In association with Moonstone Capital

submitted to

Universal Access and Service Fund (UASF) of Botswana

Draft Final (third draft)
Strategic Plan for the UASF

July 2015
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<th>Description</th>
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<tbody>
<tr>
<td>3G</td>
<td>Third Generation of Mobile Telecommunications Technology</td>
</tr>
<tr>
<td>BOCRA</td>
<td>Botswana Communications Regulatory Authority</td>
</tr>
<tr>
<td>CAGR</td>
<td>Compound Annual Growth Rate</td>
</tr>
<tr>
<td>CAPEX</td>
<td>Capital Expenditure</td>
</tr>
<tr>
<td>DTTB/DTB</td>
<td>Digital Terrestrial Television Broadcasting</td>
</tr>
<tr>
<td>EDN</td>
<td>Education Data Network</td>
</tr>
<tr>
<td>EGIS</td>
<td>Enterprise-level GIS</td>
</tr>
<tr>
<td>FO</td>
<td>Fibre-Optic communications - using optical fibres as a means to transmit light between the two ends of the fibre, where they permit transmission over longer distances and at higher bandwidth than wire cables</td>
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<tr>
<td>FY</td>
<td>Financial Year</td>
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<tr>
<td>GIS</td>
<td>Geographic Information System</td>
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<tr>
<td>GoB</td>
<td>Government of Botswana</td>
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<td>GSM</td>
<td>Global System for Mobile Communications</td>
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<td>ICT</td>
<td>Information and Communications Technology</td>
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<tr>
<td>ISP</td>
<td>Internet Service Provider</td>
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<tr>
<td>IT</td>
<td>Information Technology</td>
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<tr>
<td>ITU</td>
<td>International Telecommunication Union</td>
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<tr>
<td>LAN</td>
<td>Local Area Network</td>
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<tr>
<td>LTE</td>
<td>Long Term Evolution/ 4G LTE - standard for wireless communication of high-speed data for mobile phones and data terminals</td>
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<tr>
<td>MB</td>
<td>Mega Byte</td>
</tr>
<tr>
<td>MHz</td>
<td>Mega Hertz</td>
</tr>
<tr>
<td>MLG</td>
<td>Ministry of Local Government and Rural Development</td>
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<tr>
<td>MNO</td>
<td>Mobile Network Operator</td>
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<tr>
<td>MOESD</td>
<td>Ministry of Education and Skills Development</td>
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<tr>
<td>MOU</td>
<td>Memorandum of Understanding</td>
</tr>
<tr>
<td>MP</td>
<td>Member of Parliament</td>
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<tr>
<td>MTC</td>
<td>Ministry of Transport and Communications</td>
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<tr>
<td>NBS</td>
<td>National Broadband Strategy</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>---------</td>
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<tr>
<td>NDP</td>
<td>National Development Plan</td>
</tr>
<tr>
<td>O&amp;M</td>
<td>Operation and Maintenance</td>
</tr>
<tr>
<td>OPEX</td>
<td>Operating Expenditure</td>
</tr>
<tr>
<td>POPs</td>
<td>Points of Presence</td>
</tr>
<tr>
<td>P</td>
<td>Botswana Pula</td>
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<tr>
<td>PPO</td>
<td>Public Postal Operator</td>
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<tr>
<td>PTO</td>
<td>Public Telecommunications Operator</td>
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<tr>
<td>RAN</td>
<td>Radio Access Network</td>
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<tr>
<td>RFP</td>
<td>Request for Proposal</td>
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<tr>
<td>SDH</td>
<td>Synchronous Digital Hierarchy - standardized protocols that transfer multiple digital bit streams synchronously over optical fiber</td>
</tr>
<tr>
<td>UAS</td>
<td>Universal Access and Service</td>
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<tr>
<td>UASF</td>
<td>Universal Access and Service Fund</td>
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<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>VAN</td>
<td>Value Added Network provider</td>
</tr>
<tr>
<td>VSAT</td>
<td>Very Small Aperture Terminal - a two-way satellite ground station with a dish antenna typically 75 cm to 1.2 m in size</td>
</tr>
<tr>
<td>WiFi</td>
<td>Local area wireless computer networking technology that allows electronic devices to network</td>
</tr>
<tr>
<td>WRC</td>
<td>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</td>
</tr>
</tbody>
</table>
Executive Summary

The Universal Access and Service Fund (UASF) strategy was developed over a three-month period, starting in April 2015, and was based on the following key methodology elements:

a) Overall national policy context, past key policies and related strategies;
b) Review of international experiences of universal access and service (UAS) and broadband policies, and Universal Service Funds (USFs);
c) Extensive stakeholder consultation; and
d) Detailed market analysis and current state of UAS in Botswana.

The 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 UAS;
2. To focus its assistance on population groups and areas which are beyond the reach of the communications market and to not distort the 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, starting officially with the UASF FY 2016/2017 until 2018/2019, but using this remaining financial year as well.

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, as a minimum, a total of P 193 million available for this three 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.

In addressing the Vision 2016 aspiration of prosperity for all Batswana, an educated and informed nation is considered an important foundation to increase national productivity, innovation and competitiveness. Communications technology and the required skills and capacity to use its services, are crucial for this. It is internationally recognized that communications services, especially broadband Internet, contribute significantly to economic growth. With the rapid development of the Internet, the telecommunications sector is also the most dynamic, and capacity building efforts for this digital information age, are urgently required and promise the highest impact for economic and social development. Therefore the flagship program of this UAS strategy is connecting communities and their schools with broadband Internet. Further, currently the large majority of the UASF funds are also received from the telecommunications 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 a two-stage bidding process;
- Ensuring open access to any network development that receives UASF subsidies on existing commercial terms within the industry;
- 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 be innovative and use 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 new and in the process of becoming fully operationalized. In order to have both fast implementation success and high impact, it is to focus for the first three years on one major flagship program. After these critical first three years, the UASF can increase its programs and scope as required.

The flagship program of this UAS strategy is connecting communities and schools with broadband Internet. This will include computerization of primary schools and providing broadband connectivity to schools that are located in communities with less than 10,000
inhabitants. 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 extending or upgrading networks to provide broadband capacity and services in the entire area.

The figure below shows the six main elements of the school connectivity concept.

Other key UASF activities include providing voice services to around 60,000 unserved inhabitants living in the most remote locations of the country and to important economic transport and other corridors, and increasing radio FM broadcasting coverage of 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 likely to become 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, universal postal service needs to be demand based and BOCRA is currently undertaking a market-study. Further, several reform steps and provisions of the CRA 2012 still are to be implemented. Consequently, any potential UASF component is on hold and requires further engagement with the relevant stakeholders once key reform steps are implemented.

The UAS strategy involves several key stakeholders and partners, including the Ministry of Transport and Communications (MTC), the Ministry of Education and Skills Development (MOESD), the Ministry of Local Government and Rural Development (MLG) and all the players in the communications industry. Clear roles, effective co-ordination and co-operation are critical to its success.
The table below provides an overview of the 3-year strategic goals and targets of this UAS strategy and estimated costs. It is important to note that available funds of the UASF have been conservatively estimated and combined with the competitive bidding approach, it is likely that the UASF will have more resources available.

<table>
<thead>
<tr>
<th>Main program activity per sector</th>
<th>UAS Strategy overview for first 3 years</th>
<th>Estimated costs (million Pula)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voice communications</td>
<td>Provide an estimated 60,000 inhabitants in most remote parts of the country with voice communications services as well as covering key economic corridors</td>
<td>20</td>
</tr>
<tr>
<td>Community and School broadband Internet connectivity</td>
<td>Computerization &amp; IT teacher for 224 Primary schools in Cluster 3 and 2</td>
<td>87.8</td>
</tr>
<tr>
<td></td>
<td>Broadband connectivity for 74 Secondary schools and 224 Primary schools in Cluster 3 and 2</td>
<td>35.6</td>
</tr>
<tr>
<td></td>
<td>Broadband network expansion for 162 villages</td>
<td>48.3</td>
</tr>
<tr>
<td>Broadcasting</td>
<td>Increase broadcasting coverage of commercial radio stations from 60% of population up to 90% of population</td>
<td>1.0</td>
</tr>
<tr>
<td>Postal services</td>
<td>This is under further consultation</td>
<td></td>
</tr>
</tbody>
</table>

This UAS strategy has been developed for the next three years, and in its third year, the next three year UAS strategy will be developed. The communications sector is developing and changing more rapidly than many other sectors. Thus this UAS strategy and the next need to be flexible enough in their implementation to adapt to major changes in the industry as well as relevant new input from key stakeholders, while remaining clear on and true to their core objectives and key principles.
1 Introduction

1.1 Rationale for a UAS strategy

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 indispensable 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, the expansion of the broadband network and capacity building, especially in institutions such as schools, has become important 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.

1.2 Background

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 overseen 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.
1.3 Context & relation to other policies

The National Development Plan (NDP) 10 with its theme “Accelerating Achievement of Vision 2016 through NDP 10” has many key strategies that provide an overall and wider context for this UAS strategy. The NDP 10, in its economic strategy for example, focuses on direct spending on infrastructure, education and training towards the needs of the private sector.\(^1\) Vision 2016 has identified the importance of information, developing of efficient information system and networks to support research, education, development and communication with the rest of the world.

Also, in addressing the Vision 2016 aspiration of prosperity for all Batswana, an educated and informed nation is considered an important foundation to increase national productivity, innovation and competitiveness. Communications technology and the required skills and capacity to use its services, are crucial for this. A key output for NDP 10 includes the development and implementation of human resources based on the requirements of the economy. The strategy seeks to match skills with the needs of the economy in order to improve global competitiveness and enhance economic growth and diversification. The key features of developing human resources include the enhancement of utilization of ICT.\(^2\)

The NDP 10 also specifically mentions a Universal Service and Access Policy developed under NDP 9 in line with the Vision 2016 pillar of “An Educated and Informed Nation”. The Policy is aimed at promoting access to communication services throughout Botswana. It advocates the establishment of a Universal Service Fund to finance the provision of communications services to the rural, under-served and disadvantaged population, including areas that would otherwise be deemed commercially unviable. It is expected that the Policy and the accompanying legislation will be fully implemented during NDP 10.\(^3\) The CRA Act 2012 has created the legal foundation for the UASF and this UAS strategy will implement the UAS policy directives.

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 realization in the more urbanized 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.

1.4 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 comprises
1 Telecommunications, Internet and ICT;
2 Broadcasting services; and
3 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.

Further, this UAS strategy has been developed for the next three years, and in its third year, the next three year UAS strategy will be developed. The communications sector is developing and changing more rapidly than many other sectors. Thus this UAS strategy and the next need to be flexible enough in their implementation to adapt to major changes in the industry as well as relevant new input from key stakeholders, while remaining clear on and true to their core objectives and key principles.
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 communications market and to not distort it; and
3. To enable people to use communications services and build their capacity to take advantage of the many opportunities and benefits of the Internet.

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. 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 a communications service – such as the telephone – reaches a high level of household penetration in society and has demonstrated social and economic value, then that service has become so essential that mere access is insufficient; instead the services needs to be available 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 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 telephone service available, accessible and affordable in order to use it, broadband Internet requires also an individuals capacity to use it. Further, it requires some knowledge about its potential tangible benefits. Thus the awareness and capacity building function of universal access and service strategies has hugely increased in importance. Also, the importance of available local or relevant content and applications has increased. Typically national programs such as broadband strategies and other institutions such as ICT innovation hubs address local content and applications, while UASFs generally play a smaller, but supportive role. 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 3](image)

Specific definitions of universal access and service for the four sub-sectors of communications services - broadcasting, postal, Internet and voice communications – 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. It already 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 soon. 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.
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. The Fund is to develop market-oriented programs, and subsidise projects that will be mostly implemented by operators and service providers. 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 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. This 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.

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.

**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 is to 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 stage:** the technical proposal gets opened and evaluated. 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 Request for Proposal (RFP), a simple pass or fail evaluation takes place. Only bidders that pass the technical evaluation, proceed to the second stage.
• Second stage: 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 in advance to provide the industry with an upper cost ceiling 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 build-out requirements and service provision 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.

**Open access**

While competitive tendering will be used, especially for major network expansion and broadband capacity upgrades, this shall not lead to exclusivity for the winning operator or service provider. Any service provider that receives subsidies from the UASF for a particular network expansion project shall be required to provide open access to its network according to existing commercial terms within the industry.

**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 is to 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 stakeholders 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 live 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. As their coverage does not completely overlap, it is a save estimate that approximately 3% or less of the 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.

In addition, there are some considerable gaps in the voice coverage of national highways including for example the Trans Kalahari trading route and other key economic travel corridors (e.g., of tourists), as well as some important farming areas.

Conclusion: To achieve universal service for voice communications in Botswana approximately 60,000 Batswana need to be connected, as well as selected high-traffic trading routes along national highways and other key economic areas.

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 81 more sites planned 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 a minimum 70%. In early 2015, LTE has been launched and rolled out by one operator and others are soon to follow.

However, this means that there is essentially no mobile broadband (3G) coverage in Cluster 2 (locations with 1,000 to 5,000 inhabitants) and Cluster 1 (locations with 500-1,000 inhabitants) today. The lack of grid-power from Botswana Power Corporation 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. Actual mobile Internet penetration is somewhere between those two figures, more than 30% but less than 49%. This is due to the fact that subscription numbers are higher than population numbers, and include business subscriptions and multiple SIM ownership, also for broadband.
- Mobile data revenue as a 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.  
- 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\(^5\) 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.\(^6\)

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 27\(^{th}\) 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 handset is around P1500.
4.2.4 Further regulatory measures

There are several regulatory enablers and incentives – as identified by operators and service providers during the initial consultation - which could accelerate further 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 and service providers.

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.

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 the need for future network roll-out projects funded by it. 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 School connectivity

The nearly 1,000 government schools have no broadband Internet connectivity today. While some of the schools in Botswana have Internet connectivity, it is all narrowband i.e., 256kbps or less. This is virtually unusable for a computer lab with around 30 children. Further, almost all primary schools have neither a computer laboratory (lab).

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
- Internet 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. This recognizes 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.

**Secondary schools – current distribution and existing broadband coverage**

In order to assess how schools and other institutions are distributed across Botswana – the size of town, village or location in which they are located – an Excel model was created. This is based on 2011 Census data and has categorized cities, towns and villages into 6 clusters according to their population size. These clusters are the same clusters that are used for the NBS; except cluster 4 and 5 were combined in this model. Current and future rollout data from operators is either also available by cluster or lists the villages and locations it is covering. The model has also integrated available data from

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

This model allows an analysis of distribution of schools across location sizes (and thus between urban and rural schools) and their coverage with broadband infrastructure, incorporating existing and near-future roll-out. Based on the model, 95% of the 239 secondary schools could be located and categorized into 5 clusters. The table below shows the distribution of secondary schools across the various sizes of locations and the existing broadband coverage.

### Table 2

<table>
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<tbody>
<tr>
<td>Total</td>
<td>239</td>
<td>146</td>
<td>111</td>
<td>2</td>
<td>7</td>
<td>95%</td>
</tr>
<tr>
<td>Cluster 6 (Gaborone &amp; Francistown)</td>
<td>26</td>
<td>26</td>
<td>26</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Clusters 4/5 (&gt;10,000)</td>
<td>101</td>
<td>75</td>
<td>71</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cluster 3 (5001-10,000)</td>
<td>35</td>
<td>24</td>
<td>14</td>
<td>2</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Cluster 2 (1001-5000)</td>
<td>62</td>
<td>21</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>41</td>
</tr>
<tr>
<td>Cluster 1 (500-1000)</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Smaller locations</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>227</td>
<td>146</td>
<td>111</td>
<td>2</td>
<td>7</td>
<td>44</td>
</tr>
</tbody>
</table>

*Not located yet* 12
56% of the secondary schools are either in the two main 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. There are only 44 secondary schools which are not within existing broadband coverage, largely in cluster 2.

**Primary schools – current distribution and existing broadband coverage**

The model also has 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. The table below gives an overview of the distribution of primary schools into the five clusters of cities, town and village size, and their existing broadband coverage. Based on the model, 91% of the 756 government primary schools could be located and categorized into 5 clusters.

**Table 3 – Availability of broadband coverage for primary schools across population clusters**

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</tr>
</thead>
<tbody>
<tr>
<td>Cluster 6 (Gaborone &amp; Francistown)</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Clusters 4/5 (&gt;10,000)</td>
<td>200</td>
<td>148</td>
<td>142</td>
<td>52</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cluster 3 (5001-10,000)</td>
<td>53</td>
<td>35</td>
<td>17</td>
<td>3</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Cluster 2 (1001-5000)</td>
<td>200</td>
<td>51</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>149</td>
</tr>
<tr>
<td>Cluster 1 (500-1000)</td>
<td>139</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>106</td>
</tr>
<tr>
<td>Smaller locations</td>
<td>64</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>61</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>686</strong></td>
<td><strong>300</strong></td>
<td><strong>209</strong></td>
<td><strong>55</strong></td>
<td><strong>15</strong></td>
<td><strong>316</strong></td>
</tr>
<tr>
<td><strong>Not located</strong></td>
<td><strong>70</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

The situation can be summarized as follows:

- The 50 primary schools in the two cities have a choice of broadband service both via fibre-optic (FO) and LTE; Costs are likely less expensive than in other parts of the country. FO is a good 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;

- Out of the 200 primary schools in cluster 4/5, almost 75% have an option of either FO or LTE, with 52 schools relying solely on LTE as broadband option;

- The 53 primary schools in cluster 3 are again covered by both FO 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, 51 schools are in villages with FO presence – however, that is all, leaving 149 primary schools outside any broadband coverage today and in the near future;

- For the 119 primary schools in cluster 1, 13 could be served using FO infrastructure – but 106 are without broadband coverage; and

- 64 primary schools reside in locations with less than 500 inhabitants (but larger villages may be close by) – 3 have FO presence while 61 are without any broadband coverage.
Conclusion: School broadband connectivity should be a main target of the UASF and focus on government secondary and primary schools in cluster 3, 2 and 1, and smaller locations. 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 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.

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 receive the broadcasting service?
- 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%, 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, Gkemaborone, 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 stations 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. The latter has terrestrial coverage of 85%. However, the latter is not under BOCRA’s jurisdiction and thus also outside this UAS 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), with the date for the switchover set to June 17, 2015, and awareness campaigns underway. 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; prices are expected to be in the range of Pula 150 to 500. There is no information though if these prices present 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 at this stage.

Conclusion: TV has not reached enough penetration to be included in universal service. UASF involvement is not recommended at this stage but it will be continuously monitored for future inclusion in the UASF program.

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 can be designated as Public Postal Operator (PPO), and this forthcoming 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.

Further, BOCRA has just commissioned a market study of the postal sector, which is also to assist with developing a licensing framework. This study includes a postal service demand analysis as well as pricing elasticity of specific demand. Valuable information and insights of this study will help to reform the postal sector further and define universal postal service based on actual demand for it.

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. BotswanaPost has 124 post offices and 85 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 of 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.

<table>
<thead>
<tr>
<th>Clusters</th>
<th># of postal offices</th>
<th># of postal agencies</th>
<th># of cities/towns &amp; villages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster 6 (Cities)</td>
<td>7</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Clusters 4/5 (&gt;10,000)</td>
<td>26</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>Cluster 3 (5001-10,000)</td>
<td>23</td>
<td>5</td>
<td>27</td>
</tr>
<tr>
<td>Cluster 2b (2001-5000)</td>
<td>29</td>
<td>33</td>
<td>197</td>
</tr>
<tr>
<td>Cluster 2a (1001-2000)</td>
<td>10</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Cluster 1 (500-1000)</td>
<td>3</td>
<td>7</td>
<td>153</td>
</tr>
<tr>
<td>Less than 500 pop</td>
<td>1</td>
<td>0</td>
<td>95</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>99 out of 124</strong></td>
<td><strong>85 (92% located)</strong></td>
<td><strong>494</strong></td>
</tr>
</tbody>
</table>

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, especially considering 48 outlets in villages with less than 2,000 population. However, population size is not always the only criteria for demand, but also economic activity or social importance.

Postal services remain important for the conveyance of parcels and mail, and provision of P.O. boxes, among other services. BotswanaPost is to become 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 and major changes and sector reform is still ahead. In particular, universal postal services need to be demand-based, and BOCRA is currently undertaking a market study which will include important demand data and analysis for this. Also, several provisions of the
Communications Regulatory Authority Act (CRA) from 2012 are not fully implemented yet.

Conclusion: BotswanaPost is clearly in a challenging position generally and in regards to universal postal service provision. It has made considerable innovation efforts. However, 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. Also, a potential merger with the Savings Bank is outstanding.

Universal postal service provision has to be demand-based i.e., what services are needed at which type of locations and with which frequency, and once that is known, the network and service can be optimized. BOCRA’s current market study will provide valuable demand analysis. Based on this, it will have to be determined further:

- for which services it is feasible to increase prices;
- which postal outlets can be closed or re-located to places with more demand;
- how the list of universal postal services can be revised to focus on key basic postal services, which are realistic to provide, and meet actual demand; and
- whether a different frequency of mail delivery in rural areas based on demand is feasible and saves costs.

UASF involvement is on hold at this stage but it will be continuously monitored and will be developed through further engagement with the relevant stakeholders once major outstanding reform elements have been implemented, for future inclusion in the UASF program.
5 Available UASF funding

The first financial year of the UASF began on 1 April 2014 through 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 P37.043.852, 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), as the vast majority of funds come from this sub-sector. While the first year on year growth was high with over 28%, the two following years had barely any growth or even slightly negative. The Compound Annual Growth Rate (CAGR) over the last 3 years was 8.8%.

<table>
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<tbody>
<tr>
<td>Telecom revenue</td>
<td>2.415.423.590</td>
<td>3.102.543.146</td>
<td>3.123.453.724</td>
<td>3.108.977.642</td>
</tr>
<tr>
<td>CAGR</td>
<td>28,4%</td>
<td>0,7%</td>
<td>-0,5%</td>
<td>8,8%</td>
</tr>
</tbody>
</table>

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.

Assuming conservative market growth of 5%, 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 5

Assuming again 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 the third financial year, and thus this UAS strategy cannot include them as fully available funds for the 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 conservative assumptions.
6 Intended results and benefits of the UAS strategy

The intended benefits of the UAS strategy are for both the country as a whole as well as for the communications sector. The high-level benefits are shown in the following two diagrams.

The school and community connectivity program is aimed at digital literacy and increased ICT usage in the communities.

The closing the voice gap program is aimed at inclusion of remaining populations and the coverage of important economic corridors and sectors.

The increasing radio coverage program is aimed at increasing information and local content throughout the country.

The communications sector will benefit through increased network coverage, growth of ICT usage and sector growth.

Detailed benefits of each program will be elaborated during individual project design and each evaluation and monitoring program.
7 Strategic program: Closing the voice gap

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;
- Prioritizing key economic corridors such as national highways to be connected with at least voice and narrowband data; and
- Designing a project to provide service to these location and offering a smart subsidy via a competitive bid to licensed operators.

As a first key step, it is recommended that BOCRA consider developing its own Enterprise-level GIS or EGIS. EGIS can be defined as an accurate and graphically 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 the needs arises for the various functions.

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 transmission networks, 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 UASF project cost, revenue and viability analysis.

7.1 Identification of unserved localities and key economic corridors

The EGIS could be used to map a) all villages, localities and important economic corridors such as national highways, farming areas and main tourist travel routes, 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 and the parts of key national highways 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.
7.2 Demand analysis and project design

In a second step, the UASF shall commission a demand study in a representative set of unserved localities and uncovered transport and other economic corridors 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 and gaps in transport and other economic corridors 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. Further, it has to be determined whether only a smart subsidy is needed or possibly ongoing OPEX support.

For the remaining 3% of population which are 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. However, the tender should be technology-neutral.

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 is currently not enough information to estimate costs for the voice program, it is recommended to reserve P20 million for this component.
8 Strategic program: Connecting schools & communities with broadband Internet

This flagship program will have a two-pronged objective that will be accomplished at the same time:

- Connecting schools with broadband Internet, and
- Providing the community with broadband network coverage.

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 connecting schools to broadband Internet is to be the flagship program of the UASF. As primary schools have no computer labs today and lack technical support and teaching staff, this will include flanking measures to make primary schools “Internet ready.” Also, instead of just connecting the school as a single point, this program will focus on bringing broadband Internet to the small town or village in which the school is located, thus benefitting also the wider community.

The table below provides an overview of the UASF program for school and community broadband connectivity. Details regarding the connecting schools and their communities concept, costs involved and the implementation approach is described in this section.

<table>
<thead>
<tr>
<th>Main activity</th>
<th># of beneficiaries</th>
<th>Estimated costs (million Pula)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computerization &amp; IT teacher</td>
<td>224 Primary schools</td>
<td>87.8</td>
</tr>
<tr>
<td>School broadband connectivity</td>
<td>74 Secondary schools</td>
<td>35.6</td>
</tr>
<tr>
<td></td>
<td>224 Primary schools</td>
<td></td>
</tr>
<tr>
<td>(Total schools 298)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broadband network expansion for community</td>
<td>162 villages</td>
<td>48.3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>171.8</strong></td>
</tr>
</tbody>
</table>

8.1 School and community connectivity concept

The figure below shows the six main elements of the school connectivity concept.

Figure 8
8.1.1 Additional broadband network coverage

162 villages will be provided with a broadband network. This will be done in areas where schools are to be connected, but there is insufficient broadband coverage today. The school and community connectivity program will offer a smart subsidy to the service providers to add higher capacity broadband to their existing network – for example this could be 3G where there is only 2G today, or 4G/(LTE) where there is only 3G. However, any tender will be technology neutral while specifying the required services only. This is described in more detail below, under implementation approach.

140 schools in Cluster 2 (locations with 1001 to 5,000 inhabitants) have no broadband coverage today, they are in villages which are covered by the 2G mobile network, allowing voice and narrowband data only. Then there are 22 schools in Cluster 3 (locations with 5001 to 10,000 inhabitants) which have 3G coverage. However, the 3G capacity is unlikely to be sufficient to provide 5MB to the school due to the larger size of these locations and over time increasing broadband demand. In smaller villages, like cluster 2, with less than 5,000 people, 3G capacity is likely sufficient.

By expanding the broadband network to the communities without sufficient broadband coverage, the schools can be thus connected with broadband Internet. Both the wider communities and the schools benefit, and the country’s broadband network coverage is increased considerably.

136 schools (including both secondary and primary) in cluster 3 and 2 do already have broadband coverage today. This means they only need financial assistance under this program regarding the provision of broadband Internet and other related measures.

8.1.2 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 already a draft 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, the ICT curriculum for primary schools is to be finalized by the MOESD.

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

### 8.1.3 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 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 themselves;
- 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, this recommendation of hiring recent IT graduates allows the UASF also to make a small impact in reducing youth employment.

### 8.1.4 Movable computer lab

The MOESD educational experts should consider and explore the suitability of having a movable computer lab for primary schools where computer tablets are used. The tablets could be placed on a trolley and then are able to be moved within the school to the
classroom that needs them. Some traditional computers could be located in the resource room for pupils to be used outside of the classroom, for example to do some research or self-study. The trolley with computer tablets requires a secure room for storage as well as for re-charging and other maintenance.

### 8.1.5 WiFi school coverage & proposed download speed

It is recommended that each school is served with a pass-word protected WiFi network that covers the classrooms as well as the administrative and teachers rooms. This will ensure that the teachers and schools administrators have access to the Internet as well, and can benefit. For teachers this will mostly entail access to additional educational material and teaching resources, and for administrators improved communication, as well as data exchange and management tools.

Most importantly, this will enhance the uptake and acceptance of computers and Internet connectivity among the head teachers and senior school administrative personnel. As ICT so far is only an examinable subject in the senior secondary school, their sensitization and empowerment in regards to ICT will assist in their support of the school connectivity program.

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.

### 8.1.6 Public WiFi Internet access

The UASF shall explore the feasibility of making the school WiFi service available to the general public outside of classroom hours. This would be at normal commercial prices with, for example, a 30 minutes free period as many commercial providers offer. This assumes that the school is close to or within a village.

As the operators would make some revenue from this public WiFi, it is expected that the subsidy requests are lower and more schools can be connected as a result.

Opening classrooms to the public and offering ICT capacity training to the general public are attractive concepts but have proven in practice quite complicated, especially in regards to security, costs of training, additional workload, sustainability and so on. It is therefore not a mandatory element of this UASF strategy, but pilots of public ICT training facilitated by schools are encouraged.

### 8.2 Detailed costing

#### 8.2.1 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. The table below shows estimated costs in regards to computerization of primary schools and contracting a recent IT grad who provides both ICT training and technical support for the computer lab.
Table 7

<table>
<thead>
<tr>
<th>Items</th>
<th>Per school in Pula</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 new tablets including some computers @ 4,000</td>
<td>120,000</td>
</tr>
<tr>
<td>Computer lab room improvements/security</td>
<td>20,000</td>
</tr>
<tr>
<td>IT grad salary @ 7,000/month for 3 years</td>
<td>252,000</td>
</tr>
<tr>
<td><strong>Total per school</strong></td>
<td><strong>392,000</strong></td>
</tr>
</tbody>
</table>

Latest information from the Ministry of Local Government and Rural Development regarding school infrastructure lists 60 primary schools that require solar power. This has to be factored into the final costs during implementation, but may only affect the most remote schools which are not part of this first three-year UAS strategy.

### 8.2.2 Costs of connectivity & getting schools Internet ready

The table below shows broad cost estimates for establishing Internet connectivity in 86 schools in Cluster 3 and 212 schools in Cluster 2, based on the mix of available technology and required additional network roll-out. It also includes the cost of getting the primary schools Internet ready, i.e., the computerization & the ICT support & basic teaching.

Key assumptions include:

1. Costs were estimated for initial cost to establish the broadband Internet connectivity (e.g., router, installation) and for monthly costs (including maintenance and technical support) for 3 years;
2. In locations where there is no broadband coverage today, the upgrade to LTE or 3G includes only 50% of CAPEX of the BTS, as a) there are existing towers to be used and b) operators will benefit from the subsidy to provide services to the general public. It includes only a small amount for any backbone upgrade costs as this upgrade is for a single BTS and not for larger contiguous areas; and
3. In places that both have the transmission network from BoFiNet present and LTE, the lower cost Internet connectivity from LTE was chosen for costing purposes.

For estimating costs, specific technologies were assumed as illustrated above, which are the most likely and economic to be used. However, actual costs will be determined through a competitive tender among services providers as described further below. The tender will further be technology neutral, allowing services providers to offer the most suitable and economic technology solution that is capable of meeting the specific service requirements.
The costing model shows:

- 51% of the program cost are allocated to getting primary schools Internet ready: providing computers, a secure room and an IT grad which will provide in-house technical support and teach basic ICT skills to both pupils and teachers;
- 20% will be used for extending the broadband network to 162 villages;
- 28% will be used for setting up broadband Internet connectivity in schools and providing Internet service @ 5MB for three years;
- Considering that the UASF will only have P193 million securely available for this 3 year strategy, this analysis also shows that only schools in Cluster 3 and 2 can be connected in this strategic plan, and even thus only partially;
- It is crucial that the MOESD uses their available funding to also connect and computerize schools, ideally focussing on Cluster 5 (the two main cities) and Cluster 4/5 (locations with more than 10,000 inhabitants).

### Table 8 – Costs of the community and school broadband connectivity program

<table>
<thead>
<tr>
<th></th>
<th>Cost per school SMB using FO/3 years</th>
<th>Cost per school SMB using LTE/3 years</th>
<th>Cost per school SMB upgrading 3G to LTE</th>
<th>Cost per school 2MB upgrading to 3G</th>
<th>Total UASF costs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Network CAPEX max. subsidy</strong></td>
<td>0</td>
<td>0</td>
<td>220.000</td>
<td>220.000</td>
<td></td>
</tr>
<tr>
<td><strong>Set-up, connectivity for 3 years &amp; tech support</strong></td>
<td>325.000</td>
<td>80.000</td>
<td>80.000</td>
<td>80.000</td>
<td></td>
</tr>
<tr>
<td><strong>Cost of computerization &amp; IT teacher (only primary schools)</strong></td>
<td>392000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cluster 3 (5001-10,000)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sec. schools to be connected</td>
<td>10</td>
<td>16</td>
<td>7</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Prim. Schools to be connected</td>
<td>18</td>
<td>20</td>
<td>15</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Cost of computerization (only primary schools)</td>
<td>7.056.000</td>
<td>7.840.000</td>
<td>5.880.000</td>
<td>20.776.000</td>
<td></td>
</tr>
<tr>
<td>Cost of broadband network max. subsidy</td>
<td>0</td>
<td>0</td>
<td>4.840.000</td>
<td>4.840.000</td>
<td></td>
</tr>
<tr>
<td>Cost of year broadband connectivity</td>
<td>9.100.000</td>
<td>2.880.000</td>
<td>1.760.000</td>
<td>13.740.000</td>
<td></td>
</tr>
<tr>
<td><strong>Total Costs</strong></td>
<td>16.156.000</td>
<td>10.720.000</td>
<td>12.480.000</td>
<td>39.356.000</td>
<td></td>
</tr>
<tr>
<td><strong>Cluster 2 (1001-5000)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td># of Secondary schools</td>
<td>21</td>
<td>0</td>
<td>0</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td># of Primary schools</td>
<td>51</td>
<td>0</td>
<td>0</td>
<td>149</td>
<td></td>
</tr>
<tr>
<td>Sec. schools to be connected</td>
<td>21</td>
<td>0</td>
<td>0</td>
<td>20</td>
<td>41</td>
</tr>
<tr>
<td>Prim. Schools to be connected</td>
<td>51</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>120</td>
</tr>
<tr>
<td>Cost of computerization (only primary schools)</td>
<td>19.992.000</td>
<td>-</td>
<td>-</td>
<td>47.040.000</td>
<td>67.032.000</td>
</tr>
<tr>
<td>Cost of broadband network max. subsidy</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>30.800.000</td>
<td>30.800.000</td>
</tr>
<tr>
<td>Cost of year broadband connectivity</td>
<td>23.400.000</td>
<td>-</td>
<td>11.200.000</td>
<td>34.600.000</td>
<td></td>
</tr>
<tr>
<td><strong>Total Costs</strong></td>
<td>43.392.000</td>
<td>-</td>
<td>89.040.000</td>
<td>132.432.000</td>
<td></td>
</tr>
</tbody>
</table>

**3 year school and community connectivity program costs**

<table>
<thead>
<tr>
<th></th>
<th><strong>Cost of computerization (primary schools only)</strong></th>
<th><strong>Cost of broadband network max. subsidy</strong></th>
<th><strong>Cost of 3-year broadband connectivity</strong></th>
<th><strong>Total Costs</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>87.808.000</td>
<td>35.640.000</td>
<td>48.340.000</td>
<td>171.788.000</td>
</tr>
</tbody>
</table>

**Notes:**
- Red is for input cost data
- All figures are in Pula
- While in Cluster 3 all schools are to be connected, not all schools in cluster 2 can be connected
It is recommended that the UASF provide the finance for computerization, IT teacher and broadband connectivity of secondary and primary schools in clusters 3, 2 and 1, while the MOESD focuses on secondary and primary schools in the cities and clusters 4/5.

8.3 Implementation approach

8.3.1 Stakeholder partnership and co-ordination

In order to have a successful school connectivity and ICT capacity building program, it is imperative to have a good partnership and co-ordination between the UASF and the MOESD, and for both parties to “own” the program and have a serious stake in its success. Also, the Ministry of Local Government and Rural Development (MLG) is involved, as it is responsible for the primary schools and their infrastructure.

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. It is recommended that the UASF develops and signs a Memorandum of Understanding (MoU) with both the MOESD and the MLG, outlining respective duties and obligations.

Co-ordination is also important in order to avoid any duplicating efforts, and maximize available funds on all 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”. This tender has not been awarded due to insufficient funds. A better program can be designed, reaching more schools and communities faster, by combining the MOESD existing and already allocated funds with the funds from the UASF.

Further, the MOESD has plans to upgrade computers in 177 schools, with 40 computers using 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 this should be directed to their secondary and primary schools in the cities (Cluster 6) and towns with more than 10,000 inhabitants (Cluster 4/5), to align with this UAS strategy.

Among many other topics, the MoU between the UASF and MOESD should cover the following:

- MOESD to gather and supply school-relevant data and information in a timely fashion,
- MOESD, to start with, preparing a basic ICT curriculum for primary schools, which simply outlines what pupils are to be taught regarding computer or tablet use and regarding Internet browsing. A more detailed ICT curriculum for primary schools should then be developed;
- MOESD identifying, purchasing and tailoring an appropriate e-learning/educational software to be used in primary schools,
- MOESD’s responsibility for providing the budget for general software upgrades,
- Making sure that the schools themselves also have a voice and input into 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 three years, Internet service prices will likely further decrease; 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, MLG and MOESD.

### 8.3.2 Sequencing of school and community program

The Table on 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 9

<table>
<thead>
<tr>
<th>Year</th>
<th>Main activity</th>
<th># of schools &amp; communities</th>
<th>Estimated costs (million Pula)</th>
<th>Available UASF funds (million Pula)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remaining FY 2015/2016</td>
<td><strong>Broadband connectivity</strong> to secondary schools and communities in Cluster 3</td>
<td>33 secondary schools 7 communities</td>
<td>6.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Broadband connectivity</strong> to secondary schools in Cluster 2</td>
<td>41 secondary schools 20 communities</td>
<td>12.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Computerization/IT teacher primary schools Cluster 3</strong></td>
<td>53 primary schools</td>
<td>20.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Computerization/IT teacher for 50% of primary schools Cluster 2</strong></td>
<td>85 primary schools</td>
<td>33.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>73.6</strong></td>
<td><strong>90.4</strong></td>
</tr>
<tr>
<td>FY 2016/2017 (YEAR 1)</td>
<td><strong>Broadband connectivity</strong> to primary schools in Cluster 3</td>
<td>53 primary schools 15 communities</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Broadband connectivity</strong> to primary schools Cluster 2</td>
<td>85 primary schools 60 communities</td>
<td>26.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>38.3</strong></td>
<td><strong>32.6</strong></td>
</tr>
<tr>
<td>FY 2017/2018 (YEAR 2)</td>
<td><strong>Computerization/IT teacher for remaining 50% of primary schools Cluster 2</strong></td>
<td>85 primary schools</td>
<td>33.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>34.3</strong></td>
<td></td>
</tr>
<tr>
<td>FY 2018/2019 (YEAR 3)</td>
<td><strong>Broadband connectivity</strong> to primary schools Cluster 2</td>
<td>85 primary schools 60 communities</td>
<td>26.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>36.0</strong></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td></td>
<td><strong>171.7</strong></td>
<td><strong>193.3</strong></td>
</tr>
</tbody>
</table>
This three year plan is quite ambitious, and will cover almost all secondary and primary schools in Cluster 3 and 2, allowing MOESD to focus on secondary and primary schools in cities and Cluster 4 and 5. After the implementation of this plan, only some primary schools in Cluster 2 and all primary schools in Cluster 1 – villages with less than 1,000 inhabitants, still need to be computerized and provided with broadband connectivity.

8.3.3 Competitive bidding approach for Internet connectivity

The UASF should use a competitive tendering approach for the least amount of subsidy requested for connecting schools and communities from qualified bidders. This does not involve any weighting between the technical and financial proposal, but is a two-stage bidding process where bidders need to provide a sealed technical proposal and a separately sealed financial proposal. The technical proposal needs to be responsive to the request for proposal (RFP) document which requires a range of qualifications for corporate, financial, management, technical, business and service specifications:

1. first the technical proposal gets opened. Against the required technical and other specifications published in the RFP, a simple pass or fail evaluation takes place. Only bidders that pass the technical evaluation are considered capable and qualified, and proceed to the second stage.

2. During the second stage, only the qualified bidders have their separately sealed financial proposal opened. Among these qualified bidders, the bidder with the lowest request for subsidy is awarded the project.

Further, the RFP will contain a maximum allowable subsidy so as to clarify expectations for the industry and increase cost minimization efforts and innovative use of technology.

The RFP will also contain how the schools and communities to be connected are grouped, and various options have their advantages and disadvantages, as follows:

<table>
<thead>
<tr>
<th>Grouping</th>
<th>Grouping options of schools for competitive tendering</th>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single lot – all schools to be tendered together</td>
<td>- creates economies of scale, especially if the overall numbers of schools in a particular project are not large - attracts mostly “big” bidders - easier to administer for UASF</td>
<td></td>
<td>- 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</td>
</tr>
<tr>
<td>Regional tendering (e.g., 4 regions in Botswana)</td>
<td>- still creates economies of scale - attracts mostly “big” bidders - easier to administer for UASF</td>
<td></td>
<td>- 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</td>
</tr>
<tr>
<td>Tendering by district</td>
<td>- allows smaller players to participate - increases competition</td>
<td></td>
<td>- increased effort to evaluate proposals - increased effort to administrate several providers</td>
</tr>
<tr>
<td>School by school tendering (e.g., a list with each school)</td>
<td>- provides maximum competition - provides maximum choice for bidders in terms of which schools they can serve most cost-effectively</td>
<td></td>
<td>- increased effort to evaluate proposals - increased effort to administrate several providers</td>
</tr>
</tbody>
</table>
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, MNOs, 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 per its licence.

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 and community connectivity program.
9 Strategic program: Increasing radio coverage

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.
10 Monitoring, evaluation & planning the future

10.1 General approach

Monitoring and evaluation is key to any strategy implementation, as it is for the UASF strategy. However, monitoring and evaluation are separate concepts, as follows:

Monitoring is done within shorter timeframes, more frequently and more or less an ongoing activity. It has the objective to ascertain that the implementation goes to plan, and allows the monitor to detect if it does not. Monitoring will then help to devise and implement timely corrective measures.

In particular for the UASF, monitoring of the following is important:

1. Do the service providers deliver the contracted service according to schedule and quality of service specifications?
2. Are the beneficiaries – like the primary schools – able to take advantage of the services provided or are there any impediments?
3. Are the beneficiaries using the service as intended – e.g., are ICT training classes taking place at expected frequencies; do the expected number of pupils and teachers benefit?

Evaluation is a medium to long-term activity. Latest examples of UASF evaluations in other countries (e.g., Pakistan or Uganda) indicate that evaluations are conducted after 5 to 10 years. It is recommended that the UASF determines for each program what the earliest time is to do a meaningful evaluation. This could be using a shorter timeframe as long as the expectations regarding the possible impact achieved are reasonable. The purpose of an evaluation is focussed on evaluating the intended impact, i.e., have the intended benefits of the program been realized? The evaluation builds on the factual information gathered during regular monitoring. It is often important to establish baseline data: what is the exact situation in regards to certain key parameter the project plans to impact. For example:

1. What is the current knowledge and skill level of primary pupils in regards to computers and the Internet? (In this case it might be safe to assume that it is nil);
2. What are the current test scores for primary school pupils in the various teaching subjects? – An evaluation would then compare test results in 3 to 5 years and analyse if a) any improvement has taken place and b) if this can be attributed to better access to educational content.

During the design phase of each project, the UASF shall include a monitoring plan, which covers:

- What parameters are to be monitored;
- How frequently these parameters are monitored; and
- The combination of methods to be used for the monitoring.

Further, for each strategic program stream, the UASF shall develop an evaluation plan, which covers:

- What are the main intended benefits of the program and how will their advancement been measured?
- Is a baseline study needed to determine the current situation on which to evaluate benefits later?
- In what timeframes will the specific impact been measured?
• What methods are to be used to evaluate the impact later?

This will ensure that the UASF has a solid foundation of data and analysis that supports its rationale, implementation and socio-economic impact.

10.2 Sustainability

A key aspect of the monitoring and evaluation activities is to ensure the sustainability of the various programs and individual projects, assuming they have indeed proven their beneficial impact.

Key questions in regards to the sustainability of projects include the following:

7. Can the service provider of broadband Internet, voice or broadcasting sustain the service provision based on the UASF smart subsidy received for the contracted period of time?

8. Will UASF partners such as the MOESD provide the necessary budgetary resources to a) support the program adequately as agreed, and b) take over the program and its ongoing costs and obligations at some point in the future? If not all costs, what part of the program can be taken over?

The UASF will monitor the sustainability issue especially carefully and include key measures required in the next cycle of a 3-year UASF strategy to ensure ongoing sustainability.

10.3 Planning next phase of UASF strategy

This UASF strategy is for the next 3 years as seen below, starting officially for the UASF financial year of 2016/2017, after an informal ramp-up period where projects already get started.

<table>
<thead>
<tr>
<th>UASF Strategy Year</th>
<th>Start</th>
<th>End</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramp-up period</td>
<td>Q3 2015</td>
<td>Q1 2016</td>
</tr>
<tr>
<td>UASF FY 1</td>
<td>Q2 2016</td>
<td>Q1 2017</td>
</tr>
<tr>
<td>(1 April 2016 to 31 March 2017)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UASF FY 2</td>
<td>Q2 2017</td>
<td>Q1 2018</td>
</tr>
<tr>
<td>(1 April 2017 to 31 March 2018)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UASF FY 3</td>
<td>Q2 2018</td>
<td>Q1 2019</td>
</tr>
<tr>
<td>(1 April 2018 to 31 March 2019)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The UASF has a 3 year strategy planning cycle and this document covers the first phase. The second phase is to be designed 6-12 months before this UASF strategic plan ends.

The next phase of the UASF strategic plan will be based on:

• A fresh assessment of the UAS situation and needs in the country, covering the telecommunications and broadband Internet sector, the broadcasting and postal services sector;
• A thorough analysis of the available monitoring data, overall experience of the current UASF strategy and any evaluation study if already available;
• An updated review of international best practice and experience, lessons learned and successful similar programs;
• A revised forecast of available funding, costing and financial feasibility of the future strategy; and
• A review of the suitability of previous projects proposed by stakeholders which had to be put aside due to the limits of available funding.
11 SWOT analysis

This SWOT analysis aims to identify the key internal and external factors seen as important to achieving the UASF objectives. This SWOT analysis is organized into two main categories:

1. internal factors – the strengths and weaknesses internal to the UASF and UASF strategy, and
2. external factors – the opportunities and threats presented by the outside environment.

Table 13

<table>
<thead>
<tr>
<th>STRENGTHS</th>
<th>WEAKNESSES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INTERNAL</strong></td>
<td><strong>EXTERNAL</strong></td>
</tr>
<tr>
<td>- Very focussed program through choosing the school flagship program</td>
<td>- Partnering with Botswana Innovation Hub to promote local and relevant content and applications for broadband Internet, with special interest in educational content for primary schools and applications for rural areas</td>
</tr>
<tr>
<td>- School program has strong and broad support among the majority of stakeholders</td>
<td>- Drawing on Botswana’s large pool of IT graduates for supporting ICT capacity building and technical support in primary schools and creating employment opportunities at the same time</td>
</tr>
<tr>
<td>- Comprehensive international experience regarding schools programs to draw on lessons learned</td>
<td>- Possibly limited Human Resources/ manpower within the UASF Secretariat to fulfill rapid implementation program: design detailed projects, manage implementation and monitor service providers and program results</td>
</tr>
<tr>
<td>- Strong evidence of the positive socio-economic impact of ICT capacity building in schools</td>
<td>- Potential bureaucratic delays at the MOESD</td>
</tr>
<tr>
<td></td>
<td>- Increased cost through unreliable or non-existing electricity supply</td>
</tr>
</tbody>
</table>

It is important to keep in mind that a SWOT analysis tends to be a listing of various positive and negative factors, but does not provide the weighing of the factors in terms of their actual importance and priority in achieving objectives. As such, it is helpful in creating the awareness of strengths, weaknesses, opportunities and threats, but is somewhat limited in terms of judging their relative importance.
Annex A – Methodology for developing UAS strategy

The UAS strategy was developed over a three-month period, starting in April 2015, and was based on the following key methodology elements:

1. Overall national policy context, past UAS policies and related strategies;
2. Review of international experiences of UAS and broadband policies, and USFs;
3. Extensive stakeholder consultation; and
4. Detailed market analysis and current state of UAS in Botswana.

In the following, the key methodology elements are described.

1. **Overall national policy context, past UAS policies and related strategies;**

Key national plans and policies were reviewed to align the UAS strategy with these wider plans and policies. This included, but were not limited to:

- National Development Plan (NDP) 2009-2016
- A long-term vision for Botswana – Vision 2016
- Botswana Telecommunications Policy 1995
- National Broadband Strategy (NBS) – 2014
- Education and Training Sector Strategic Plan (ETSSP) 2015-2020

Other legal documents were also reviewed, including the Telecommunications Act, Botswana Broadcasting Act 1998, Broadcasting regulations 2004, Botswana Postal Services Act and the Communications Regulatory Authority Act 2012. Further, the Draft Communications Regulations 2015 were also reviewed.

2. **Review of international experiences of UAS and broadband policies, and USFs**

Each national UAS strategy has to be tailored to the country’s situation and needs, but it can benefit from and build on the experiences other countries have made. The following major reference documents were reviewed, describing almost all 90 existing USFs, as well as broadband and school connectivity strategies of many countries, and key success factors, challenges and lessons learned:

- The State of Broadband 2014: Broadband for all. A report by the Broadband Commission
- Alliance for Affordable Internet, Affordability Report 2014
- Universal Service Fund Study, conducted on behalf of the GSM Association, 2013
- Universal Service Fund and digital inclusion for all, ITU 2013
- E-Learning Africa report: The trajectory of change – Next steps for education, 2015
- ITU School connectivity Toolkit (several modules)
Further, the consulting firm assisting with the development of this UAS strategy, has specialized for over 17 years in rural communications, UAS, USFs and broadband, having worked in over 16 countries specifically on developing and implementing UAS policies, strategies, programs and projects. In early 2015, the consulting firm just reviewed 35 countries in Africa, Asia and Latin America regarding their UAS, USF and broadband policies.

Not only international experience were reviewed and analyzed, but also several connectivity projects within Botswana as follows:

- The Nteletsa II project,
- Various Kitsong centres, and
- Selected school connectivity projects (e.g., for World Telecommunications and Information Society Day 2015 in Ghanzi).

3. **Extensive stakeholder consultation**

A range of key stakeholders and representatives of certain industry sectors were consulted in individual meetings. The purpose was twofold: to get data and information on the market situation and to receive their views and input regarding a UAS strategy. In some instances several meetings were held as required. Further, a public stakeholder workshop was held on 26 May 2015 in Gaborone to summarize USF international experience, present the first draft UAS strategy and facilitate comments and discussions. Below is a list of stakeholders with whom a meeting was held:

- Ministry of Transport and Communications
- Ministry of Education and Skills Development
- Ministry of Local Government and Rural Development
- Botswana Innovation Hub
- Botswana Post
- Duma FM
- Gabz FM
- Kemonokeng
- e-Botswana (TV)
- Abari Communications
- Broadband Botswana Internet (BBI)
- Global Broadband Solution (GBS)
- BTCL/ BeMobile
- Mascom
- Orange
- Botswana Fibre Networks Ltd (BoFiNet)

Also, stakeholders had an opportunity to provide written comments.

4. **Detailed market analysis and current state of UAS in Botswana**

Using a wide set of socio-economic, demographic, financial and communications sector statistics and data, and data and insights provided by the stakeholders, the three main communications sectors – broadcasting, postal services, and telecommunications – were analyzed in detail.
Most importantly, the following aspects were investigated: availability, access and affordability – which correspond to the key concepts of universal access and service –, through questions like this:

- What is the current network coverage – for what percentage of the population is the network available?
- What is the current usage (actual access) of the respective communications service?
- What are current key barriers to the usage (access) of a communications service (this could include for example lack of relevant content, lack of awareness or ICT illiteracy)?
- Are basic services and a minimum time of usage affordable? Are end-user devices – e.g., a radio set, a telephone, a broadband-enabled phone, computer or tablet – affordable? (Please note, UAS is not about allowing every person to have every luxury gadget, but allowing every person to be able to use essential communications services)

This analysis resulted in an accurate assessment of the current situation of UAS in broadcasting, postal services and telecommunications services, though in the postal sector further data is required, especially about actual demand and usage of universal postal services.

Finally, the Census data from 2011 were used to create an Excel model, which lists all existing cities, towns, villages, and localities over 100 people, and categorizes into 6 size clusters. These are the same clusters used for the NBS analysis. The existing and short-term planned coverage (i.e., network availability) of key networks – voice (incl. 2G), broadband Internet (incl. fibre, 3G and 4G), postal offices and agencies – has been mapped also for each city, town and village in this Excel model. This resulted in a clear picture of which cities, towns and villages have what type of network coverage.
1 See 5.118 in the National Development Plan (NDP) 10
2 See for example 7.5.7 in the NDP 10
3 See 8.28 in the NDP 10
4 See for example, ITU, Measuring the Information Society Report 2014
5 Alliance for Affordable Internet, 2014
6 See for example BTCL wholesale prices in BOCRA’s annual report 2014.
7 National Broadcasting Board Survey - Audience Survey Report Volume I, April 2013