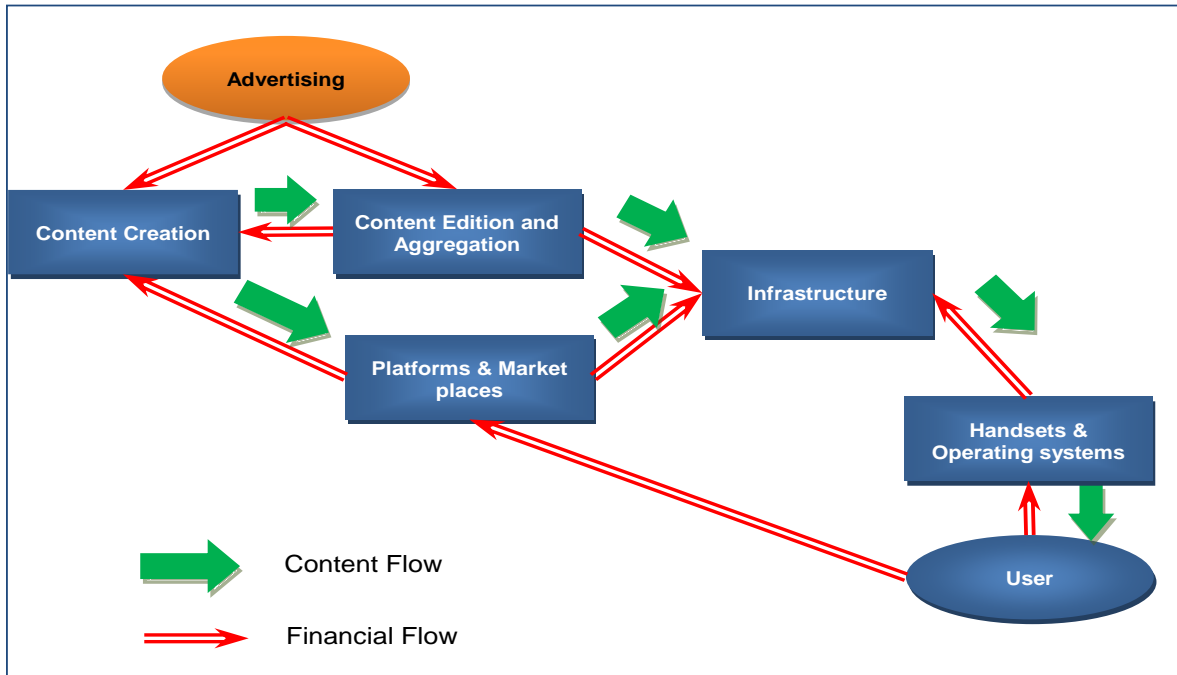
Figure 2: Simplified Value Chain of online content

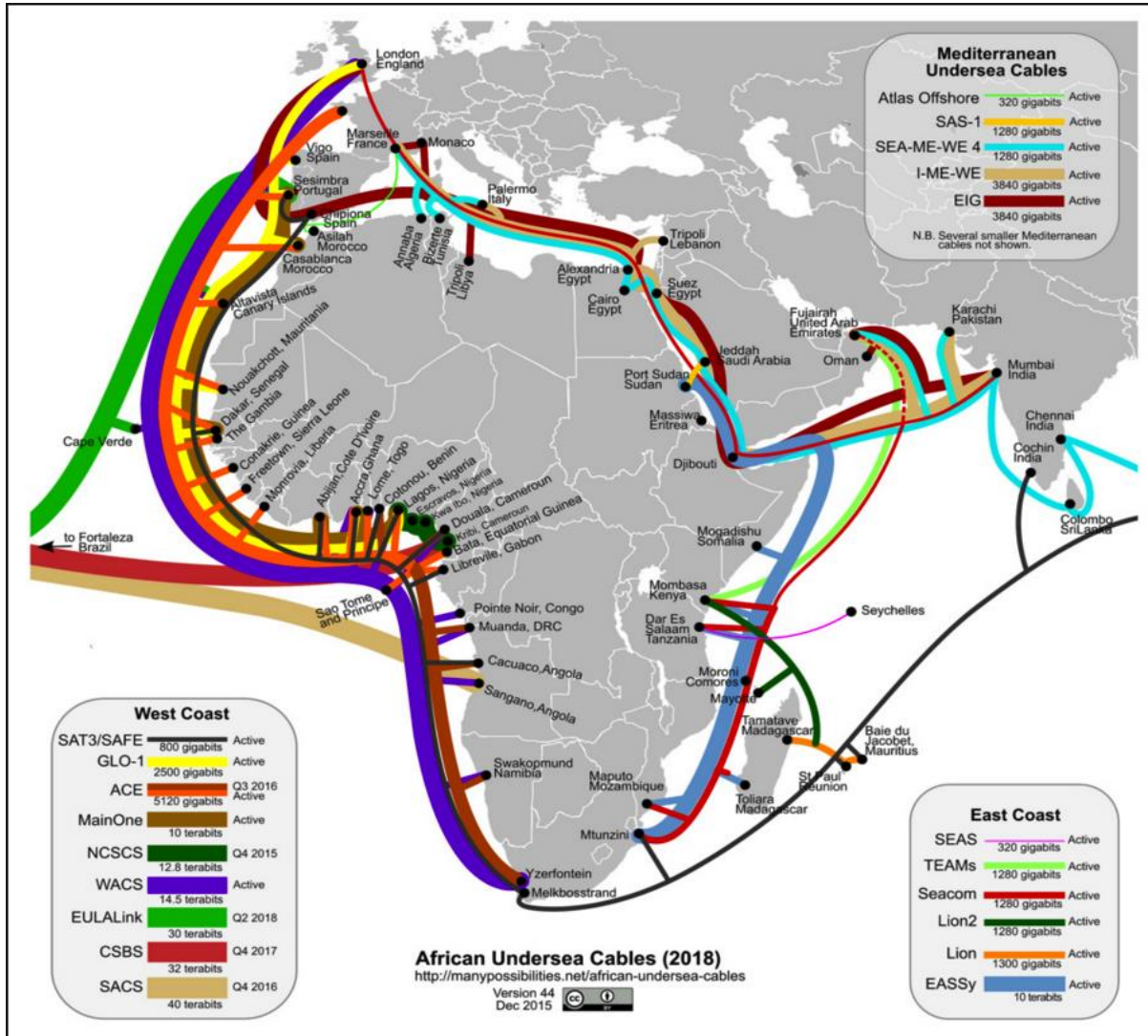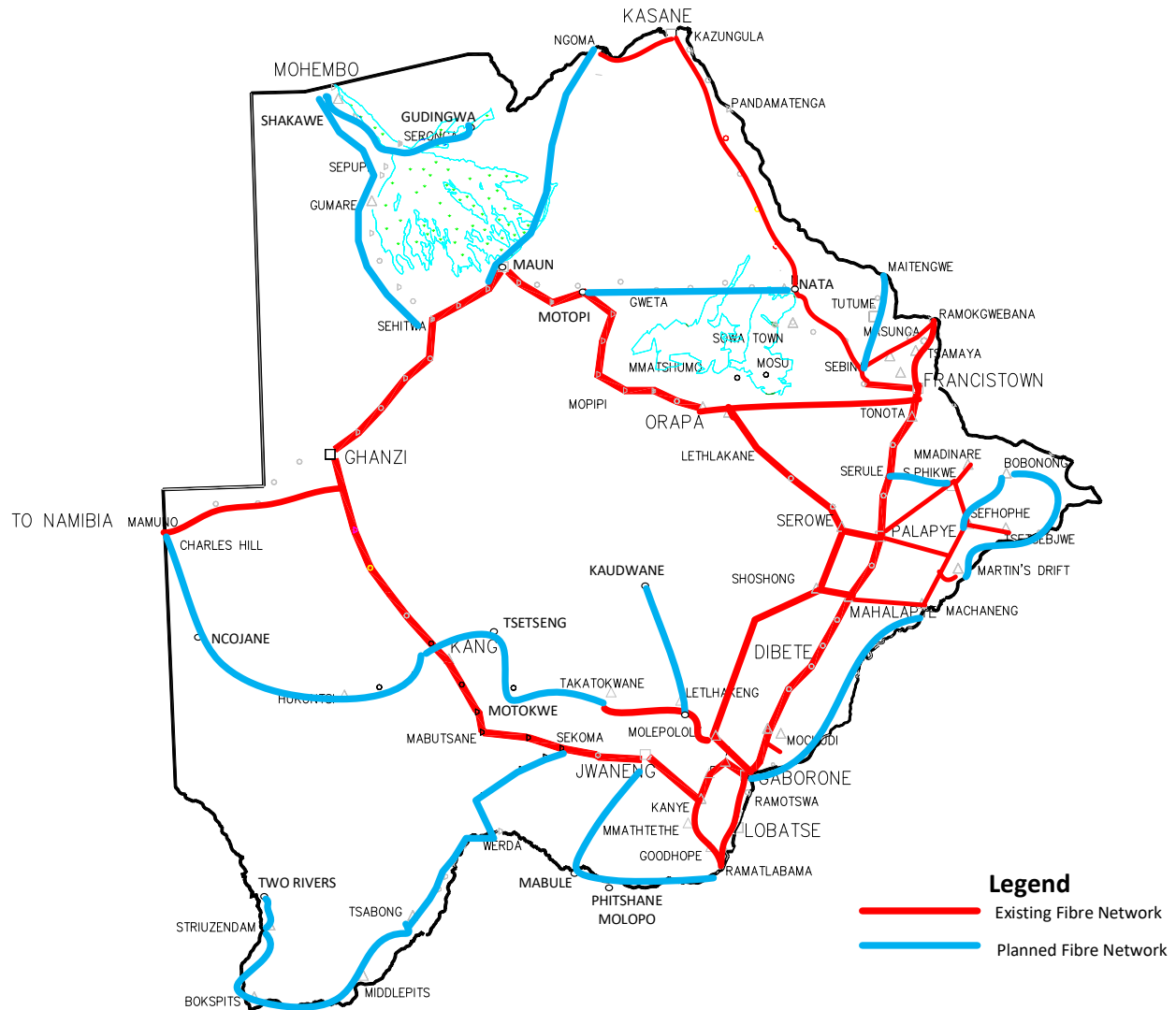**Figure 3: International Bandwidth Connectivity**

Source: BOFINET
Figure 4: National Fibre Network Layout

Names of Routes to be Implemented

1. Sehithwa – Mohembo – Gudingwa
2. Maun – Kachikau – Ngoma
3. Sekoma – Tsabong – Two Rivers
4. Takatokwane – Tsetseng – Kang – Hukuntsi – Ncojane – Charleshill
5. Letlhakeng – Kaudwane
6. Jwaneng – Mabule – Ramatlabama
7. Oodi- Sikwane - Mookane –Machaneng
8. Martins Drift – Bobonong – Selebi Phikwe – Serule
9. Sebina – Tutume – Maitengwe
10. Nata - Motopi
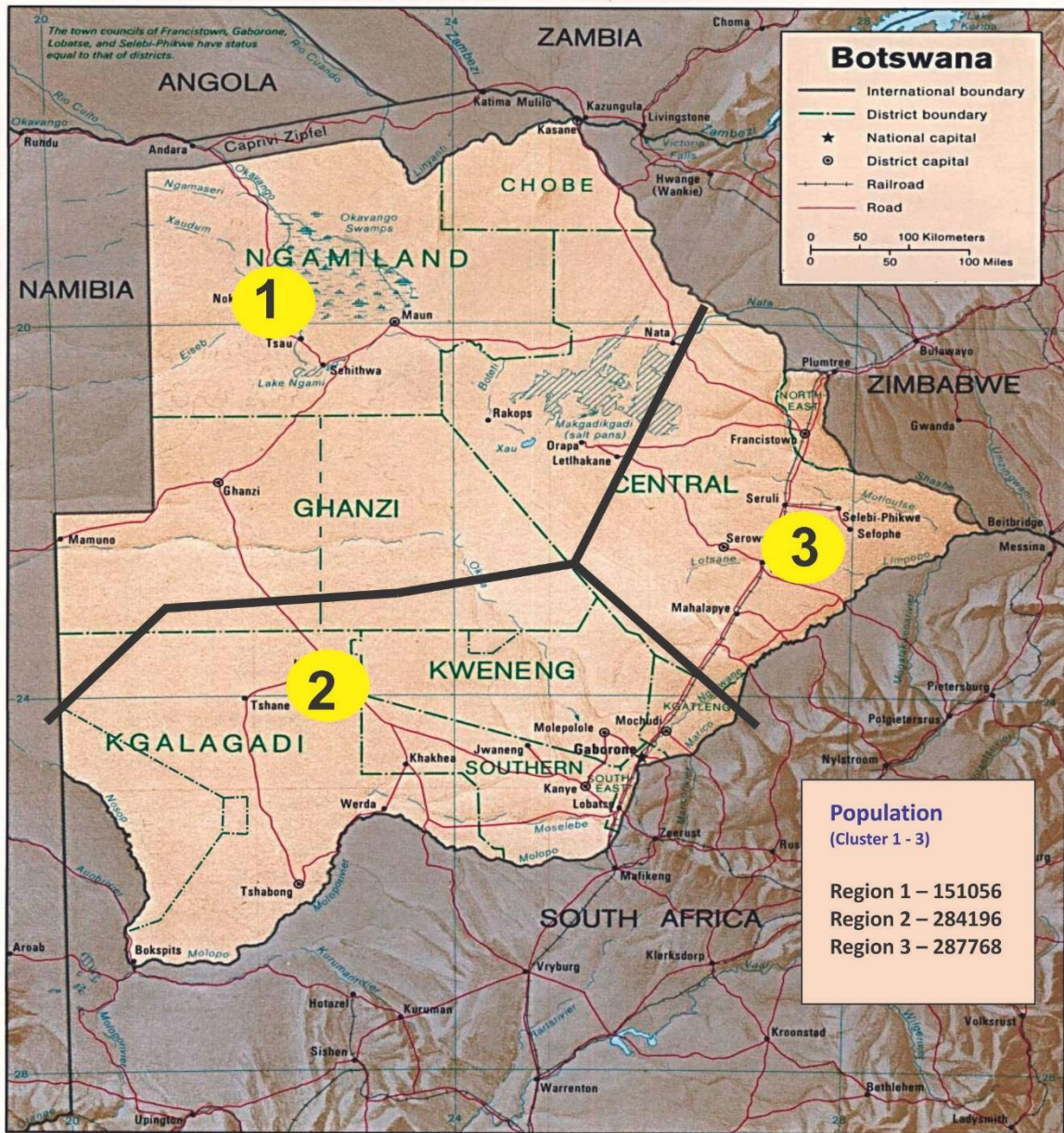
Figure 5: Proposed Rural Regions to be tendered for under reverse auction
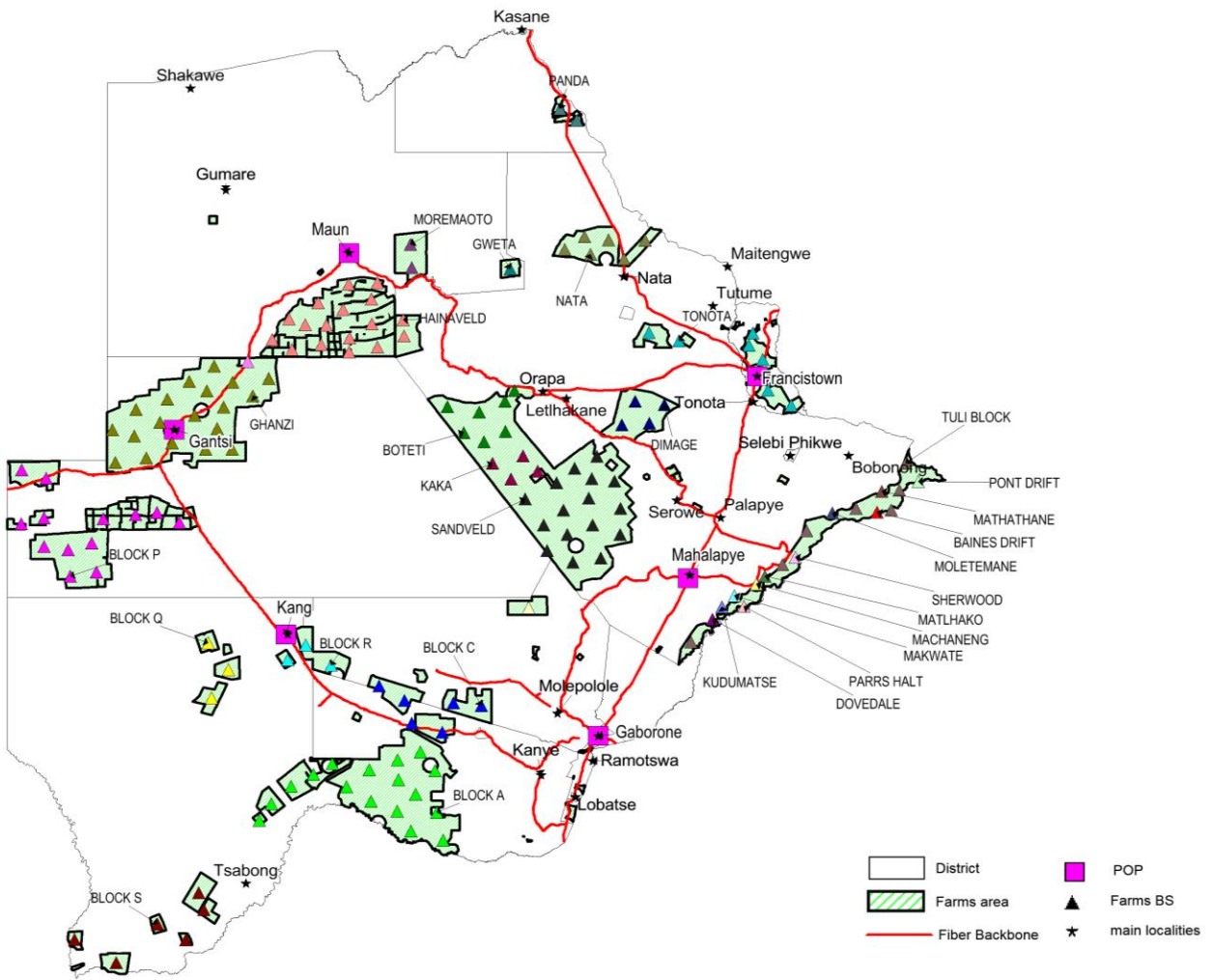
Figure 6: Farms to be considered for mobile broadband coverage

```
┌─────────────────────────┐
│   Information Age        │
│        Council          │
└─────────────────────────┘
          │
┌─────────────────────────┐
│          NBS            │
│      Coordination       │
│       Committee         │
└─────────────────────────┘
    │         │         │
┌────────┐ ┌────────┐ ┌────────┐
│  NBS   │ │  NBS   │ │  NBS   │
│Project │ │Project │ │Project │
└────────┘ └────────┘ └────────┘
```
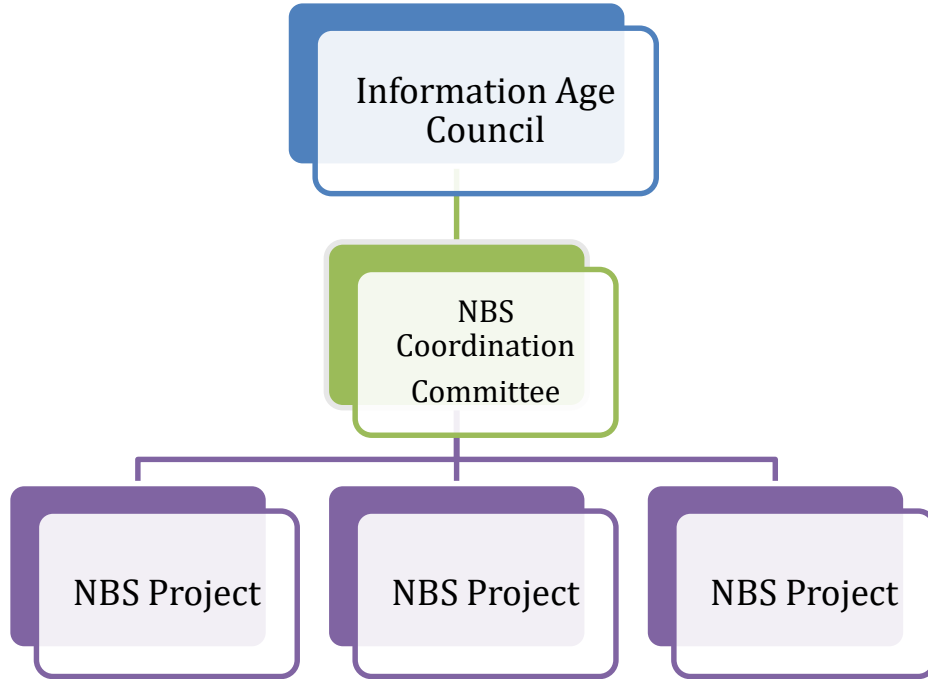
Figure 7: National Broadband Coordination Structure

No.	Location	Population	Total Number of Plots (All Plots)	Number of Industrial, Commercial, Civic & Community Plots
1.	Gaborone*	231626	47351	2574
2.	Francistown*	98963	30184	2897
3.	Molepolole	66466	20496	2224
4.	Maun	60273	25293	2248
5.	Serowe	50820	18461	791
6.	Selebi- Phikwe	49411	13714	559
7.	Kanye	47013	15686	2130
8.	Mahalapye	46409	19265	734
9.	Palapye	37256	12435	1561
10.	Orapa	11645	2159	263
11.	Letlhakane	20841	7454	857
12.	Lobatse	29007	7796	638
13.	Jwaneng	18016	8432	660
14.	Ghanzi	14809	5229	922
15.	Tsabong	8945	5666	267
16.	Kang	5992	3078	446
17.	Mochudi	46914	14115	1851
18.	Mogoditshane	58079	10368	953
19.	Gabane	15327	2469	177
20.	Ramotswa	28952	8480	810
21.	Tlokweng	35326	6631	400
22.	Mmopane	15450	5377	129
23.	Tutume	17528	6667	702
24.	Moshupa	20016	7057	668
25.	Thamaga	21471	8559	669
26.	Tonota	21031	7306	801
27.	Bobonong	19389	7717	810
28.	Mmadinare	12086	4846	490
29.	Tatisiding	8112	1154	86
30.	Metsimotlhabe	8884	2552	153
31.	Kasane	9084	3798	719

No.	Location	Population	Total Number of Plots (All Plots)	Number of Industrial, Commercial, Civic & Community Plots
32.	Bokaa	5680	1761	98
33.	Oodi	5687	2676	213
34.	Good Hope	6362	2840	518
35.	Borolong	5184	2019	1209
	Total	**1158054**	**348438**	**31227**

Table 1: FTTx Roll out

Note: In Gaborone and Francistown, FTTx will be rolled out to all plots and these will include *"Residential, Industrial, Commercial, Civic and Community"* plots.

ANNEXURE 3 – IMPLEMENTATION BUDGET ESTIMATES

Initiative	BWP Million									
	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
NBS Coordination and Monitoring			0.2	0.2	3.0	4.0	5.0	5.0	5	22.4
International Connectivity	129	210.4	183.9	192.5	223.2	135.2	142	138.5	122.3	1476.9
Backbone Network (fibre, radio)	104.9	163.2	219.8	109.5	235.3	232.7	217.7	106.5	20	1409.5
Fixed Access Network (FTTx)	118	182	486	33	169.5	157.3	160.8	175.8	31.7	1514
Fixed Access Network (xDSL, Wireless)	55.0	54.7	73.8	71.2	50.9	42	35	29.3	29	440.8
Mobile Broadband to Urban Areas	131.8	188.2	254.1	380.1	412	375.8	408.3	394.2	120	2664.4
Mobile Broadband to Rural Areas				46	86.7	96	105.2	93.7	70	497.6
Mobile Broadband to Agricultural Areas							20	15		35
Digital Literacy Program	1.5	1.5	2	2.5	19.4	11.6	11.8	12.1	4.2	66.4
Public Awareness & Educational Campaigns						1	1	1	1	4
Internet Connectivity to Public Facilities (Schools, Libraries, Kitsong Centres, health facilities, Government offices, post offices)		45.3	292	203	469.2	368.6	463.1	598.7	431	2871
ICT Research, Innovation & Development	0.1	0.1		0.2	0.3	0.3	0.3	0.5	0.5	2.1
Local Content	0.8	0.8	0.8	0.3	10.8	10.8	12	12	5	43.3
Total Expenditure	**541**	**846.1**	**1512.6**	**1038.3**	**1670.3**	**1435.2**	**1582.1**	**1582.1**	**839.7**	**11047.4**