In association with Moonstone Capital

submitted to

Universal Access and Service Fund (UASF) of Botswana

First Draft

Strategic Plan for the UASF

May 2015

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Acronym	Description
3G	Third Generation of Mobile Telecommunications Technology
BOCRA	Botswana Communications Regulatory Authority
CAGR	Compound Annual Growth Rate
CAPEX	Capital Expenditure
DTTB/DTB	Digital Terrestrial Television Broadcasting
EDN	Education Data Network
EGIS	Enterprise-level GIS
FY	Financial Year
GIS	Geographic Information System
GoB	Government of Botswana
GSM	Global System for Mobile Communications
ICT	Information and Communications Technology
ISP	Internet Service Provider
IT	Information Technology
ITU	International Telecommunication Union
LAN	Local Area Network
LTE	Long Term Evolution/ 4G LTE - standard for wireless communication of high-speed data for mobile phones and data terminals
MB	Mega Byte
MHz	Mega Hertz
MNO	Mobile Network Operator
MOESD	Ministry of Education and Skills Development
MOU	Memorandum of Understanding
MP	Member of Parliament
MTC	Ministry of Transport and Communications
NBS	National Broadband Strategy
O&M	Operation and Maintenance
OPEX	Operating Expenditure
POPs	Points of Presence
P	Botswana Pula

Acronym	Description
PPO	Public Postal Operator
PTO	Public Telecommunications Operator
RAN	Radio Access Network
RFP	Request for Proposal
SDH	Synchronous Digital Hierarchy - standardized protocols that transfer multiple digital bit streams synchronously over optical fiber
UAS	Universal Access and Service
UASF	Universal Access and Service Fund
UN	United Nations
VAN	Value Added Network provider
VSAT	Very Small Aperture Terminal - a two-way satellite ground station with a dish antenna typically 75 cm to 1.2 m in size
WiFi	Local area wireless computer networking technology that allows electronic devices to network
WRC	World Radio-communications Conference - organized by ITU to review, and, as necessary, revise the Radio Regulations, the international treaty governing the use of the radio-frequency spectrum and the geostationary-satellite and non-geostationary-satellite orbits

Executive Summary

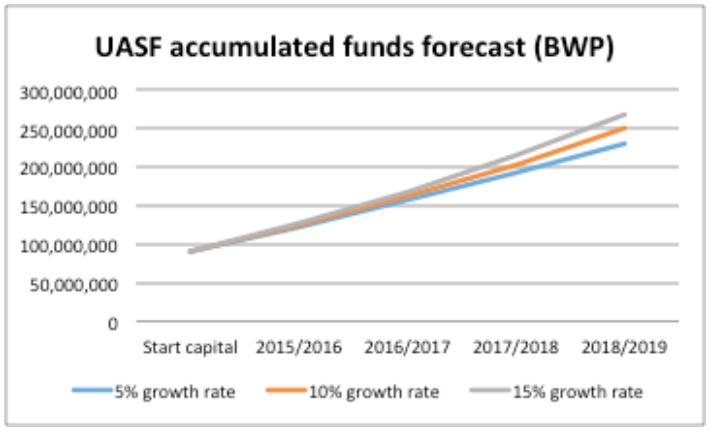
The Universal Access and Service Fund (UASF) of Botswana has three main objectives:

1. To ensure that all Batswana have access to a set of *basic yet essential* communications services throughout the country at affordable costs – this is called universal access and service (UAS);
2. To focus its assistance on population groups and areas which are beyond the reach of the market and to not distort the communications market; and
3. To enable people develop the capacity to use communications services and take advantage of its many opportunities and benefits.

In order to fulfill these key objectives the UASF collects a 1% levy of revenues from designated communications service providers. The UASF then develops specific programs and projects to assist in achieving universal access and service, as well as capacity development. This UAS strategy sets out the specific strategic programs and targets that the UASF aims to implement in the next three years.

The UASF has a starting capital of P90.481.389, a combination of seed funding and surplus funds from BOCRA, and the first year levies. Overall accumulated finances over the next 4 years are shown in the figure below.

Figure 1



Assuming conservative annual revenue growth of 5% per year, the UASF will reach slightly over P230 million in FY 2018/2019. However, as the FY 2018/2019 collection is only complete *after* that financial year, the UASF has a total of P 193 million available for this 3 year strategy.

The communications sector comprises the regulated telecommunications, broadcasting and postal sphere and thus the UASF and UAS strategy also comprises

1) Telecommunications, Internet and ICT;
2) Broadcasting services; and
3) Postal service.

However, it is important to note that almost all of the UASF funds are received from the telecommunications sector. With the rapid development of the Internet, is is the most

dynamic sector, and capacity building efforts for this digital information age, are urgently required and promise the highest impact for economic and social development. The major focus of this UAS strategy is therefore the broadband Internet sector.

The UASF is guided by the following key principles:

- Promoting market efficiency and targeting interventions only where market forces cannot reach;
- Providing smart subsidies that leverage additional investment by service providers, and allow service provision to become sustainable after UASF finance;
- Developing market-oriented programs, and subsidise projects that are mostly implemented by operators and service providers;
- Using competitive tendering for smart subsidies where possible and apply two-stage bidding process;
- Carefully deciding if and what assistance can be given for the "true access gap" – areas that will need ongoing subsidies;
- Designing programs and projects in a technology neutral manner and allowing service providers to e innovative and choose the most cost-effective technology;
- Aiming to design and implement projects with a high impact, especially in the area of capacity development; and
- Working in a transparent manner and in close consultation with stakeholders.

The UASF is fairly new and in the process of becoming fully operationalized. In order to have both fast implementation success and high impact, it is recommended to focus for the first three years on one major flagship program. After these critical first three years, the UASF could increase its programs and scope as required.

The flagship program of this UAS strategy is computerization of primary schools and providing broadband connectivity to all schools that are located in communities with less than 10,000 inhabitants. There will be no separate network roll-out project in the first three years. Instead increasing broadband coverage will be packaged with the school broadband connectivity program – i.e., where schools are outside of existing broadband coverage, the UASF will provide finance not only for that school, but assist in upgrading networks to provide broadband capacity and services in the area.

Other UASF activities include providing voice services to around 60,000 unserved inhabitants living in the most remote locations of the country, and increasing radio FM broadcasting coverage and availability of the commercial radio stations to almost 90% of the population.

Postal services remain important for the conveyance of parcels and mail, and provision of P.O. boxes, among other services. BotswanaPost is the designated Public Postal Operator (PPO) and required to provide universal postal services. This sector is thus fundamentally different as there is only a sole provider for universal service. Also, several provisions of the Communications Regulatory Authority Act (CRA) from 2012 are not fully implemented yet. The postal sector analysis and potential UASF component is consequently still under development and requires further engagement with the relevant stakeholders.

The table below provides an overview of the 3-year strategic goals and targets of this UAS strategy and estimated costs:

Table 1

UAS Strategy overview		
Main program activity per sector	**Description**	**Estimated costs (million Pula)**
Voice communications	Provide an estimated 60,000 inhabitants in most remote parts of the country with voice communications services	**20**
School computerization & broadband Internet connectivity	Computerization/IT teacher for 234 Primary schools in Cluster 3 and 2	**81.8**
	Broadband connectivity for 94 Secondary schools and 234 Primary schools in Cluster 3 and 2	**76.3**
Broadcasting	Increase broadcasting coverage of commercial radio stations from 60% of population up to 90% of population	**1.0**
Postal services	*This is still under development*	
	Total program costs	**179.1**
	Contingency/ Reserve	**13.9**
	Est. total available UASF finance	**193**

1 Introduction

Why universal access and service matters

Communication has always been important for societies. In the digital information age, communications services – whether they are voice communications or broadband Internet, the mass media of TV and radio, or postal communications – have become indispensible for modern life. They are crucial for governments, business and individuals alike, both for economic growth and social development, as well as for the functioning of a democracy.

In a liberalised communications market, the private sector and commercial operators are largely responsible to invest in infrastructure and deliver communications services to a country, while the government sets policies and the industry regulator, the Botswana Communications Regulatory Authority (BOCRA), oversees and regulates the market.

However, each country, including Botswana, will have population groups and areas – in particular lower income groups, disadvantaged people and rural areas – which cannot be served by the market or it will take too long until they are served. Further, with the advent of broadband Internet and the infinite possibilities it offers for information, content, applications and services, the individual capacity to harness and benefit from these opportunities has become critical. As such, capacity building, especially in institutions such as schools, has become critical and urgent, and cannot be postponed.

In recognition of these issues and the importance of communication services, governments intervene to secure universal access and service of a set of minimum communications services for all their inhabitants, regardless of location, income or other issues such as disability – this is called Universal Access and Service (UAS). Over 90 countries world-wide have chosen to set-up specific UAS funds to finance and manage the provisions of UAS and capacity building, as has Botswana.

Botswana's UASF

In 2006 and 2007, the then BTA undertook a study and consultation on universal access and service policies, which resulted in the inclusion of important UAS provisions in the Communications Regulatory Authority Act No. 19 of 2012 (CRA Act): Section 5 (1) (b) which gives the Botswana Communications Regulatory Authority Board (The Board) administrative responsibility to promote and ensure universal access with respect to provision of Communication Services in Botswana. The CRA Act further provides, through section 5 (1) (c), for the Board to impose a Universal Access and Service (UAS) levy on identified operators for purposes of funding universal access in the communications sector.

In line with the Act, the BOCRA Board established a Universal Access and Service Fund (UASF or the Fund) in April 2014, which is managed by an independent UASF Board of Trustees. BOCRA serves as the Secretariat to the UASF. The overall objective of the UASF is to facilitate an enabling environment for the development and use of communication infrastructure and services in Botswana, particularly in underserved and unserved areas.

Relation to other policies

The Telecommunications Policy of 1995 and the ICT Policy for Botswana (Maitlamo 2007) identify expansion of networks and services to reach the whole population as the primary

goal of the communications industry in the country. The goal of universal access and service to communications is closer to realisation in the more urbanised parts of Botswana, while the provision of services in rural areas is still a challenge. This UAS strategy is to assist in achieving these national goals.

The Botswana National Broadband Strategy (NBS), developed in 2013, sets out the objectives, targets, principles, and mechanisms to achieve country-wide broadband development and penetration, within the market context and priorities of the Government and people of Botswana. As such, it contains already many directives for the UAS strategy and this strategy has been developed in alignment with the NBS.

While the NBS has formulated a comprehensive set of measures to achieve *national* broadband development, addressing an enabling broadband ecosystem, the demand and supply-side, this UAS strategy is focused on a very specific sub-part of broadband development – the rural and unserved areas and building digital literacy.

Scope of UAS strategy

According to the definitions in the CRA Act 2012 the communications sector comprises the "aggregate regulated telecommunications, broadcasting and postal sphere" and thus the UASF and UAS strategy also comprises

4) Telecommunications, Internet and ICT;
5) Broadcasting services; and
6) Postal service.

However, it is important to note that:

- Each UAS strategy needs to be seen in very close context to the specific overall sector policy and market situation; and
- UAS, while a common concept, is actually defined quite differently in each of these sectors.

Therefore the UAS approach for the sectors are *distinct,* and each sector is addressed separately in the following UAS strategy.

2 Objectives

This section sets out the main objectives of the UASF, as well as the strategic goals of this UAS strategy. It also provides a more detailed explanation of universal access and universal service, also in light of latest international trends.

The Universal Access and Service Fund (UASF) of Botswana has three main objectives:

1. To ensure that all Batswana have access to a set of *basic yet essential* communications services throughout the country at affordable costs – this is called universal access and service (UAS);
2. To focus its assistance on population groups and areas which are beyond the reach of the market and to not distort the communications market; and
3. To enable people develop the capacity to use communications services and take advantage of its many opportunities and benefits.

The goal of Universal Access is to ensure that, in the shorter term, all people in every part of the country have reasonable means of *access* to basic and essential communications services (including broadcasting, postal, Internet or telecommunications) in their community. This does not necessarily mean individual service or service in their home, but instead the minimum required for universal access is shared use, such as public payphones or phone shops, postal outlets, broadcasting coverage and various types of Internet cafes (or Kitsong centres).

Basic and essential communications services means a set of minimum communications services which are considered so essential that everybody should have access to it or the service provided. A measure of how essential a service is, is whether the large majority of the population has it, and the few without it would be excluded and disadvantaged, and could not participate in everyday social and economic activities.

This is reflected in the term Universal Service: it recognizes that once the market penetration of a communications service – such as the telephone – reaches a high level in society and has demonstrated social and economic value, then that service has become essential to virtually every household. As a consequence, exclusion from having *private* access to the service would place citizens at a social and economic disadvantage. Universal service thus sets the target of the provision of basic communications services to every household in the country. Whereas it is recognized that this goal will be reached only in stages and will be realized in more urbanized and least remote areas first, it is the medium to long term goal for the whole country.

Further, universal access and universal service have several dimensions and thus the UASF has the objective to support and assist in the achievement of the following:

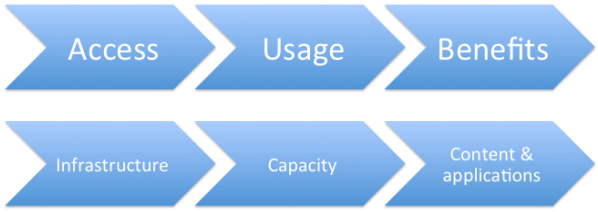
a) **Availability -** the level of the basic and essential communication service should be available for all users without geographical discrimination;

b) **Accessibility -** all inhabitants should be treated in a non-discriminatory manner with respect to being able to access the communications service, in all places, without distinction of race, sex, religion, disability, etc; and

c) **Affordability -** the price of the basic communications services should not be a factor that limits service access for all users.

With the rise of the Internet, especially the possibilities of broadband Internet, the understanding of universal access and service has expanded. While it is sufficient to have telecom service available, accessible and affordable in order to use it, broadband Internet requires also an individuals capacity to use it as well as the knowledge about its potential tangible benefits to be interested to use it. Thus the capacity building function of universal access and service strategies has hugely increased in importance. Also, the importance of available content and applications has increased though UASFs usually play a lesser role in that area as there are often national programs such as broadband strategies and other institutions which address content and applications. The connections among various underlying elements – infrastructure, capacity, content & applications – and what they facilitate – access, usage and benefits - is shown in the figure below:

Figure 2



Specific definitions of universal access and service for the four sub-sectors of communications services - broadcasting, postal, Internet or telecommunications – are defined in the context of the current situation and the strategy in sections 4 and 6.

This UAS strategy is a high-level three year strategy. Its starts in Q3 of 2015, and then continues for the three financial years of the UASF: 2016/2017, 2017/2018 and 2018/2019.

This UAS strategy aims at implementing programs and projects early and creating impact and benefits. However, there is typically a natural learning curve as a UASF gets operationalized and many things have to be developed and done for the first time. In order to achieve early project implementation and impact, the UAS strategy has selected a clear program focus for the first three years at least.

This UAS strategy does not provide detailed individual projects, but instead provides a clear strategic theme and focus, and practical guidelines for developing and implementing the specific projects in the next three years and in some cases beyond.

3 Key principles

The UASF and this UAS strategy is to be implemented according to the following key principles, based on best international practice.

Market efficiency and targeted interventions

The UAS strategy is implemented within a multi-player, commercial marketplace, in accordance with the broader policy objectives of the Government. The Government of Botswana (GoB) continues to be committed to foster efficient market operation, a fair competitive environment and overall sector expansion, and to remove any regulatory or other barriers to the operation of an efficient market. Targeted interventions and financial aid from the UASF will only be used as a means to provide support in areas and for user groups where efficient market forces alone cannot provide the desired services. This also means that UASF funding will not be used in an environment where a lack of sector reform has resulted in very costly services.

Smart subsidies and sustainability

The concept of the smart subsidy is to encourage operators, service providers and their investors to provide certain communications services with the objective of ultimately seeing the program become commercially viable. The Fund is to develop market-oriented programs, and subsidise projects that will be mostly implemented by operators and service providers.

Also in cases where commercial viability is not possible or cannot be implemented by the industry, the UASF is to consider and ensure long-term sustainability of projects.

The UASF shall use the smart subsidy approach as much as possible. Smart subsidies refer to subsidies given to rural and high cost areas, or low-income population groups and service targets which will not be reached by the market alone, even in an efficient market, or at least not for a long time to come. Targeted financial intervention is required beyond normal regulatory measures and incentives to provide services to these population groups and areas. A *smart subsidy* is designed to not distort the market, and encourages cost minimization and growth of the market. It typically is only a part of required capital for the project, for example 30-50%, and helps to "kick start" a project or service, and leverages additional operator and service provider investment. The ultimate objective of giving a smart subsidy is that the project becomes commercially viable, whereas without the subsidy operators and service providers might have been reluctant to invest. Using the smart subsidy approach, services will thus be commercially viable in the medium term without further, ongoing financial support.

Competitive tendering for smart subsidies

The mechanism to select an operator or service provider to receive a smart subsidy and provide defined services in a defined target area or for specific customers is usually that of a public, transparent and competitive tender.

The UASF should use a competitive tendering approach for the least amount of subsidy requested for service provision from qualified bidders. This does not involve any weighting between the technical and financial proposal, but is a two-stage process where a sealed technical proposal and a sealed financial proposal get submitted:

- First the technical proposal gets opened. Here bidders have to qualify first. This includes stringent corporate and financial qualification, and substantial technical

and operational compliance with the service specifications. Against the required technical and other criteria published in the RFP, a simple pass or fail evaluation takes place. Only bidders that pass the technical evaluation, proceed to the second stage.

- Second, qualified bidders have their separately and sealed financial proposal opened. Among these qualified bidders, the bidder with the lowest request for subsidy is awarded the project.

Further, a maximum allowable subsidy is to be set so as to avoid unreasonable expectations from the industry and increase cost minimization efforts and innovative use of technology.

Winning bidders will sign a time-bound service agreement, often three to five years, agreeing to a once-only cash subsidy that will be disbursed over time as they meet their service installation and/ or build-out requirements, and their service obligations. The service agreement has stringent penalties if services to not meet the requirements. Any networks deployed for providing the services remain owned by the operators.

The true access gap

The true access gap comprises areas or communications targets that are beyond any commercial viability, even in instances where initial smart subsidies are given. Commercial sector operators or service providers serving these areas would need ongoing financial support, possibly in the form of operating subsidies. It is a political decision and one of available financial resources, if and to what extent to subsidise ongoing service provision to areas, institutions such as schools, and population groups that are beyond the limits of the smart subsidy zone. The UASF is to carefully decide if and what assistance can be given for the "true access gap" – considering that these projects will require ongoing subsidies.

Creating maximum socio-economic impact

The UASF must aim to design and implement projects with a high socio-economic impact and value, especially in the area of capacity development. This includes considerations of how many people can be impacted, and the quality and lasting effects of that impact. The UASF shall aim to maximise its resources to provide high quality impact and benefits to as many underserved people as possible.

Technology neutral

The UASF mechanisms must enable the most effective, efficient and appropriate technologies to be implemented for Universal Access and Universal Service. By ensuring a technology neutral approach in the competitive tendering process, the UASF will allow the operators to choose the most cost-effective and appropriate technology to provide communications services.

Transparency and stakeholder consultation

The UASF will be operating in an open and transparent manner by

a) inviting stakeholder input into strategy, program and project development; and
b) publishing, as a minimum, annual reports that provide details of funds collected, funds disbursed, to which operator or service provider, status and achievements of projects and service provision, successes and problems encountered.

4 Current UAS situation

4.1 Voice communications

Considering its large territory and scattered rural population, Botswana has made great strides in regards to achieving universal service for voice communications. Mobile teledensity stood at 158% at the end of March 2014. While this includes business phones and many Batswana also have multiple SIM cards to take advantage of preferential tariffs, it is reasonable to assume that households have telephone service in areas that have existing service. Mobile coverage was estimated to cover 80% of the population at the end of 2006, and the market has covered subsequently 88% of the population. This left approximately 12% of the population, i.e., just over 200,000 persons, outside the coverage range of the mobile operators. The majority of these Batswana lives in 197 villages with a population of over 130,000. These were then subsequently served through the implementation of the Nteletsa II project which started in 2009/2010 and was fully implemented at the end of 2011. Nteletsa II was quite successful in covering those villages but also quite costly by offering to pay for 80% of the costs – average costs of providing services in all 4 areas was P3,143 per person. The two mobile operators having been chosen through the competitive tender to implement the Nteletsa II project, Mascom and BeMobile, have benefitted by being able to extend their population coverage. Their population coverage is estimated to be today at 95% each, which has been confirmed. As their coverage does not completely overlap, it is a save estimate that approximately 3% or less of population has no voice services today. Thus, around 60,000 Batswana have no voice services today. This is in communities with less than 250 people and can be considered the “true access gap” – meaning these places are chronically commercially unviable to serve.

Conclusion: To achieve universal service for voice communications in Botswana approximately 60,000 Batswana need to be connected.

4.2 Broadband Internet

The broadband Internet market is still developing and expanding. Many of the measures recommended in the National Broadband Strategy (NBS) have either only recently been implemented or still need to be implemented. Time is needed for these measures to take effect and have an impact in terms of broadband network expansion, price reductions and subsequent broadband uptake.

4.2.1 Broadband network development

Both fixed and wireless broadband networks are expanding substantially.

BoFiNet, established in 2012, has recently received major government funding of P400 million to expand and improve its transmission networks. It has 105 SDH sites around the country, 34 broadband wireless sites and planned 81 more sites by mid-2015. This is responding to the increasing demand by the retail providers, especially the three MNOs, who require BoFiNet transmission, the upgrade of existing capacity on heavy traffic routes and improved capillarity of the network throughout the country.

There is now 3G coverage of at least one mobile operator in all villages with more than 5,000 population; population coverage of 3G is at least 70%. In 2015, LTE has been launched and rolled out by at least one operators and others are soon to follow.

However, this means that there is essentially no mobile broadband (3G) coverage in Cluster 1 (locations with 500-1,000 inhabitants) and Cluster 2 (locations with 1,000 to 5,000 inhabitants) today. The lack of grid-power from BPC in some of these locations increases the cost of rolling out broadband.

4.2.2 Broadband market

The development of the broadband market has progressed in the last couple of years:

- In March 2015, mobile Internet subscriptions surpassed 1 million subscribers, equivalent to 30% of all subscriptions and equivalent to 49% of the population. However, as this also includes business subscriptions and multiple SIM owners which also likely include double data subscriptions, individual mobile internet subscriptions are very likely between those two figures, more than 30% but less than 49%.
- Mobile data revenue as percentage of total revenue of operators has overall roughly doubled over the past two years.
- Mobile Internet growth is at least above 20% CAGR between end of 2012 and end of 2014, which is in line with international mobile broadband growth rates in developing countries.[1]
- The fixed mobile broadband has also grown and at a minimum doubled its subscriber numbers between 2012 and end of 2014.

4.2.3 Prices and affordability

The 2014 Affordability Report[2] mentions Botswana as one of five countries that have made progress in their efforts to reduce Internet access prices between 2013 and 2014, while prices in many other countries remained relatively constant.

Prices for wholesale national transmission and backbone decreased by around 70% to 80% between 2011 and 2014.[3]

While mobile broadband is still considered quite expensive, there are several prepaid basic entry options from operators that allow lower-income users to receive low-priced Internet access, for example 15MB for P9.50, 150MB for P20 (to be used in 2 days) and 20MB for P6 (promotion).

Among developing countries, only 23 countries have achieved the United Nations (UN) 5% entry-level target (i.e., mobile broadband entry prices cost less than 5% of income). Botswana is ranked 27th and its mobile broadband prices (prepaid, handset based, 500 MB) represents 7.2% of income, and thus is getting quite close to the UN target.

Among the industry, relatively low mobile broadband (both 3G and LTE) handset penetration is considered a reason for slower than expected take-up – typical costs for a 3G enabled mobile handset is P700 while an LTE one is around P1500.

4.2.4 Further regulatory measures

However, there are several regulatory enablers and incentives – as identified by operators during the initial consultation - which could accelerate further mobile

broadband up-take, roll-out and reduce prices, thus increasing universal access and services, as follows:

- Active Radio Access Network (RAN) sharing
- 700-800 MHz becoming available, possibly after the WRC in November 2015 for LTE in more rural areas
- Re-use of 900MHz for 3G in rural areas, and
- Improve land acquisition process – possibly unified costs or guidelines for costs and specific and formalized application process with reliable timelines to get permission or response.

Conclusion: The broadband market is still expanding and growing naturally and thus major network roll-out projects by the UASF are pre-mature at this stage. It is more efficient to stimulate demand and build ICT capacity and re-visit the supply-side after 2 to 3 years. The UASF shall gather key data though annually and monitor expansion of the market to determine future network roll-out projects. In the interim, the UASF shall focus on

- **Lobbying and facilitating for enabling regulatory incentives as outlined above; and**
- **Implementing a major capacity and usage building initiative in schools as described further below.**

4.2.5 Institutional connectivity

The nearly 1,000 government schools have no *broadband Internet* connectivity and almost all primary schools have neither a computer laboratories (labs). While some of the schools in Botswana have Internet connectivity, it is all narrowband i.e., 256kbps or less. Out of the 207 Junior Secondary schools, 26% have some sort of upgraded Internet access, while 43% of the 32 Senior Secondary schools also have slightly better Internet access. Most of the 754 primary schools have either no Internet or it is so slow – 256kbps or less – to be virtually useless for a computer lab with around 30 children. Thus, the majority of schools do not have broadband Internet today.

The Ministry of Education and Skills Development (MOESD) issued a tender in April 2014 for the establishment of an Education Data Network (EDN) that is to connect all government schools and provide service for the first two years. The network was to have 6 core nodes at strategic locations around the country and schools would connect to their closest core node through leased lines. The award of the tender is currently stalled due to lack of funding.

BOCRA undertook a needs assessment of schools in the Kgalagadi, Ghanzi and Southern districts in November 2014. Its report summarizes some of the key challenges in schools as follows:

- No or few working up-to-date computers or tablets in primary schools
- Connectivity too poor/slow
- No in-school technical support
- No dedicated ICT teacher in primary school
- Some schools lack specific room for computer lab
- Internet access often limited to the computer lab and does not extend to teachers quarters, and
- in some schools electricity is an issue.

The NBS has set targets for at least 40% broadband school penetration by 2015-2017, and 70% by 2018-2021. One of the major measures of the NBS on the demand side policies is the Digital Literacy Programme, which is cognisant of the fact that broadband usage requires ICT capacity – basic computer skills and the capability of finding, evaluating, ethically using, creating and sharing the information, services, media and applications broadband Internet makes available.

Conclusion: School broadband connectivity should be a main target of the UASF.

4.3 Broadcasting

In terms of universal access and service in broadcasting, the two main criteria are

- Availability – what percentage of the population has broadcasting coverage and the required end-user device to listen to it?
- Plurality and choice – does the population have access to a variety of different media with different content and opinions?

4.3.1 Radio

There are currently three commercial radio stations licenced in Botswana, DumaFM, YaronaFM and GabzFM. There is also the state broadcaster with RB1 and RB2 for radio. However, the state broadcaster is outside of BOCRA's jurisdiction and not part of this UAS strategy. Radio household penetration in Botswana is 92%,[4] and thus very close to universal service.

The three commercial radio stations formed the joint venture Kemonokeng which is a combined signal distribution network with shared FM sites. They have all equal shareholding in Kemonokeng. Kemonokeng has currently nine transmission sites namely Lobatse, Gkeomaborone, Mahalapye, Serowe, Selibe Phikwe, Francistown, Maun, Tlokweng and Mochudi.

Thus, all commercial radio stations are available in major towns and villages in Botswana, with population coverage of between 50-60%. The 5 year roll-out plan of the commercial radio station projected that they will cover ten districts by end of 2014. In September 2014, eight out of ten districts had signal cover, an achievement of 80% rollout progress.

Kemonokeng is currently planning to deploy 5 new sites which would bring the population coverage to almost 90%. However, they have financing constraints. Their ability to raise additional advertising revenue is currently hindered by not having national coverage.

Conclusion: Radio has very high population penetration but not from all main radio broadcasters. With Kemonokeng there is an opportunity to increase the coverage of the three commercial radio stations.

4.3.2 TV

The country has one commercial TV station, e-Botswana in addition to the state broadcaster BTV. However, the latter is not under BOCRA's jurisdiction and thus also outside this UASF strategy.

eBotswana covers only Gaborone and surrounding areas within a 60km radius. The coverage license condition for the station was amended to allow eBotswana to broadcast nationally via satellite. However, while the station had committed to broadcast through satellite by July 2014, eBotswana has not been able to implement this initiative to date.

There is no data available regarding overall TV household penetration but industry estimates indicate this is under 50% of households.

Botswana is currently in the process of migrating to digital terrestrial television (DTT). BOCRA also recently issued a public consultation process for a licensing framework for DTT, which started in January 2015 and is still ongoing.

A concern is the affordability of new set-top boxes for the digital switchover, but there is no reliable information on potential prices and transition plans yet. Neither is there any information if there is a real problem and if so, the extent of this problem. Further, this is no concern of the UASF as TV has not reached 75% of households to be considered a basic service to be included in UAS. Any intervention by the UASF would assist the better-off population that can afford a TV, and not bridging the gap for those that need assistance. Thus any UASF involvement in this matter of digital TV set-top boxes would not be in line with the UASF objectives.

Conclusion: TV has not reached enough penetration to be included in universal service. UASF involvement is not recommended.

4.4 Postal services

Universal Service to postal services is internationally defined as the provision of basic postal services to the whole territory of the country at the same price. Universal Service also includes a common standard for those basic postal services based on the following five components:

a) Provision of access to services;
b) Level of customer satisfaction;
c) Speed and reliability of services;
d) Security of services; and
e) Liability and treatment of enquiries.

The CRA 2012 addresses the public postal operator (PPO), the universal service obligation and reserved services for the PPO (Section 67 to 71). According to Section 67, Botswana Post has been designated as Public Postal Operator (PPO). The Act also defines a specific list of universal postal services for the PPO to deliver. Other key provisions include:

- The PPO has detailed reporting requirements in regards to universal service;
- The PPO has to provide separate accounting for the costs of the universal service; and
- universal services are to be provided on a cost-based plus tariff, as such allowing BotswanaPost to raise tariffs to cover costs plus.

Overall, demand for mail is slowly declining with 14.8 mail items per person in 2014 compared to 16.9 mail items per person in 2005. BotswanaPost states that it makes losses due to the requirement to provide universal postal services. The Ministry of Transport and Communications (MTC) has secured funding for universal postal services for the financial year 2014/2015 in the amount of P40 million which has already been

disbursed. MTC has also secured funding for financial year 2015/16 and has asked BOCRA to develop a contract for delivery of universal postal services and disbursement modalities.

However, while substantial preparations have been made, separate accounting and detailed reporting on universal postal services are not yet fully implemented.

The CRA 2012 is silent on the distribution of postal offices and postal agencies i.e., which size of village requires a postal office or postal agencies. In practice, the postal network is determined in terms of the needs for delivery of the specified universal postal services.

BotswanaPost has 124 post offices and 86 postal agencies. However, as this is a legacy postal network, these post offices and postal agencies are not always located in town and villages according to demand for services and self-sustainability.

The Table below provides an overview postal offices and postal agencies categorized into 5 clusters according to the population size of their location. This is identical to the six clusters used for the NBS, however cluster 4/5 were combined.

Based on the information provided, so far 77% of postal offices and 100% of postal agencies could be located and categorized into the 5 clusters.

Table 2

Distribution of postal outlets across population clusters			
Clusters	**# of postal offices**	**# of postal agencies**	**# of cities/towns & villages**
Cluster 6 (Cities)	11	3	2
Clusters 4/5 (>10,000)	23	9	20
Cluster 3 (5001-10,000)	22	6	27
Cluster 2 (1001-5000)	36	61	197
Cluster 1 (500-1000)	2	7	153
Less than 500 pop	1	0	95
Total	**95 out of 124 (77% located)**	**86 (100% located)**	**494**

The Table shows that all villages with more than 5,000 inhabitants are served, either by a postal office or postal agency. Also it appears that almost 50% of villages between 1,001 and 5,000 inhabitants have a postal outlet. The postal network is thus quite substantial, and possibly in some cases has more postal outlets than needed. However, population size is not the only criteria for demand, but also economic activity or social importance.

Conclusion: Considering current government funding and the yet to be fully implemented universal service cost accounting and reporting, it is currently premature to consider a specific UASF postal strategy. It will have to be analyzed further in terms of cost-based plus tariff setting for universal postal services, and the demand and universal service criteria for the location of a postal office or agency in a certain type and size of village.

5 Available UASF funding

The first financial year of the UASF started on 1 April 2014 to 31 March 2015 (FY 2014/2015). BOCRA provided seed funding for the UASF in the amount of P37.352.734. BOCRA also added its surplus from its financial year 2013/2014 to the UASF in the amount of P16.084.802, as required by the Communications Act 2012.

In its first year, the UASF collected P 37.043.852, however, some small amounts are still outstanding. Going into the financial year 2015/2016, the UASF has a starting capital of P90.481.389.

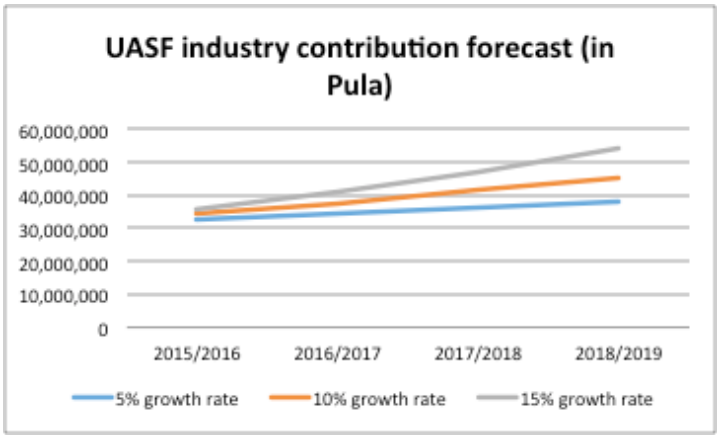
To forecast annual UASF collections, annual telecommunications revenue growth from FY 2011/2012 to FY 2014/2015 was reviewed (see the Table below). While the first year on year growth was high with over 28%, the two following years had barely growth or even slightly negative. The Compound Annual Growth Rate (CAGR) over the last 3 years was 8.8%.

Table 3 – CAGR of Telecom revenue in past 3 years

	2011/2012	2012/2013	2013/2014	2014/2015
Telecom revenue	2.415.423.590	3.102.543.146	3.123.453.724	3.108.977.642
Year on year growth		28,4%	0,7%	-0,5%
CAGR				**8,8%**

The figure below forecasts the UASF industry levy collection of 1% gross revenue over the next 4 years. It is assumed that market growth will pick-up again and there are three scenarios for the 1% UASF levy, based on 5%, 10% and 15% annual revenue growth in the market.

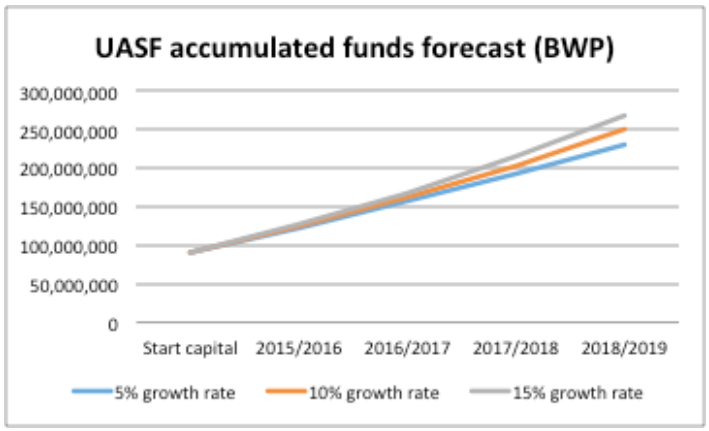
Figure 3



Assuming conservative market growth, the UASF will have annual collections of between P32 million and P37 million. Assuming optimistic market growth UASF collections could rise to P54 million in FY 2018/2019.

Overall accumulated finances over the next 4 years are shown in the figure below.

Figure 4



Assuming conservative annual growth of 5% per year, the UASF will reach slightly over P230 million in FY 2018/2019. With an average growth of 10% per year the fund will accumulate almost P250 million, and nearly P270 million under optimistic market growth scenarios. This excludes any future contributions of BOCRA surpluses.

It is important to note though that the UASF collections of FY 2018/2019 are only fully available at the end of third financial year, and thus this UAS strategy cannot include them as fully available funds for this three-year strategy.

This UAS strategy assumes the conservative market growth scenario and no additional surplus from BOCRA. As such this programme is tailored to a conservative assumption of UASF funds. This is prudent as there may be unexpected additional expenses or unforeseen project opportunities, and the UASF needs contingencies.

Conclusion: P193 million are available for this UAS strategy, based on the conservative assumption.

6 Strategic streams

6.1 Voice communications

The UASF shall close the voice communications gap within three years by:

- Identifying accurately the number and type of locations without voice services today, the number of inhabitants living there and their level of demand for voice communications; and
- Designing a project to provide service to these location and offering a smart subsidy via a competitive bid to operators within the country.

As a first key step, it is recommended that BOCRA develops its own Enterprise-level GIS or EGIS. EGIS can be defined as an accurate and rich, geographically-based Information System which is integrated throughout an organization to allow multiple users to easily access and update the same information (or authorized sub-sets) and generate key reports. This would be generally useful for BOCRA, for example to be able to analyse and report voice, 3G and LTE coverage data throughout the country, but particularly useful for the UASF. An advanced EGIS could integrate with other BOCRA database systems and functionality can be built step-by-step in a modular approach as funds and resources are available.

The EGIS would allow important GIS analyses for UAS programing, including:

- Baseline GIS map features and statistics including administration boundaries, villages, terrain, transportation networks, population, and other census data;
- Ability to generate maps showing areas of operator mobile signal and internet coverage and locations of UASF projects;
- Manipulation of Excel tables, data sets and charts to generate statistics such as percent change in geographic area with & without coverage per reporting period, and total geographic area of coverage by administration unit; and,
- Aggregate GIS-derived data for use in UASF project cost, revenue and viability analysis.

The EGIS could be used to map a) all villages and localities, and b) all BTS and their coverage, if it is combined with a radio frequency coverage mapping software. This could be a project jointly with the Central Statistic Office (if they do not yet already have a GIS-based population database).

This would be one option to identify locations without voice coverage today. Another option would be to have a public appeal by BOCRA involving the Parliament for localities to register themselves with the UASF as not having voice coverage. A third option would be to ask the three main operators to provide a list of locations they know they do not serve with voice. Operators co-operated at the end of 2014 to establish a list of unserved villages and localities; they could be asked to co-operate with the UASF.

In a second step, the UASF shall commission a demand study in a representative set of unserved localities to establish the level and type of demand. This could also be used as a verification check that indeed there is no voice coverage and also not close-by.

Based on the number of locations needing voice service and the findings of the demand study, the third step is to design a project to cover these locations, estimate the cost and commercial viability of the project, and decide on best approach and whether only a smart subsidy is needed or possibly ongoing OPEX support.

As these remaining 3% of population is clearly the most remote and difficult to serve, it is likely that they represent the "true access gap", meaning they cannot be served on commercial terms, even if a smart subsidy were given. Nevertheless, costs to connect these remaining locations can and should be minimized.

Technical options, due to the remoteness, may include satellite services, like VSAT. This could include a fixed service VSAT for each community, i.e., a public phone. Or it could be a mini-cell connected to the mobile network but with satellite backhaul; this would mean the inhabitants would have their private mobile voice (and basic data) service.

During project design, it should be investigated if there is demand for internet service and what the cost feasibility would be to add for example a public WiFi spot per locality (or for the largest localities); as a minimum, the system put in place for voice services should be upgradable to include broadband Internet at a later stage.

As there are currently not enough information to estimate costs for the voice program, it is recommended to reserve P20 million for this component.

6.2 Broadband Internet

The UASF strategy will focus on the following three key strategies for broadband Internet:

- Advocating for and facilitating of the consideration and implementation of potential regulatory improvements and incentives for rural broadband roll-out;
- Connecting both secondary and primary schools with broadband Internet and also providing them with the equipment, technical and training support to take advantage of that – and where required, leveraging school connectivity for further broadband roll-out; and
- Creating further public access through adding public WiFi to the villages in which schools are getting broadband Internet connectivity via the UASF. However, this has the following two conditions:
    - The public WiFi will only be established in villages which do not have a public WiFi spot today and are unlikely to have one on commercial grounds even in 1-2 years time;
    - The public WiFi service to the public will not be subsidized, i.e., normal pricing will apply; UASF funding will provide a smart subsidy.

6.2.1 Regulatory enablers and incentives for further broadband roll-out

As already mentioned in section 4, there are several regulatory enablers and incentives which have the potential to accelerate further mobile broadband up-take, roll-out and reduce prices, thus increasing universal access and services.

The UASF is a financing instrument and not a regulatory instrument, but its core principle is that it is an instrument of a reformed, liberalized and well regulated market, as it would otherwise finance the inefficiencies of the market place. No marketplace is perfectly regulated either, but the UASF should promote and support measures that would improve UAS, especially if they have support from a significant number of operators.

Regulatory measures that currently are considered to improve UAS include:

- Active RAN sharing – there are a number of countries where operators have implemented various levels of active RAN sharing, with different business

models and regulatory conditions; this is generally quite a complex undertaking and process, but operators can see a large reduction in costs and duplicate infrastructure and thus some are willing to explore this. What is required is a position of the regulator or a regulatory framework that gives operators the certainty over what RAN sharing and business models are allowed and what is not.

- The "digital dividend" frequencies - 700-800 MHz – are becoming available, and possibly after the WRC in November 2015 there is a clearer recommendations for using them for LTE in more rural areas;
- Re-use of 900 MHz for 3G in rural areas, and
- Improve land acquisition process – possibly unified costs or guidelines for costs and specific and formalized application process with reliable timelines to get permission or response.

6.2.2 Connecting schools and leveraging further roll-out

As outlined earlier, ICT capacity building in schools has potentially the biggest and longest-term impact on broadband development and the country as a whole. Thus making schools Internet ready and connecting them to broadband Internet is to be the flagship program of the UASF. The table below provides an overview of the UASF program for school computerization and broadband connectivity. Details regarding which schools to target, their current broadband coverage, the costs involved and the detailed implementation approach are described in this section.

Table 4

Three year school computerization and broadband connectivity plan		
Main activity	**# of schools**	**Estimated costs (million Pula)**
Broadband connectivity	**94 Secondary schools**	**22.0**
Computerization/IT teacher	**234 Primary schools**	**81.8**
Broadband connectivity	**234 Primary schools**	**54.3**
		158.1

Secondary schools

As already described in Section 4, 26% of the 207 Junior Secondary schools have some sort of upgraded Internet access, while 43% of the 32 Senior Secondary schools also have slightly better Internet access.

Based on the information provided, 93% of the 240 secondary schools could be located and categorized into 5 clusters. This is similar to the clusters used for the NBS, however cluster 4/5 were combined as the population data of the 2011 census did not include population density data.

The table below shows the distribution of secondary schools across the various sizes of locations.

Table 5

Distribution of secondary schools into clusters	
Clusters	**#of secondary schools**
Cluster 6 (Cities)	40
Clusters 4/5 (>10,000)	85
Cluster 3 (5001-10,000)	31
Cluster 2 (1001-5000)	63
Cluster 1 (500-1000)	2
Less than 500 pop	1
Total	**222**

56% of the secondary schools are either in cities or in larger towns or major villages with more than 10,000 population, with the remainder in smaller places and a large portion in localities with less than 5,000 population. While the former are likely already having Internet access and are relatively easy to serve, the latter are unlikely to have broadband Internet and are similarly underserved as the primary schools.

All schools - both secondary and primary, urban or rural - are to be provided with broadband Internet access, as per the NBS. Even some of the secondary schools with better Internet access might not have the adequate target download speed, and need improved Internet service.

The NBS targets are that 40% of schools are provided wit broadband Internet in the period of 2015-2017, and that this increases to 70% in the period of 2018-2021. There are no specific speed targets for schools in the NBS but minimum speed targets per area: 10MB in urban areas and 5MB in rural areas by 2014-2017. It is recommended that these speed targets are used as guides for schools at the beginning of the program but that quick upgrades or modifications are planned for, based on an evaluation of actual usage in schools after a year of functioning broadband Internet access. 5MB is a reasonable starting point for download speed, assuming that 30 children are online browsing at the same time, allowing at least 160 kbps.

It is recommended that the UASF assist the secondary schools that are located in Cluster 3, 2 and 1. The role of the UASF is to *assist* in school computerization and connectivity, and it cannot finance the entire ICT aspect. MOESD could focus on the secondary schools in the cities (Cluster 6) and in locations with more than 10,000 inhabitants (Cluster 4/5), which generally have better and less costly broadband service available.

Primary schools

The table below gives an overview of the distribution of primary schools into five clusters of cities, town and village size. This is again using the same clusters as for the NBS, however cluster 4/5 were combined as the population data of the 2011 census did not include population density data.

The table has also used available data from

- BoFiNet's existing SDH sites, broadband wireless sites, and planned sites in 2015,
- planned LTE roll-out data from all three MNO's, as well as
- 3G coverage data.

This allowed an identification of the primary schools that have various types of broadband coverage, and the primary schools that have no broadband coverage for some time to come.

Note: for the this first draft we have attempted to locate all primary schools (756 government schools and 57 private schools), and were at this stage only able to locate a total of 681 primary schools. In subsequent drafts we will eliminate the private schools and attempt to locate more schools in the 2011 population database.

Table 6 – Availability of broadband coverage for primary schools across population clusters

	Primary schools	with BOFINET presence	BOFINET & LTE (2015)	Only LTE in 2015 (No BOFINET)	still only 3G by end 2016	Primary schools without broadband coverage
Totals	**681**	305 incl. 98 cities	226 incl. 98 cities	57	15	
Cluster 6 (cities)	98	98	98	0	0	0
Clusters 4/5 (>10,000)	173	119	113	54	0	0
Cluster 3 (5001-10,000)	51	33	15	3	15	0
Cluster 2 (1001-5000)	183	40	0	0	0	143
Cluster 1 (500-1000)	113	12	0	0	0	111
Smaller locations	63	3	0	0	0	60
Total	681	305	226	57	15	314
Not located yet	137					

The situation can be summarized as follows:

- The 98 primary schools in the two cities have a choice of broadband service both via fibre-optic and LTE;
- Also, the 173 primary schools in cluster 4 and 5 are covered by BoFinet's transmission network and LTE, with 54 schools relying solely on LTE as broadband option;
- The 51 primary schools in cluster 3 are again covered by both BoFinet and/or LTE, except 15 which will only have 3G, even at the end of 2016 (i.e., the villages are not included in current LTE roll-out plans);
- In cluster 2, 40 schools are in villages with BoFiNet presence – however, that is all, leaving 143 primary schools outside any broadband coverage today and in the near future;
- For the 113 primary schools in cluster 1, twelve could be served using the BoFiNet infrastructure – but 111 are without broadband coverage; and
- 63 primary schools reside in locations with less than 500 inhabitants (but larger villages may be close by) – 3 have BoFiNet presence while 60 are without any broadband coverage.

The table below shows preliminary cost estimates for connecting the 681 schools that have been located so far. These figures are likely to change as more primary schools need to be included; currently only 83% are located (on the other hand some private schools need to be excluded). Further, discussions with stakeholders may yield slight changes in cost estimates. However, this still gives good ballpark costs for establishing Internet

connectivity assuming a mix of available technology and required additional network roll-out.

Key assumptions include:

- Costs were estimated for CAPEX to establish the broadband Internet connectivity and for monthly costs (including maintenance) for 3 years;
- All primary schools in Francistown and Gaborone can be connected using fibre; costs are likely even lower than currently shown. This is the best solution, considering that in the cities the LTE network is likely facing more demand and potential congestion, and required speeds are more difficult to guarantee compared to rural areas with lower demand;
- Rough cost-estimates for fibre connectivity for 10MB obtained seem quite high and need to be investigated further – for the model 50% of cost obtained was assumed;
- In locations where there is no broadband coverage today, the upgrade to LTE or 3G includes only 50% of CAPEX for the upgrade as operators will benefit from the subsidy to provide services to the general public;
- In places that both have the transmission network from BoFinet present and LTE, we assumed roughly a split of 50/50 among the technologies; and
- The 60 primary schools in locations with less than 500 populations and without BoFiNet presence are not included so far as it needs to be established whether they are close to larger villages with broadband connectivity or in very remote locations.

Table 7 – Costs of broadband connectivity for primary schools depending on location and availabe broadband service

Primary schools	Cost per school 10MB using BoFiNet/ 3 years**	Cost per school 5MB using LTE/ 3 years*	Cost per school 5MB upgrading 3G to LTE***	Cost per school 2MB upgrading to 3G	# of primary schools connected	UASF costs
681	604.376					
	302.188	80.000	230.000	230.000		
Cluster 6 (cities)	29.614.424				98	29.614.424
Clusters 4/5 (>10,000)	18.131.280	9.040.000			173	27.171.280
Cluster 3 (5001-10,000)	5.439.384	1.440.000	3.450.000		51	10.329.384
Cluster 2 (1001-5000)	12.087.520			32.890.000	183	44.977.520
Cluster 1 (500-1000)	3.626.256			23.230.000	113	26.856.256
Smaller locations	906.564				0	906.564
Total	69.805.428	10.480.000	3.450.000	56.120.000	618	139.855.428

Findings from the model are as follows:

- 50% of overall school connectivity costs is the cost of connecting 37% of the primary schools to the fibre-optic and transmission network of BoFiNet; However, this would also be at a higher and more reliable speed of 10MB;
- Considering that the UASF starts with over P90 million and will only reach slightly over P230 million at the end of FY 2018/2019, there are insufficient funds to connect all schools in the three years of this strategic plan.

As there are also additional costs of computerization for the primary schools, first the overall approach is outlined here, with a more detailed phased action plan for the first three years further below.

Overall approach

Internet–ready schools

An important lesson from international best practice is that schools need to be "Internet-ready" *before* the Internet connectivity is provided. Otherwise costly Internet service is provided without the schools being able to take advantage of it, wasting UASF funds. An Internet-ready school consists of:

- Existing computer lab with the following features
  - Safe/secure and suitable room
  - Sufficient power supply and back-up if required
  - Sufficient and up-to-date computers
  - Recent installed software
- Existing ICT curriculum that is to be taught
- Other guidelines of how to integrate ICT into teaching various subjects such as mathematics, science, art, etc.
- Special learning and educational software (content)
- Especially trained ICT teacher
- Trained or sensitized other teachers on how to integrate ICT into their subjects

While almost all secondary schools have a computer lab, the majority of primary schools has no computers, safe some donated or older computers. So far there has not been a consistent standard or dedicated approach to the computerization of primary schools. In Senior Secondary schools ICT is an examinable subject while Junior Secondary schools have ICT awareness courses. There is no ICT curriculum for primary schools. Currently 14% of the 28,000 teachers are ICT-trained, and another 2,500 are scheduled to be trained this financial year.

This basically means that secondary schools are Internet-ready, while primary schools are not. As a matter of priority for any computerization and Internet connectivity program for primary schools to go ahead, an ICT curriculum (or awareness course) for primary schools is to be developed by the MOESD.

The Internet readiness will influence the sequencing of which schools get connected during the first wave, second wave, third wave and so on.

Flanking measures – hiring recent IT graduates for primary schools

Another major lesson learnt from international experience with USF-funded school connectivity is the importance of proper technical support. Many problems can occur when there is a lack of proper and timely technical support. This includes outside technical support for major issues regarding the Internet connectivity but also in-house support for typical day-to-day problems such as viruses, required software upgrades, computer maintenance, dealing with SPAM, trouble-shooting and so on. Outside support can be resolved through technical maintenance and support agreements with the suppliers.

For internal support, it is recommended that recent IT graduates are specially hired to look after the computer lab. In primary schools, they should also teach basic ICT skills to both pupils and teachers, based on an approved teaching program. This is to resolve the problem that there are not enough (or no) trained ICT teachers in primary schools, which is crucial for success. This should be initially done and financed by the UASF on a contract basis for a period of up to 3 years, but there should be an understanding with the MOESD that these IT graduates could become permanent employees in the long run if they wish and have proven themselves.

This programme of hiring recent IT graduates should consider the following:

- Jointly with the MOESD, a proper job description and qualification criteria need to be elaborated, as well as an employment contract;
- A fair and attractive salary should be offered but which also fits into the primary teacher salary culture (i.e., not significantly lower but also not much higher than a similarly qualified entry-level primary teacher);
- A recruitment process organized, possibly outsourced, but with major input from MOESD, UASF and some representation of the primary schools;
- Some training in regards to teaching as the IT graduates have no experience or qualifications in teaching; and
- A proper supervision program of the new "Primary school ICT teachers", possibly involving the head teacher but also MOESD's regional ICT co-ordinators, and the UASF if required.

While the main objective of the UASF is to assist with ICT capacity building and service provision which is commercially not viable, this recommendation of hiring recent IT graduates allows the UASF also to make a small impact in reducing youth employment.

Cost of getting schools Internet ready and flanking measures

Detailed costing cannot be provided in this high-level strategy as many details and factors are unknown at this stage and need to be developed in a more detailed implementation plan. However, using some informed assumptions shown in the table below, a ballpark estimate can be gained for approximate program costs in regards to computerization of primary schools and contracting a special ICT teacher and computer lab/IT specialists.

Table 8

Cost of getting primary schools Internet-ready	
Items	**Per school in Pula**
30 new computers @ 5,000	150.000
Computer lab room improvements	20.000
IT grad salary @ 5,000/month for 3 years	180.000
Total per school	**350.000**
750 primary schools	**262.000.000**

While the cost of the computer lab above assumes a traditional computer lab, the UASF and MOESD should consider and explore the suitability of alternative and innovative options. One concept includes having a "mobile computer lab" for primary schools where computer tablets are used. Instead of having a specific computer room, the tablets could be on a trolley and are moved within the school to the class that needs them.

Overall program costs

Rough costs for Internet connectivity was estimated at P140 million (excluding secondary schools and not including all primary schools). Jointly with the approx. P260 million to get the primary schools Internet-ready, this is about P400 million[5]. Considering the funds of the UASF and the various costs shown in the table below, it is clear that not all schools can be made Internet ready and connected in the 3 year period of this high-level strategy by the UASF alone. The UASF has 57% of the needed finance for the whole program. So it is crucial that the MOESD uses their available funding to also connect and computerize schools.

It is recommended that the MOESD focuses on computerization and broadband connectivity for the secondary and primary schools in the cities and clusters 4/5, while the UASF provides the finance for secondary and primary schools in clusters 3, 2 and 1.

Table 9 – Combined costs of making primary schools Internet ready and connectivity costs against available UASF finance

Clusters	# of primary schools	Costs of connectivity	Costs of getting Internet ready	Combined costs	Available acumulated funds (Million/Pula)	UASF Financial Year
Cluster 6 (cities)	98	29.614.424	34.300.000	63.914.424	90,4	Start capital
Clusters 4/5 (>10,000)	173	27.171.280	60.550.000	87.721.280	32,6	2015/2016
Cluster 3 (5001-10,000	51	10.329.384	17.850.000	28.179.384	34,3	2016/2017
Cluster 2 (1001-5000)	183	44.977.520	64.050.000	109.027.520	36,0	2017/2018
Cluster 1 (500-1000)	113	26.856.256	39.550.000	66.406.256	37,8	2018/2019
Smaller locations	*3 (60 not costed)*	906.564	1.050.000	1.956.564		
Totals	**618**	**139.855.428**	216.300.000	356.155.428	**231.2**	

Note: This table just includes the 618 primary schools that could be located in the Census database so far. Connecting all 750 primary schools will add to the cost.

UASF school computerization and broadband connectivity plan

The Table o the next page shows the detailed targets of the school computerization and broadband connectivity for the slightly over 3 years of this UAS Strategic plan. It matches the costs with available funding and follows a sequence of computerizing the primary schools first before providing broadband Internet connectivity. In general, the computer lab would have to be *in place* at least for 3 to 6 months before the Internet connectivity is provided. It also focuses on the easier to serve Cluster 3 and then moves to the smaller locations in Cluster 2.

Table 10

Overview of UASF school program				
Year	**Main activity**	**# of schools**	**Estimated costs (million Pula)**	**Available UASF funds (million Pula)**
Remaining FY 2015/2016	**Broadband connectivity** to secondary schools in Cluster 3	31 secondary schools	6	**70.4** (90.4 minus 20 for voice program)
	Broadband connectivity to secondary schools in Cluster 2	63 secondary schools	16	
	Computerization/IT teacher primary schools Cluster 3	51 primary schools	17.8	
	Computerization/IT teacher for 50% of primary schools Cluster 2	91 primary schools	32 ***Total 71.8***	
FY 2016/2017 (YEAR 1)	**Broadband connectivity** to primary schools in Cluster 3	51 primary schools	10.3	**32.6**
	Broadband connectivity to 50% of primary schools Cluster 2	91 primary schools	22.0 ***Total 32.3***	
FY 2017/2018 (YEAR 2)	**Computerization**/IT teacher for remaining 50% of primary schools Cluster 2	92 primary schools	32	**34.3**
FY 2018/2019 (YEAR 3)	**Broadband connectivity** to remaining 50% of primary schools Cluster 2	92 primary schools	22.0	**36.0**
Totals	**Broadband connectivity**	**94 Secondary schools**	**22.0**	
	Computerization/IT teacher	**234 Primary schools**	**81.8**	
	Broadband connectivity	**234 Primary schools**	**54.3**	
			158.1	

This three year plan is quite ambitious, and will cover all secondary sand primary schools in Cluster 3 and 2, allowing MOESD to focus on secondary sand primary schools in cities and Cluster 4 and 5. After the implementation of this plan, only the primary schools in Cluster 1 – villages with less than 1,000 inhabitants still need to be computerized and provided with broadband connectivity.

Memorandum of Understanding (MoU) with MOESD

In order to have a successful school connectivity and ICT capacity building program, it is imperative to have a good partnership between the UASF and the MOESD, and for both parties to "own" the program and have a serious stake in its success. This starts with an agreement of what exactly gets done by whom, what are the respective roles, responsibilities, functions and expectations, as well as commitments regarding resources of funds, manpower and expertise that are at the disposal for this program.

Co-ordination is also important in order to avoid any duplicating efforts, and maximize available funds on both sides, rather than the UASF taking over all funding requirements. For example the Ministry of Transport and Communications issued a tender in April 2014 for the "Design, Implementation and Maintenance of the Education Data network and supply of high speed Internet service for (all) government schools". The current understanding is that it has not been awarded due to insufficient funds. Obviously, if this were to go ahead, the UASF would not be needed any more. However, by combining the MOESD allocated funds with the funds from the UASF, a better program can be designed, reaching more schools faster.

Further, the MOESD has plans to upgrade computers in 177 schools, with 40 zero-client technology. Zero client, also known as ultrathin client, is a server-based computing model in which the end user has no local software and very little hardware. Their available budget is P45 million and if possible, this should be implemented in a way that it supports more schools getting Internet-ready, so the UASF can provide the funds for the broadband connectivity.

Among many other topics, the MoU should cover the following:

- MOESD to gather and supply school-relevant data and information,
- MOESD developing a basic ICT curriculum for primary schools,
- MOESD identifying and purchasing an appropriate e-learning/educational software to be used in primary schools,
- Responsibility for providing the budget for general software upgrades
- Making sure that the schools also have a voice and input in the program design and implementation as their local expertise and support is crucial for the success too
- Developing the job specifications for the recent IT graduate to be hired to manage the computer lab and IT resources and train pupils and teachers
- Plans to manage the online protection of the schoolchildren
- Commitment and mechanism to resolve any differences of opinion
- Sustainability plan – the current UASF funding is for 3 years, Internet service prices have likely further decreased; what portion of school connectivity, required upgrades, ICT teachers and associated costs can the MOESD take over, which portion needs to be continued by the UASF?
- Monitoring and evaluation approach including both the UASF and MOESD

<u>Competitive bidding approach for Internet connectivity</u>

The UASF should use a competitive tendering approach for the least amount of subsidy requested for schools from qualified bidders. This does not involve any weighting between the technical and financial proposal, but is a two-stage process where:

- first the technical proposal gets opened. Against the required technical and other criteria published in the RFP, a simple pass or fail evaluation takes place. Only bidders that pass the technical evaluation, proceed to the second stage.
- Second, qualified bidders have their separately and sealed financial proposal opened. Among these qualified bidders, the bidder with the lowest request for subsidy is awarded the project.

Further, a maximum allowable subsidy should be set so as to avoid unreasonable expectations from the industry and increase cost minimization efforts and innovative use of technology.

The second consideration is how the schools to be connected are grouped, and various options have their advantages and disadvantages, as follows:

Table 11

Grouping options of schools for competitive tendering		
Grouping	**Advantage**	**Disadvantage**
Single lot – all schools to be tendered together	- creates economies of scale, especially if the overall numbers of schools in a particular project are not large - attracts mostly "big" bidders - easier to administrate for UASF	- reliance on single provider - not always attractive for industry as only one player "wins" - limits choice of industry to select schools that fit with existing network coverage and roll-out plans
Regional tendering (e.g., 4 regions in Botswana)	- still creates economies of scale - attracts mostly "big" bidders - easier to administrate for UASF	- limits choice of industry to select schools that fit with existing network coverage and roll-out plans - excludes smaller players which may have innovative approaches
Tendering by district	- allows smaller players to participate - increases competition	- increased effort to evaluate proposals - increased effort to administrate several providers
School by school tendering (e.g., a list with each school)	- provides maximum competition - provides maximum choice for bidders in terms of which schools they can serve most cost-effectively	- increased effort to evaluate proposals - increased effort to administrate several providers

Which grouping approach to take will have to be developed during the strategy implementation in consultation with the industry. However, regional or district-by-district tendering typically combine the best advantages.

It is recommended that all PTOs, VANs and ISPs with the proper licences or registrations are eligible to participate in the competitive bidding process. BoFiNet's role should remain as a wholesale provider.

As a government-owned operator that receives government funding, it is recommended that BoFiNet offers their wholesale transmission and Internet capacity at a discounted price for the school connectivity program.

6.3 Broadcasting

6.3.1 Radio

It is very fortunate that the existing three commercial radio broadcasters have already created a joint signal distribution company, Kemonokeng. Therefore a competitive smart

subsidy tender would not make any sense in this instance, as the radio stations do not compete based on terrestrial broadcasting network coverage, but on broadcasting content.

As such, it would be fair and feasible to provide a smart subsidy to Kemonokeng directly, without any competitive tender, in return for increasing their broadcasting coverage. Further, Kemonokeng is already planning network expansion to five more sites which would bring the population coverage to between 80% and 90%. Costs are estimated at P2 million and Kemonokeng struggles to finance this expansion.

It is recommended for the UASF to fund this expansion up to 50% of CAPEX, subject to Kemonokeng providing a detailed and costed roll-out plan for these sites and projected population coverage.

Due to technical issues the signal distribution network of Kemonokeng could not easily accommodate a 4th player as the sites are designed to carry three stations only and equipment has to be ordered and custom-designed for the number of stations to be carried. The UASF shall have to consider if it is feasible to assist in any upgrades and modifications to allow Kemonokeng to accommodate additional radio stations in the future.

6.4 Postal services

Postal services remain important for the conveyance of parcels and mail, and provision of P.O. boxes, among other services. As discussed in Section 4.4, BotswanaPost is the designated Public Postal Operator (PPO) and required to provide universal postal services. This sector is thus fundamentally different as there is only a sole provider for universal service. Also, several provisions of the Communications Regulatory Authority Act (CRA) from 2012 are not fully implemented yet. The postal sector analysis and potential UASF component is consequently still under development and requires further engagement with the relevant stakeholders.