

Guidelines for Development of National Broadband Plans

June 2015

This Guide has been prepared by the ITU by the ITU expert Dr. Thomas Senaji under the supervision of the ITU Regional Office for Africa, in particular Mr. Marcelino Tayob, and received valuable inputs from the Southern African Development Community (SADC), Communications Regulators' Association of Southern Africa (CRASA) and ITU Member States.

The document is to be updated over time with information on technologies, policy initiatives and new regulatory provisions as well as new models of investment and successful projects that achieve the highest socio-economic impact.

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LIST OF ABREVIATIONS

2G	Second Generation Mobile
3G	Third Generation Mobile
ADSL	Asymmetrical Digital Subscriber Line
BB	Broadband
BDT	Telecommunications Development Bureau
BSC	Broadband Steering Committee
CBK	Central Bank of Kenya
CoE	Centres of Excellence
CRASA	Communications Regulators' Association of Southern Africa
DAE	Digital Agenda for Europe
DEA	Department of Environmental Affairs
DoC	Department of Communication
DPE	Department of Public Enterprises
DPSA	Department of Public service and Administration
DS 2027	Digital SADC 2027
DSA	Dynamic Spectrum Alliance
FTTC	Fibre-to-the-Cabinet
FTTP	Fibre-to-the-Premises
FTTx	Fibre to the home/cabinet
Gbps	Gigabits per second
GDP	Gross Domestic Product
GHz	Gigahertz
HSDPA	High-Speed Downlink Packet Access
ICASA	Independent Communication Authority of South Africa
ICT	Information and Communications Technology
ISP	Internet Service Provider
ITES	Information Technology Enabled Service
ITU	International Telecommunication Union
Kbps	Kilobits per second
LLU	Local Loop Unbundling
LTE	Long term Evolution
MACRA	Malawi Communications Regulatory Authority

Mbps	Megabits per second
MEIP	Market Economy Investor Principle
MHz	Megahertz
MTL	Malawi Telecommunications Limited
NBN	National Broadband Network
NBP	National Broadband Plan
NBP	National Broadband Plans
NBS	National Broadband Strategy
NDP	National Development Plan
NEMA	National Environmental Management Authority
NGA	Next Generation Access
NHI	National Health Insurance
NNBP	Nigerian National Broadband Policy
PICC	Presidential Infrastructure Coordinating Committee (South Africa)
PPC	Presidential Portfolio Committee on Communication
PPP	Public Private Partnership
R&D	Research and Development
RCIPMW	Regional Communication and Infrastructure Program Malawi Project
RDI	R&D and Innovation
REC	Regional Economic Communities
ROW	Right of way
SADC	Southern African Development Community
SANBS	South Africa National Broadband Strategy
SANRAL	South African National Roads Agency Limited
SAPOA	Southern African Postal Operators Association
SATA	Southern African Telecommunications Association (SATA)
SIP	Strategic Integrated Plan
TVWS	Television White Spaces
UASF	Universal Access Service Fund
UBW2	2nd Universalising Broadband in SADC Workshop
UN	United Nations
URS	User Requirements Specification
USF	Universal Service Fund

VDSL	Very high bit rate Digital Subscriber Line
WiFi	Wireless Fidelity
WRC	World Radio-communication Conference

EXECUTIVE SUMMARY

1. Background

"Governments which are able to adopt a 'change agent' mentality across their own departments and with delivery organisations are consistently more effective at delivering major infrastructure programs and their associated benefits" (Deloitte, 2014, p.2).

Role of broadband

The role of the Broadband as an enabler of economic and social development in countries is broadly recognized in various published studies[1] and documents including in the reports of the Broadband Commission for Digital Development[2]. An assessment of the status of broadband development in African countries reveals that the countries are at different stages in broadband development. Studies suggest that broadband penetration is higher in countries with National Broadband Plans (NBP), policies and strategies than in countries without these. It has been noted that most of the African countries have the national Information and Communications Technologies (ICTs) Policies. Other Countries are in the process of development of elaborate Broadband Policies/Plans; others have started to elaborate broadband projects in line with their broadband strategies. Indeed, Countries that have harnessed the potential of ICTs have attained significant social and economic development; they are rapidly transforming into information and knowledge-based economies[3].

Access to an affordable, good-quality and open ICT infrastructure for all citizens will contribute to cohesion and rural development policy aims. In the end, this will increase innovation and productivity of regional and rural actors. As a result, it is of primary importance for policy makers, regulators and the society at large to be aware of the positive effect that access to affordable broadband has in terms of meeting the most basic needs of the households, communities, public administrations and businesses in a country hence contribution to the realization of Southern African Development Community (SADC) common agenda, namely integration. In this regard, the International Telecommunications Union (ITU) is assisting member states in Africa to develop their broadband by proposing guidelines for an orderly development of NBP.

[1] In an academic study for the Word Bank, Christine Qiang (2009), demonstrated that a10% increase in basic broadband penetration enlarged GDP growth by an additional 1.21% when looking at 66 high-income countries; and by 1.38% in the remaining 120 low- and middle-income countries. For further details see: Qiang, C. Z. and Rossotto, C. M., *Economic Impacts of Broadband, Information and Communications for Development: Extending Reach and Increasing Impact*, World Bank (Washington, DC, 2009), pp. 35–50.

[2] http://www.broadbandcommission.org/documents/

[3] See Report on ICT Policy Review in the EAC Partner States (A review for Kenya National ICT Policy) prepared by Dr. Thomas Senaji (2009 April) for the Regional ICT Support Program, RICTSP

During their meeting in Mangochi, Malawi, 2014, SADC ICT Ministers agreed to develop a Broadband Plan Model that would allow for accelerated development of NBP in the Region. These Guidelines, therefore, will assist SADC in its development of the SADC Model on Broadband Plan. These Guidelines will also assist the SADC Member States in their development of National Broadband Policies, Plans and Strategies and allow the Region achieve the Digital SADC 2027 (DS 2027) agenda targets.

The implementation of these initiatives is expected to serve as catalyst to mobilize resources from other sources including national sources for broadband development. The initiatives can also be used for capacity building in cooperation with RECs in order to help as many countries as possible to build the skills necessary for developing their own plans.

Purpose of this guide[4] **-** So far, first generation broadband has had a large and measurable impact on society and on the conduct of business. Consumers can access services, public services (e.g., e-government) which can be delivered more efficiently, at lower cost while Small and Medium Enterprises (SMEs) can reach global markets in ways that were hitherto unimaginable, or simply unaffordable. To ensure that Africa remains competitive in the global economy it is important that the underlying communication infrastructure is upgraded so that all citizens, businesses and public services can benefit from the development of new digital applications and services. By presenting the areas to focus on, and the process to be followed, these Guidelines will assist countries in development of their NBP while taking into account the existing country specific situation.

3. SADC Guidelines for Developing National Broadband Plan

Since SADC aspirations with regard to ICT are already set out in its SD 2027, each country's national broadband plan should reflect these aspirations in their NBPs to ensure that the developments of broadband support the Common Agenda – Integration, namely Promotion of sustainable and equitable socio-economic growth; Promotion of common political values; and Promotion, consolidation and maintenance of democracy, peace and security.

This guide is a tool to support public authorities in defining their role and plans with regard to broadband. The goal of the Guidelines is not to provide ready-to-apply recipes on how a Public Authority (PA) should go about planning and investing in broadband in its country or region or municipality. It rather aims to assist the public authorities in African countries in formulating the important questions, and to provide the conceptual tools and the information needed to make the right decisions matching their needs.

[4] Adapted from 'Guide to High-speed broadband investment'. Available at: http://ec.europa.eu/digital-agenda/en/news/broadband-investment-guide/ (September 18 2014).

The document guides the PAs including National Regulatory Authorities (NRAs) through the steps of producing a broadband plan, making the appropriate strategic choices for their countries and implementing the plan so that the Next Generation Network (NGN) infrastructure for society is deployed. Important strategic choices that need to be made in terms of investment models, infrastructure type, business models and financing tools are highlighted. Further, important issues like citizen involvement, collaboration with market actors, coordination between different public authority units and with other stakeholders; and monitoring and evaluation, etc. are also presented.

Framework for broadband development. The following is the broad framework for the development of broadband:

(i) **National imperative to succeed** which must be visible by citizens from the political side as evidenced by leadership, role modeling, and demonstrated commitment by the NBP steering committee or Broadband council, and from the Minister in charge of ICTs who should be the chair of the broadband steering/ governing council. Further, success can only be realized by p**roper planning,** since 60 to 90% of problems can be fixed with proper planning/ reviewing the NBP delivery plan;

(ii) *Governance of broadband*. How broadband issues are being governed/ managed; and the oversight that is necessary for the orderly deployment of broadband;

(iii) *Implementation framework for broadband*. How broadband is being/ should be implemented by focusing on institutions (and stakeholders) involved in the actual implementation; and the associated business model, investment model etc.

(iv) *Financing of broadband*. How broadband development is being financed through various sources of funds for broadband including investment by both government and private sector; including through equity, debt, grants etc.

(v) *Demand side of Broadband*: content development, applications and innovations, training, and stimulation of demand (e.g., through creation of awareness); and

(vi) *Supply side of Broadband* including regional/ national development vision; vision of ICT policy and sector development plan, legislation, regulation, broadband technologies, security, and guidelines to support broadband development.

Scope of Guidelines for national broadband plan development. Broadly, this guide presents the policy, legal, regulatory, and technological issues pertinent to the development of broadband. In addition, a discussion of the investment and business models and investment tools are presented. The guide concludes with action plans.

Summary of steps in broadband development. Consistent with the most common practices for successful broadband development, the following is a step-by- step guide that is proposed for use in the development of national broadband plans by African countries:

(i) Establish high level leadership for ICT agenda from the Presidency through the Ministries in charge of ICT and appoint a broadband steering committee such as the Broadband Council;

(ii) Conduct a broadband gap analysis with regard to policy, legislation, institutions, supply and demand, and capacity development;

(iii) As necessary, and through multi-stakeholder consultations, formulate, and/or review, and align the broadband ICT policy with the national development plan to ensure that it captures the aspirations of the country. The policy should clearly addresses national development priorities across all sectors;

(iv) Determine and /or refine (where they already exist) the broadband strategy pillars;

(v) Enact legislation and prepare regulations to operationalize the ICT policy and give prominence to ICT in general and to broadband in particular; including the establishment and/ or strengthening the ICT sector regulator to deal with emerging issues;

(vi) Establish or strengthen the institutional framework (institutions) for the implementation of the national broadband strategy/plans;

(vii) Adopt a holistic approach to broadband development by targeting connectivity globally, regionally, nationally, first-mile, user devices; and for driving the demand for broadband by stimulating demand and usage of broadband by citizens;

(viii) Establish multi-stakeholder task teams/ working groups to deal with each broadband pillar and come up with a detained input to the overall broadband plan;

(ix) Formulate a comprehensive broadband action plan complete with targets and a monitoring and evaluation framework covering all broadband pillar/ focus areas as identified in the ICT policy; and including specific projects (flagship and demonstration);

(x) Elaborate specific (flagship projects) for each broadband plan pillar;

(xi) Mobilize resources for the implementation of the broadband plan including through Public Private Partnerships (PPPs);

(xii) Comprehensively address affordability of broadband as a critical demand side concern;

(xiii) Implement the national broadband plan projects (including through e.g., public private partnerships, PPPs) complete with performance indicators, targets, and measurements for specific flagship (and demonstration) projects under each national broadband plan focus area/ pillar/thematic area.

Strategic deployment of broadband. After the finalization of the NBP, the implementation of the plan should be preceded by an elaboration of five agreed strategic decisions made upon consultations with all stakeholders:

i. Infrastructure strategy for both the first mile (access network, e.g., FTTH) and backbone network;

ii. Investment model/ strategy, e.g., PPPs;

iii. Business model/ strategy depending on the market structure;

iv. Investment tools/ instruments such as equity, debt etc.

v. Demand promotion for broadband

Operational Guide to National Broadband Plan. The main basis for the operational recommendations presented in this guide is threefold, (1) an assessment of the status of broadband development in Africa, (2) recommendations of the SADC Universalizing Broadband workshop (UBW, Lilongwe, 2014 August), (3) review of literature on broadband plans in Africa and elsewhere; and (5) consultation with regional experts and focal points in Africa starting with SADC member states. At a more operational level, the implementation of broadband strategy and plan should proceed by considering:

(i) Prioritising and implementing multi-stakeholder consultations;

(ii) Establishing a high level broadband steering committee/ team such as the South Africa's and Nigeria's national broadband councils;

(iii) Conducting national Broadband access gap studies to have evidence for use in further decisions (including policy) on broadband;

(iv) Increasing the capacity and skills in Broadband through workshops and educational curricula in institutions of learning;

(v) Improving Broadband attractiveness by creating awareness of its benefits;

(vi) Assigning Broadband spectrum including in the framework of digital dividend as per resolutions adopted at World Radiocommunication Conference (WRC)-12 and forthcoming WRC-15. ;

(vii) Establishing regulatory systems that ensure new entrants into the Broadband market to increase the supply of broadband;

(viii) Reducing the cost of Broadband access such as through infrastructure sharing (develop infrastructure sharing guidelines) by network operators and service providers; and by using existing postal infrastructures and networks to facilitate the extension of the broadband services;

(ix) Collecting ICT statistical data that could be utilized at national and even SADC regional level to enable evidence based decisions regarding broadband;

(x) Establishing multi-media training centres to allow for creation of local content and e-applications; this can include upgrading of existing Centres of Excellence (CoEs) to be able to handle the new demand;

(xi) Promoting and providing incentives for use of green power in infrastructure deployments and utilization of Broadband services beyond the electricity grid including fiscal incentives such as reducing or eliminating import duty on green power equipment/ accessories;

(xii) Working with local governments for Right Of Way (ROW) authorisations and infrastructure sharing;

(xiii) Developing and implementing strategies for financing of broadband infrastructure that the private sector is unable to undertaken on their own (including PPP approaches)

Promotion of broadband. Further, the promotion of broadband capacity is multifaceted and takes place on a number of different levels:

- the wholesale market for broadband connectivity (domestic and international backbone connectivity);

- the retail market for broadband access (i.e. “last mile connectivity”); and

- the development of services, applications and content; and devices for accessing broadband.

1.0 INTRODUCTION

1.1 Background and Context

Broadband and socio-economic development. The role of the Broadband as an enabler of economic and social development in countries is broadly recognized in various published studies and documents including in the reports from the Broadband Commission for Digital Development[5]. Some analysts[6] go even further to state that Broadband connectivity will soon be regarded as a daily necessity like water, electricity and even the very air we breathe as the right to communicate is now mandatory and fundamental for everyone. Similarly, the Global Symposium of Regulators[7], 2011 (GSR11), asserted that:

> "The rapid growth of the digital economy presents huge opportunities for economic and social development, creating global markets for applications and services, improving productive capacity, reducing the cost of doing business, and unleashing creativity and innovation. The growth of broadband networks will accelerate this trend, offering the opportunity to leapfrog time and distance limitations and providing greater bandwidth across the globe" (p.1)

However, national sustainable rollout of Broadband infrastructure requires adequate National Broadband Plans (NBPs) that will meet the national development policy and strategic objectives. In recognition of this imperative, countries around the world, including some African countries, and in Southern African Development Community (SADC) in particular, have developed and are implementing their NBPs while others are launching the process.

[5] http://www.broadbandcommission.org/documents/
[6] Such as UN Secretary General
[7] GSR11 best practice guidelines on Regulatory approaches to advance the deployment of Broadband, encourage innovation and enable digital Inclusion for all*

From basic broadband to NGN infrastructure[8]**.** When the existing telecommunication networks were built, the process was mostly driven by monopolistic and state-owned telephone companies to deliver the telephony service. Towards the end of the last century, these networks (and in some cases TV-distribution networks) started to be used for data services. Initially synonymous with the *"Internet"*, data services have evolved rapidly and today's so-called broadband networks carry a plethora of services of all types, both of commercial and societal interest.

As more information services and tools are developed and greater volumes of data are transmitted, advanced communications networks are required to meet the need for speed, capacity, quality, reliability and affordability. While fixed networks could be built using existing copper infrastructure, bandwidth demand from users and providers is quickly reaching a point when a new generation of digital communications infrastructure is needed. In this regard, it is necessary to bring optical fibre closer and closer to the end-user to support a wide range of fixed and wireless technologies.

1.2 Problem statement

Studies suggest that broadband penetration is higher in countries with national broadband plans, policies and strategies than in countries without them[9]. While most countries recognize the need of such plans they lack the adequate know how and/or financial resources[10] to prepare their respective national plans hence the need to support their capacity building efforts by providing them financial and technical assistance to develop such plans.

[8] Guide to high-speed broadband investment (September 2014). European Union Regional Policy
[9] E.g., Cisco and ITU, 2013, Planning for Progress: Why National Broadband Plans Matter

[10] This is one of the "Challenges of Universalizing Broadband in Tanzania, 2014)

1.3 Justification of the Project

Recognizing the role of the Broadband in the social and economic development of African countries and the importance of the NBP for a well-planned and coordinated roll out of the broadband infrastructure and provision of required services, the International Telecommunications Union (ITU)/ Telecommunications Development Bureau (BDT) took the initiative to allocate resources in its Operation Plan for the year 2014 to assist countries in Africa to start developing their respective NBPs either through direct technical support or in cooperation with the Regional Economic Communities/ Groupings (RECs) and/or through other partners that may be identified. Working with RECs may facilitate regional harmonization through usage of elaborated common guidelines that would be prepared on the worldwide best practices.

1.4 Target group/Final beneficiaries

Based upon specific realities of each sub-region in Africa, the technical support would be provided via the Secretariat of the RECs and/ or directly to the countries in the Region. In some cases, the Regulators Associations, such as the Communications Regulators' Association of Southern Africa (CRASA) which may be the main operational entity acting under the umbrella of the REC. The support for these guidelines was provided through CRASA which is a specialized agency of SADC. In the long term, the beneficiaries will be the citizens of the SADC as a whole as more countries get the plans and implement them leading to more Africans having access to broadband services.

1.5 Objectives, Expected Outcomes and Implementation Strategy

Objectives: The objective of this initiative is to assist African countries in the development of their respective NBPs either through direct technical support or in cooperation with the RECs. As the first step in this initiative, the ITU conducted a survey to determine the status of development of both national and regional broadband policies, strategies, plans and projects with a view to suggesting guidelines to assist countries in Africa to accelerate the development of NBPs which would subsequently be

implemented by the countries/ RECs. The development of these guidelines followed from the ITU survey of the status of broadband development and deployment in Africa.

Expected results: The implementation of this initiative will serve as catalyst to mobilize resources from other sources including national sources and/or be used for capacity building in cooperation with RECs in order to help as many countries as possible to build the skills to develop their own plans.

1.6 Methodology

The first phase of the broadband initiative was to assess the status of broadband policies, plans and deployment while the second phase involved development of guidelines for deployment of broadband in SADC based on the assessment of the status broadband of assessment development**.** Data and information collected on the status of broadband from African countries that responded to the questionnaire, mostly from SADC (Phase 1 of the ITU Initiative) were analyzed.

Taking advantage of a workshop on the matter (Universalizing Broadband Workshop, UBW) organized by SADC, the results were presented to stakeholders of this particular region via direct distribution of the broadband survey report and the inputs received and incorporated in the final report. The report formed the basis of the guidelines (Phase 2) that have been developed for NBP preparation to assist in the acceleration of the development of Broadband in the continent with initial focus on SADC as the main respondents and later to be extended to other regions.

The assessment of the status of the NBP development in the Africa Region, and in SADC in particular (due to their response level to the questionnaire), and of the level of their implementation (Phase 1 of this ITU Initiative) was the first step of a larger initiative aimed at assisting countries in Africa in the development of their respective NBP either through direct technical support or in cooperation with the Regional Economic Groups (RECs). These Guidelines (Phase 2) are intended to serve as a guide to the development

of NBPs which will be followed by their (NBPs) implementation by the SADC member states in the framework of SD 2017.

These guidelines have been prepared in collaboration with the Communications Regulators Association of Southern Africa (CRASA) by adopting the following approach:

(i) ITU survey of the status of NBPs development in Africa;

(ii) Preparation of the NBP status report;

(iii) Presentation of the NBP status report in the SADC universalizing broadband workshop (UBW) (Lilongwe, 2014 August);

(iv) Consultation with stakeholders in the ITU regional office for Africa and with the focal points in the SADC member states;

(v) Preparation of Guidelines for preparation of national broadband plans

It is projected that as many SADC member states as possible will have NBPs or at least be in an advanced stage of its (NBP) preparation based on the presence of models, plans or guidelines for their respective member states/ constituencies as soon as possible.

1.7 Structure of the Guide

These step-by-step guidelines on 'how to do" of broadband are based on the study on the status of broadband development in SADC which covered policies, strategies, plans and projects; and on best-practice experiences within and outside the Region. While the background and situational analysis are presented in Part 1.0 and Part 2.0 respectively and the planning considerations for broadband captured in Part 3.0. An overview of the guidelines is presented in Part 4.0, and elaborations of the guidelines are covered in Parts 5.0 to 10.0.

Broadband plan: The first parts of this Guide presents the SADC Digital 2027 (SD 2027) agenda, paints the picture of the broadband situation, and introduces the importance of defining a **broadband plan**, which is the high level strategy of what a Public Authority

(PA) planning the broadband intervention wants to achieve. A sound broadband plan is a politically supported document containing an analysis (including mapping) of the current situation, the goals to be achieved, the financial support to be provided and a mechanism detailing actions to be undertaken to ensure implementation of goals as outlined in the broadband plan. The later parts of the Guide focus on the four strategic areas that are pertinent to the implementation of broadband namely infrastructure type, investment model, business model, and financing tools, as follows: -

Choice of the infrastructure type: Does the PA[11] aim to deploy a new future-proof broadband infrastructure or would it be sufficient to upgrade the existing infrastructure, considering the pros and cons of the two choices? The infrastructure should cover all the pillars[12] and platforms[13] (physical, institutional and regulatory) that form the basis of the national broadband plan.

Choice of the investment model: Should the public authority opt for direct investment, indirect investment, and public-private sector partnerships, community based initiatives.

Choice of the business model: Should the public authority opt for a vertically integrated or an open-access network model? Which one is most likely to maximise the financial sustainability of the project, broadband coverage and penetration (also beyond an individual project), promote competition and, most importantly, maximization of the socio-economic development of the affected community?

[11] This is an entity designated by the SADC member states to lead the broadband deployment effort on its behalf; specifically to champion the Digital SADC 2027 Agenda. PA will be used to refer to whichever entity is in charge of broadband in the member states.

[12] Physical ICT infrastructure, e-services and Innovations research, Innovation and Industry development, and capacity building and content

[13] These include confidence and security of networks and services; and policy and regulatory harmonization

Choice of the financing tools: How can the public authority ensure adequate financial coverage for building and operating the new infrastructure or upgrading of existing infrastructure and what can it contribute in terms of capital, expenditure and assets?

Finally a **check-list** is provided to keep track of all actions to be executed and all the aspects to be covered during the whole process. Figure 1 gives a graphical representation of the guide's core structure.

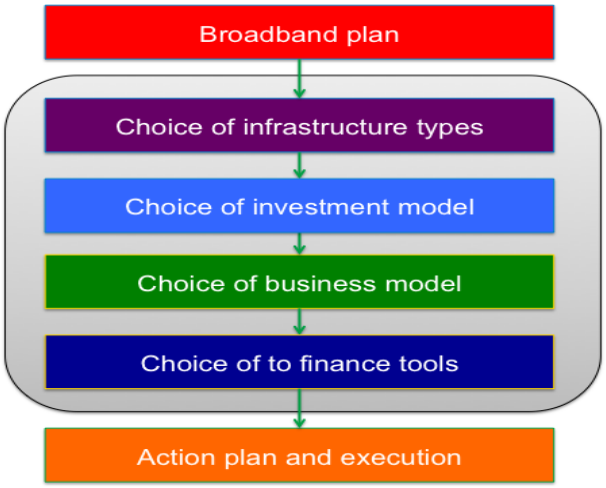


Figure 1. *Structure of the National Broadband Plan Guide*

The following are the key questions[14] that need to be asked and answered with regard to investment in national broadband plans.

(i) Why should we invest in broadband? - This question can be addressed by defining project objectives and milestones to tackle market failures and/or deliver socioeconomic benefits;

(ii) What type of network infrastructure should we invest in? - An understanding of the costs and benefits of different kinds of infrastructure is required;

(iii) How should we invest? - This calls for investment models/ business models and an understanding of the merits of each investment model and what might work best for you;

[14] Source: Adapted from Seven steps of broadband planning by Analysys Mason

(iv) How do we manage/ monitor the outcome? - by coming up with performance indicators/ statistics; ensuring successful delivery and operation; measuring performance, and providing evidence for audit of the broadband;

(v) What can be done to ensure demand for services? - this requires stimulation of demand and a clear understanding of the commercial case and your potential role on the demand side;

(vi) What can be done to reduce the cost and manage risks? - To address this question, infrastructure/facilities sharing and partnerships should be as part of measures to reduce costs and manage risks;

(vii) What are the next steps that need to be taken? - The NBP projects that contribute to meeting the SADC broadband goals (e.g., SD 2027 using available funds quickly and effectively) should be formulated and implemented.

The next sections of this guide address the questions posed in the context of the four strategic areas (Choice of the infrastructure type, Choice of the investment model, Choice of the business model, and Choice of the financing tools) identified (Figure 1). The report firstly presents a background and review of the situation with regard to broadband in the region and of SD 2027 Agenda which form the basis of these Guidelines. A full section (Part 9.0) of this document is dedicated to the pivotal role that the regulator (National Regulatory Authority [NRA]) can play in accelerating broadband development.

2.0 SADC DIGITAL 2027 AGENDA AND STATUS OF BROADBAND

In this part, a review of the SD 2027 Agenda and its implications for broadband deployment is reviewed. This is done to provide a context to SADC countries within which the Guidelines have been developed.

2.1 SADC Common Agenda – Integration

Integration: The common agenda for SADC is Integration with the following key themes:

(i) Promotion of sustainable and equitable socio-economic growth;

(ii) Promotion of common political values; and

(iii) Promotion, consolidation and maintenance of democracy, peace and security

ICT can play a pivotal role in the realization of this Agenda hence the need for a coordinated development of broadband in the SADC region. The already developed and approved SD 2027 Strategy is an important milestone in the realization of a robust broadband in the Region.

Vision for SADC Digital2027: These guidelines draw from the SD 2027 Vision of broadband which is "Based on the promise of always-on affordable broadband (BB) connectivity, rich content and useful applications, with easy to use access devices and postal systems; and with collective effort, clear allocation of roles and Responsibilities and system approach to eliminating bottlenecks and identifying the best methods to move forward".

2.2 Broadband Goals, Pillars and Platforms

The goals of the broadband strategy should emanate from the regional/national government development goals (specifically the SD 2027) to ensure that Broadband

contributes to the realization of aspirations and development goals for social-economic growth and development of the SADC member states. The broadband should in turn be implemented over appropriate platforms that ensure accessibility, reliability and affordability of services by the population.

2.2.1 Goals

The gals of the national broadband plan are as follows:

(i) Well informed rapid decision making

(ii) Lifelong learning;

(iii) Social and cultural inclusion;

(iv) More wealth and livelihood creation options and employment opportunities;

(v) Efficient cross border travel and seamless markets for goods and services;

(vi) Increased agricultural production and more efficient produce markets;

(vii) Accessible government, commercial and financial services, e.g., by implementing e-government and e-commerce;

(viii) A healthier, happier population, including through e-health

2.2.2 Pillars and Platforms for SADC Digital 2027

SD 2027 is anchored on four pillars and supported by two platforms as follows:

Pillars: These include physical ICT infrastructure; e-services and innovations research, innovation and Industry development; and capacity building and content.

Platforms: These include confidence and security of networks; and services, and policy and regulatory harmonization.

2.2.3 Explanation of broadband pillars and platforms

A brief explanation of the broadband plan pillars and platforms is presented as follows:

Infrastructure: The envisaged ICT infrastructure across SADC should be:

(i) broadband based:

(ii) technological neutrality in supporting various services e.g. fixed, satellite, mobile, mobile wireless etc:

(iii) interconnected:

(iv) reliable:

(v) affordable: and

(vi) improved use of existing infrastructure e.g. postal networks

e-services and Innovations: The services and innovations will comprise:

(i) sharing software development costs across the SADC region;

(ii) improving efficiency in public service delivery (such as e-government) and commerce – including e-commerce, m-commerce etc. ;

(iii) facilitating administration of regional flow of people, goods and services; and

(iv) open access to public data

Research, innovation and Industry development: In order to realize maximum socio-economic benefits from ICTs, R&D; to generate knowledge necessary to create new products and services; and to ensure positive impact of ICTs on the population in the region, this pillar will:

(i) strengthen ICT research institutions and SMEs;

(ii) promote national and regional institutional collaboration;

(iii) innovate and develop local ICT manufacturing industries;

(iv) minimise hazardous effects of ICTs on environment; and

(v) ensure use of ICTs to mitigate effects of climate change.

Capacity building and content: This pillar partly addresses the demand side of broadband intended to:

(i) maximise human capacity through regional cost sharing;

(ii) raise awareness of ICT supported development strategies;

(iii) develop regional certification standards for information literacy;

(iv) establish ICT and postal centres of excellence; and

(v) establish regional repositories of online learning materials.

Similarly, platforms that support the four pillars are**:**

Confidence and security of networks and services to make Member States and regional communications networks reliable through establishment of computer emergency response teams (CERTs) and standards

Policy and regulatory harmonization: This includes the provision of enabling regional/ national environment and institutional arrangements, and strengthening regional strategic plan implementation institutions such as CRASA, the Southern African Telecommunications Association (SATA), the Southern African Postal Operators Association (SAPOA) and all broadcasters taking into account convergence of services. This arrangement should be cascaded to the national level to ensure that there is harmony in the implementation of the broadband across the region. Along with the broadband pillars and platforms, two other cross-cutting issues should be covered in the national broadband plans:

(i) e-waste management; and,

(ii) universalizing broadband to ensure equity and inclusion.

2.3 Broadband Implementers/ Implementing Agencies

The implementation of SD 2027 through national broadband pans will involve various stakeholders having specific roles and working in a coordinated manner; these include:

(i) ICT operators and service providers' associations/ groupings (SATA);

(ii) SAPOA;

(iii) CRASA and its members;

(iv) utility providers such energy/ electricity suppliers;

(v) local government authorities with regard to right of way and way leaves;

(vi) Member States through the SADC secretariat;

(vii) consumer groups/ associations including through advocacy on service quality

2.4 Summary of Broadband Projects in SADC

SADC member states are at different stages in the development of broadband through specific projects. All member states have an ICT policy with some having already commenced review of the policies. In addition to the policies, there are other ongoing projects intended to implement the policies covering legislation, regulation, and infrastructure.

2.4.1 Digital SADC 2027 projects

The following projects are being implemented to **SD 2027** Vision:

(i) adoption of the regional cyber security law models;

(ii) establishment of Regional Internet Exchange Point (IXP); and

(iii) establishment of Regional Computer Emergency Response Team (CERT).

2.4.2 CRASA projects towards Achievement of SADC Digital 2027

Similarly, there is number of projects aimed at the realisation of SD 2027 being implemented by CRASA, including:

(i) adoption of SADC Universal Access Guidelines;

(ii) development of SADC Open Access to Broadband Infrastructure Guidelines;

(iii) development of SADC Infrastructure Sharing Guidelines;

(iv) development of broadband frequency allocation/assignment spectrum strategies; and

(v) adoption of ICT Consumer Protection guidelines by SADC member states.

2.5 Bottlenecks to Universal Broadband in SADC

Bottlenecks to universal Broadband lead to suppressed demand (Linzie, 2014). Some of the bottlenecks to universal Broadband in SADC are:

(i) absence of policy direction on broadband hence absence NBPs;

(ii) lack of open access to broadband infrastructure leading to High Transit Charges/costs which make broadband services unaffordable to the population (for example the price for bandwidth capacity from the African coast to London is US$200 – 300/ Mbps/month while capacity from inland locations to the African coast is US$500 –2000/Mbps/month);

(iii) lack of content to ensure efficient use of existing broadband networks and achieve lower prices per unit;

(iv) lack of adequate or available funding for network development: proposal made towards the US$20 billion Digital Connecting SADC Broadband Investment Facility (DCSBIF); and

(v) absence of regular data gathering to provide Monitoring and Evaluation (M&E) of the progress in the development and deployment of broadband across the region which this also hampers evidence based planning for broadband.

(vi) Vested interests and resistance to reforms e.g., if an incumbent may not be willing to participate in reforms

(vii) Wastage of scarce resources such as inability to share scarce resources due to lack of guidelines to facilitate the process.

2.6 Action Points on Broadband Development

Drawing from international practice, the assessment of broadband in SADC and from the UBW, a number of medium term and immediate actions have been identified for accelerating broadband deployment in SADC.

2.6.1 Medium term actions

On the basis of the recognized and acknowledged issues regarding broadband in SADC, the following are recommended for consideration by Member States:

(i) prioritising multi-stakeholder consultations as they commence with the development of national Broadband Strategies/Policies/Plans;

(ii) conducting national Broadband Access gap studies in order to inform the development of national Broadband strategies in line with SD 2027;

(iii) increasing the capacity and skills of their human resources to allow for effective e-applications with special focus on persons with special needs;

(iv) improving Broadband attractiveness through creation of local content, public awareness, education and provision of key government services;

(v) assigning spectrum (including the license exempt) effectively and using it efficiently;

(vi) identifying opportunities and implementing actions which can reduce the cost of Broadband access as well as encouraging local manufacturing;

(vii) including the existing postal infrastructures and networks to facilitate the extension of Broadband services to the underserved urban and rural areas;

(viii) establishing and applying effective regulatory systems to ensure that the new entrants to the Broadband market are regulated on fair terms and with certainty;

(ix) ensuring that there are clear regulations and rules for dynamic spectrum access according to ITU regulations;

(x) collecting ICT statistical data that can further be utilised at regional level;

(xi) establishing multi-media training centres to allow for creation of local content;

(xii) promoting and providing incentives for use of green power in infrastructure deployments and utilization of Broadband services; and

(xiii) Setting as a priority the awarding of digital dividend to Broadband services (already a SADC Agreement) in a way that facilitates universal Broadband access.

2.6.2 Immediate actions

Based on the results of UBW, the following (Table 1) are the key recommendations for consideration by SADC.

Table1. Recommendations for consideration

	Recommendation	**Proposed Action**
1	To develop a SADC Broadband Model Plan as a matter of urgency	Engage a facilitator to guide in the development of the BB model plan for SADC
2	To conduct a series of training workshops that would allow for increased capacity and knowledge on policies, regulations and strategies to achieve universal Broadband access in the Region	SADC to organise workshops (similar to UBW) and invite resource persons including those drawn from SADC member states who have made significant steps in BB development
3	To develop a standardised statistical data template that Member States can use in collecting ICT indicators	SADC to liaise with the ITU to develop a template for data collection
4	CRASA to consider completing the following regional regulatory guidelines: a) SADC Broadband Spectrum Plan guidelines; b) SADC Infrastructure Sharing guidelines; c) SADC Open Access to Broadband Infrastructure guidelines; d) SADC License Exempt Spectrum Plan guidelines;	CRASA to partner with stakeholders fast-track the completion of the spectrum, infrastructure sharing, open access and licences exempt spectrum plan guidelines

5	CRASA in collaboration with SATA, GSMA and other stakeholders to develop a Position Paper regarding the dynamic spectrum access (DSA) in extension of Broadband service deployment	CRASA to fast-track the development of the Position Paper by engaging a facilitator

3.0 PLANNING CONSIDERATIONS FOR BROADBAND

Broadband plans should be preceded by an ICT policy that sets policy objectives for broadband. The policy objectives should be based on the end result – the expected outcome such as access to broadband in rural areas, prioritise shared infrastructure, be cross-sectoral in approach, promote collaboration among key players; and link national vision to local initiatives since the national development objectives should inform broadband policy and strategy[15]. Since SADC aspirations with regard to ICT are already set out in its SD 2027, each country's national broadband plan should reflect these aspirations in their NBPs.

As a minimum, broadband planning should take into account: Cost (and financing of broadband), Affordability, Stakeholder consultation, Infrastructure, Security, Data Collection and Evidence-Based Decision Making, Monitoring and Evaluation (M&E), Consumer Protection and Pricing Transparency, Shared Access to broadband; and Role of Champions; and equally crucial is policy, legislative and regulatory framework to support broadband development. Discussions and recommendations on these considerations are as follows:

3.1 Cost of Broadband

The cost of broadband varies widely across the world and within countries in Africa (see Box 2). Its impact on affordability of broadband is a major factor in the demand of broadband in Africa and elsewhere in the world.

[15] Adapted from Ericsson (UBW2, Windhoek, June 2015)

Box 2. How much does a fixed broadband connection cost?

- Developed world: 1.7% of monthly income
- Pakistan: 15.5%
- Less developed world: 30.1% (ITU 2013)
- In 17 countries: 100% or more (2012)
  - The Gambia and Eritrea (700%)
  - Tajikistan (500%)
- Cuba, Swaziland and Togo (400%)

Source: Alliance for Affordable Internet (A4AI, 2014)

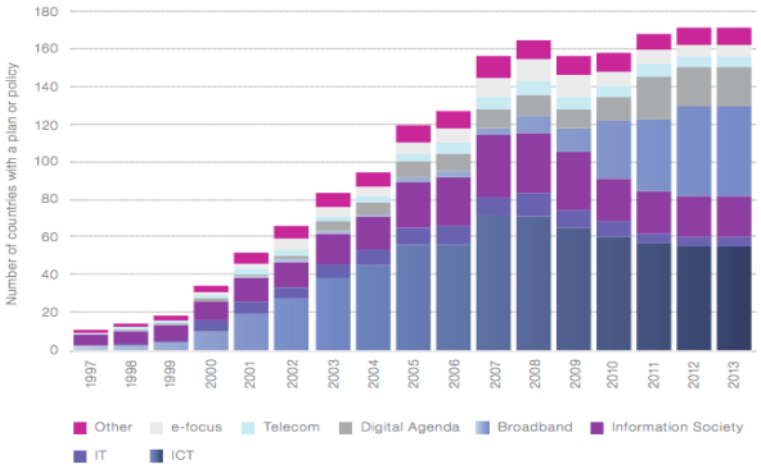
Box 2 shows the connection cost of fixed broadband in different countries

In this regards, appropriate policy and regulatory decisions should be taken to address affordability including setting targets of what the cost of broadband should be as a percentage of income.

3.2 Policy and Regulation

Policy and regulation constitute an important platform for the development of broadband, hence effective development of broadband should have a sharp focus on policy and regulation; SD 2027 strategy also includes this as a crucial platform for its realization. The evolution of focus policies are presented in Figure 2.3

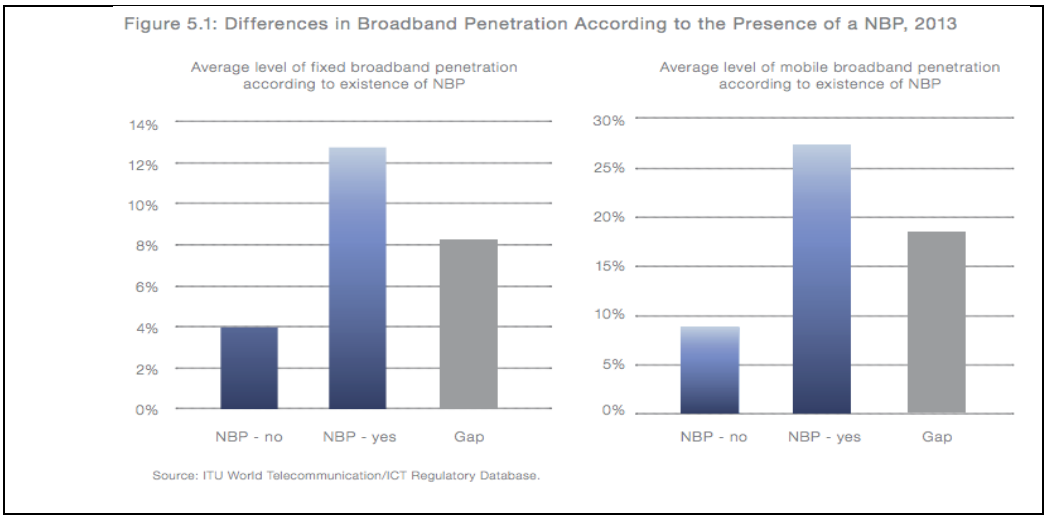
Figure 2.3: Focus of Different Policies & Plans, 1997-2013



Source: Cisco and ITU, 2013, Planning for Progress: Why National Broadband Plans Matter

3.3 Infrastructure

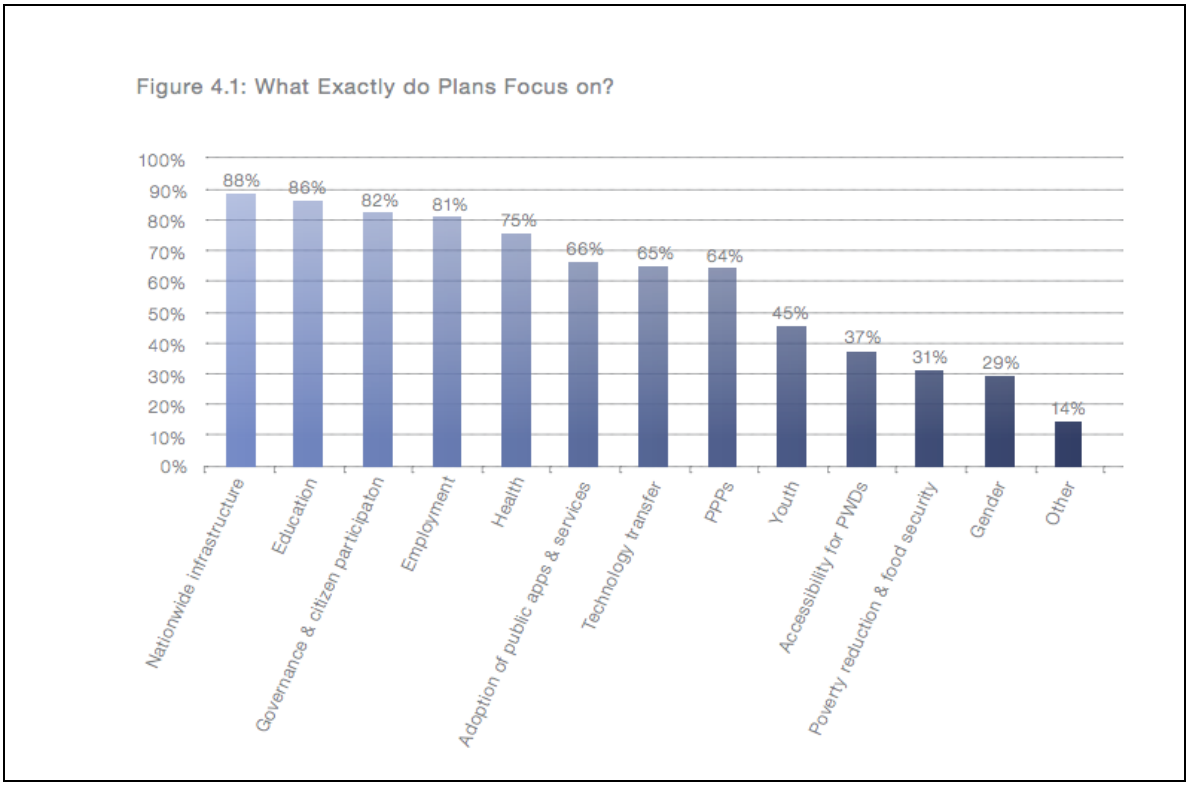
There has been an increase in ICT plans with greater focus on broadband over the last decade (A4AI[16], 2014) since failure to plan will inevitably lead to failure. Broadband penetration in relation to the presence of NBP is presented in Figure 5.1



Source: ITU World Telecommunication /ICT Regulatory Database

It is evident that the presence of NBP leads to higher penetration of broadband and that low levels of BB penetration can be attributed to the absence of NBP. The challenge therefore is that countries that do not develop and implement broadband plans risk having lower levels of broadband penetration leading to loss of socio-economic benefits that result from broadband. However, there is opportunity resulting from availability of more indicators of what works than ever before and thus a great opportunity to logically plan effective broadband development. It should be noted that most broadband plans are largely focused on infrastructure (Figure 4.1)

[16] Alliance for Affordable Internet (A4AI)



Source: Cisco and ITU, 2013, Planning for Progress: Why National Broadband Plans Matter

Though infrastructure is the focus, there is an increasing focus on driving adoption and sustained use of broadband.

3.4 Stakeholder consultation

Stakeholder consultation/engagement is crucial to the success of broadband strategy and plan. However, there are challenges associated with it: it is a very protracted process where existing relationships can undermine process; and the inability of stakeholders to articulate needs (e.g. weakness of consumer organizations/groups) can also hamper the process. In spite of these challenges there is an opportunity for facilitation of the process (competent organizations exist for this purpose); and that, if well executed, implementation of the plans is smooth; and further that there is increasing number of ICT enabled ways of canvass ideas. In this regard, identifying

stakeholders, establishing collaboration, and mapping demand are crucial (See Box 3) in the broadband strategy development process.

Box 3. Identifying stakeholders, establishing collaboration, and mapping demand

There are many stakeholders involved in a broadband project. A broadband plan that creates the right conditions and incentives for all the relevant stakeholders to participate in the project will be able to better leverage on the resources, competence and assets present in the region and ultimately, will have higher chances of being a success.

Important stakeholders can be found in the private sector, and the project will increase significantly its success chances by making them business partners, rather than competitors:

- other companies owning infrastructure (especially fibre, or last mile connections to the end user);
- operators and service providers interested in selling services over the network;
- network providers interested in placing active equipment in all the nodes and to deliver those services (see section on business models);
- other telecom companies willing to lease the dark fibre, e.g. 3G/4G operators, cable TV operators, service providers, and any other operator needing backhauling;
- non-telecom companies wishing to lease dark fibre for their own needs (e.g. banks, TV production companies, large corporations, etc.).

Source: Adapted from 'Guide to High-speed broadband investment'. Available at: http://ec.europa.eu/digital-agenda/en/news/broadband-investment-guide/ (September 18 2014).

In a broader sense the stakeholders in the broadband ecosystem include the following:

(i) Government ICT policy and regulatory bodies;

(ii) other Government agencies and institutions (whose visions may need integration with ICT vision);

(iii) ICT network and service providers;

(iv) other ICT industry suppliers;

(v) financial sector representatives;

(vi) information, applications, and content providers;

(vii) Community organizations, NGOs; and

(viii) business and citizen consumers

Besides these stakeholders, an identification and mapping of broadband demand in a customer centric manner is required for a complete broadband plan.

3.5 Data Collection and Evidence-Based Decision Making

The 'rule of thumb' decision making process is not appropriate in moving the BB agenda forward. In this case, the setting of objectives, goals and targets must become more evidence-based. However, it is difficult to access reliable data from a number of countries in the SADC region as was the case during BB surveys. Data in some countries may either be inaccurate or outdated and in some cases its collection is not systemized (who collects, when, what and how).

This challenge notwithstanding, there is opportunity to remedy the situation through:

(i) obligating private sector to collect data to share it;

(ii) getting guidance from international organizations and stakeholders e.g. the ITU; and

(iii) that costs of data collection are falling with available online tools for data collection.

3.6 Monitoring and Evaluation

Having a body that will monitor implementation and impact of broadband is critical. The main challenge though is that there is limited experience with M&E. However, this can partly be addressed by the increasing number of effective frameworks and models for monitoring and evaluation of implementation of plans/ projects including broadband but this remains significant proportion of annual budgets of some PAs.

3.7 Consumer Protection and Pricing Transparency

"The only sure bulwark of continuing liberty is a government strong enough to protect the interests of the people, and a people strong enough and well enough informed to maintain its sovereign control over the government."

Franklin D. Roosevelt, 32nd President of the USA

Although broadband plans and strategies must become more consumer-centric, it is hampered by weak consumer advocacy groups and difficulty in pricing transparency for broadband in countries with low levels of digital literacy. This requires capacity building and creation of awareness among consumers/consumer groups. To address this problem, there is an increasing focus on consumer protection among regulators including a dedicated section within the regulatory body to deal with consumer protection issues. Further, policy and legislation[17] on consumer protection[18] have been enacted in a number of countries in Africa including among SADC member states including in South Africa[19] and Common Market for Eastern and Southern Africa (COMESA) countries such as Kenya.

The SADC Declaration on Regional Cooperation in Competition and Consumer Policies is a positive endeavor towards promotion of consumer rights.[20] To address this challenge further, private sector evidence about pricing transparency is available e.g. from Intel and Google, international consumer advocacy groups[21] and Consumer Organisations[22] is

[17] One of the mandates given to MACRA under section 4 of the Communications Act Cap 68:01 of the Laws of Malawi is Consumer Protection. For further information see also http://www.macra.org.mw/index.php?page=pages&pid=124

[18] The 24th Meeting of ARICEA Executive Committee discussed the regulations. It has been agreed that the draft .regulations be circulated for Members for comments. The comments have to be sent to the ARICEA Secretariat before or by 7th Nov 2014

[19] For further details see: https://www.icasa.org.za/LegislationRegulations/FinalRegulations/ConsumerProtectionRegulations/tabid/717/Default.aspx

[20] For detailed provisions, see; http://www.tralac.org/files/2011/03/SADC-Declaration-on-Regional-Cooperation-Competition-Policy.pdf

[21] For some of the gaps and opportunities for improvement of the consumer protection environment, see: http://www.consumersinternational.org/media/1344758/developing-rights-based-consumer-protection-advocacy-strategies.pdf

prepared to advise and support; and to provide information for consumers whilst other organisations assist consumers by producing guides and educating consumers on their rights, campaigning for a fair deal and/or advising consumers on what to do in cases where they have complaints even as others are involved in enforcing consumer protection law.

3.8 Shared Access

Although shared access is one of the cornerstones for successful broadband deployment, there are a number of challenges facing this approach including: funding and sustainability, the belief that shared access is not important, and difficulty in building effective partnerships between agencies.

The existing opportunities to address this problem include: increasing evidence of what works, Universal Access Service Fund (UASF) to roll out shared access, and connecting public institutions which has multiple benefits. Guidelines for shared access should be prepared/ finalised for each SADC member state to guide them in the deployment of broadband since this aspect has important implication for the cost of deployment and affordability of broadband.

3.9 Affordability

In summary, affordability remains a serious challenge to the demand side of broadband hence low levels development and use of broadband services in SADC. The cost of entry-level for mobile broadband in SADC ranges from 1.8% to 126.4% of Gross National Income (GNI) per capita with only two SADC countries having achieved United Nations

[22] See also http://www.consumercouncil.org.uk/filestore/documents/home_economics_a_level_and_gcse/gcse_wiser_buyer/Consumer_Organisations_Factsheet.pdf

(UN) target of 5% of GNI per capita[23].The barrier to broadband demand is a result of **NOT doing** the following: planning, consulting stakeholders, using data for evidenced based decision making, creating enabling environments for open access, infrastructure sharing, implementing mobile broadband, developing and executing a monitoring and evaluation plan, providing shared access, and NOT being consumer-centric.

Since the essence of broadband deployment is to contribute to socio-economic development by citizens using the services, it implies that the factors that impact affordability and hence demand and use of broadband should be addressed/incorporated in the national broadband strategy and plan as a bare minimum.

3.10 Role of Champions

The role of champions is crucial for broadband development and deployment. Therefore, identifying and empowering *champions* to drive the process *is essential.* The champions may include people from among the various stakeholders. However, in the context of universalizing broadband and shared access, it is imperative that government takes a facilitating lead role.

3.11 Elaboration of broadband projects

Task teams should be set up to elaborate projects under each priority area/ pillar. These projects should be prioritized and a comprehensive delivery framework provided - objectives, actions, time frame, responsibility, budget, outcomes, and measurement/ verification indicators.

[23] Reported in A4AI presentation (UBW, 2014). See also ITU Measuring the Information Society (2013) Ranking for fixed and entry-level mobile broadband prices at https://www.itu.int/en/ITU-D/Statistics/Documents/publications/mis2013/MIS2013_without_Annex_4.pdf

4.0 STEP BY STEP GUIDELINES FOR DEVELOPMENT OF A NATIONAL BROADBAND PLAN

Some of the themes in national broadband strategy and plans are: definition of broadband, infrastructure, creation of demand, e-services, affordability, capacity building, and investment, institutions and governance, regulation/legislation and stakeholder involvement. The definition of broadband varies between countries in Africa including SADC and a common definition is required. However, as a starting point, and based on experience elsewhere (e.g., India), the entry level for broadband is 512 kbps and should be reviewed upwards as the deployment of broadband progresses in SADC countries.

4.1 Key Considerations for Broadband Development

In this sub-section, key considerations and relevant questions for broadband development are presented.

Defining goals. In order to identify how and where to make interventions for broadband, a number of questions need to be answered by the public authorities in charge of broadband development:

(i) What are the social and economic development objectives of the region in the next 10 to 20 years?

(ii) How does high-speed broadband fit into those overall objectives and how can it contribute to its achievement?

(iii) What needs for services are based on high speed broadband among the socio-economic actors in the regions?

(iv) What are the problems to overcome for the rapid deployment and for facilitating usage of high speed broadband in my [a respective] region?

(v) Which benefits will broadband create for residents located in different areas of the region (urban, rural and other sparsely populated areas) and for society at large in terms of economic growth, business development, employment, tourism, education, culture and leisure etc.?

Need for Analysis. Due to the importance of the foregoing questions it is imperative to carry out an in-depth analysis of the current socio-economic context in order to map the current situation, verify citizens' and business demand, and sustain these needs through a healthy competitive market in high speed broadband services.

Scope of national broadband plan. Based on the answers to these questions, the national broadband strategy and plan should be based on clear principles[24] and taking into account the following issues

(i) **Vision, goals and pillars.** Existence of a clear national vision such as Nigeria's Vision20 2020, South Africa's Vision 2030 and Kenya's Vision 2030 and other national Vision. The broadband plan should aligned with the national development plan of the country;

(ii) **National ICT policy** which should be based on the goals of the national development plan where aspects of the national development plan that ICT will make a contribution to as an enabler and/or a sector are identified.

(iii) **High level leadership and direction** such as the Presidency and/ or the Ministry responsible for ICT;

(iv) **A credible policy, regulatory, and institutional framework** and enactment of legislation establishing the regulator (among other provisions);

(v) Consultation and participation of all stakeholders in the preparation of the national broadband strategy/plan;

(vi) **Finance and investment.** Leveraging the strength of the public and private sectors through Public Private Partnerships (PPPs) to finance broadband development;

(vii) **Implementation framework** encompassing all stakeholders with very clearly defined roles, responsibilities and accountability mechanisms including frameworks for content, infrastructure, finances, rights of way.

[24] These principles include (1) universal and open access, (2) competition over shared resources, (3) transparency, and (4) the right to interconnect.

(viii) **Monitoring, measurement and evaluation of the progress of the plan**. A comprehensive and holistic monitoring and evaluation of broadband development will further contribute to the success of the project.

ICT policy processes[25] involve policy conception, formulation, development of strategies and action plans and implementation of ICT programmes. A typical policy process is shown in Box 6:

Box 6: Typical Policy Process

- High-level policy makers begin the conception of a policy for ICTs by articulating the needs
- An advisory group or a task force (drawn from key stakeholders) is established to drive the policy process
- External consultant may be hired to support local teams in conducting e-readiness (needs) and putting a policy document together
- Draft policy discussion paper that outlines key public commitments is produced
- A review of a draft discussion paper by stakeholders is made
- Consultation is held with the various government departments
- Approval of the draft policy paper by the Cabinet
- Approval of the policy paper by legislators
- Development of policy strategies and action plans
- Implementation of the ICT strategy and action plans (including through flagship projects e.g., e-government)
- Monitoring and evaluation of progress on annual basis
- Revision of the ICT policy and Implementation plans based on data obtained from monitoring and evaluation

Source: Adapted from "ICT Policy in EAC Partner States: Regional Harmonization Report", by Dr. Lishan Adam, September 2008

4.2 Broadband Pillars, Platforms and Mapping

Drawing from the broadband ecosystem, six thematic areas (pillars) and at least two enabling platforms should form the content of the national broadband plan.

[25] See also "ICT Policy in EAC Partner States: Regional Harmonization Report" by Dr. Lishan Adam, September 2008

Broadband pillars. Based on the findings of the assessment of broadband plans status in the SADC member states and literature from other regions such as the European Union (EU)[26] on broadband deployment suggest that a national broadband strategy should address at least six key areas/ themes which are important for its successful implementation which should be supported by a platform comprising governance and a monitoring and evaluation framework. The six key focus/ areas of the NBP strategy and plan should be:

(i) Infrastructure;

(ii) Connectivity and Devices (including wireless Next Generation Access [NGA] networks and integrated multi-service access devices);

(iii) Content, Applications and Innovations – including Research and Development (R&D) in these areas;

(iv) Capacity Building and Awareness;

(v) Policy and regulatory harmonization covering policy, legislation and regulation;

(vi) Finance and Investment.

Enabling platform to support broadband pillars. These key areas should be supported by an enabling platform comprising:

(vii) Confidence and security of networks and services;

(vii) Governance structures, with clear roles and responsibilities for broadband

At implementation phase, a clear broadband implementation framework; and monitoring and evaluation of the development of broadband should be developed.

Mapping of current broadband situation. The decision on these key factors (six themes and three platforms) should be preceded by a clear mapping of the current situation in each of the SADC member states. The questions to address in the mapping process are

[26] See also 'Guide to High-speed Broadband Investment' at: http://ec.europa.eu/BroadbandInvestmentGuide.pdf

presented in Box 5 showing the key questions that should inform the broadband (current situation) mapping process.

Box 7. Mapping the broadband current situation[27]

The broadband plan should include a market and infrastructure analysis of the Region's broadband situation. Mapping[28] is a key element to identify areas affected by market failure. Some of the key questions that should be answered are:

- What are the socio-economic and demographic features of the territory?
- What are the current coverage, quality and price of broadband access?
- What coverage of next generation, high-speed broadband will the region/ country most likely achieve commercially, if no intervention is made?
- How credible are the existing plans for private investment for the next three years?
- What is the demand for services required by the household and enterprises?
- Which public services are to be delivered (exclusively) online in the coming 10-20 years?
- Where/what are the gaps left between the existing and forthcoming private deployment of broadband services and what are the needs for services expressed by the territory (Region/ country)?

Source: See http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2013:025:0001:0026:EN:PDF

4.3 Key Success Factors for Broadband Development

There are number of key factors that have implications for the success of the formulation and implementation of a broadband strategy. Specifically, attention should be paid to the following key issues in formulating broadband policy and strategy:

(i) definition of broadband (see Box 6) starting from an entry level and setting targets for future rollout and use

(ii) affordability of broadband by addressing all drivers of cost to ensure that price barriers to the access and use of broadband are lowered or eliminated

[27] For further information please consult also the EU State aid guidelines on Broadband: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2013:025:0001:0026:EN:PDF

[28] See also: http://www.broadbandmapping.eu/

(iii) competition and private investment by creating regulatory certainty and availing spectrum and other resources to investors

(iv) role of government – at the very least, government should act as:

a) policy maker
b) broadband facilitator
c) lead applications developer
d) major user
e) investor in network infrastructure
f) demand side facilitator

From the broadband definition perspective, the comparison between basic broadband and next generation broadband in fixed networks is presented in Box 8.

Box 8 - Basic broadband versus next-generation broadband in fixed networks

There is often a great deal of confusion when it comes to broadband, Internet and next generation network (NGN). Even though the relationship between infrastructure and speeds tends to change with technological development and advancement, digital communications services (of which Internet service is only one, digital TV, IP-telephony, security and e-health services are among others) can be classified as follows (ordered in increasing speed and quality):

1. **First generation** always-on **broadband connections:** these are the most common BB connections in Europe today. They can be achieved using telephone lines, coaxial cables for TV distribution, satellite dishes, or wireless connections (see below). These connections (mostly ADSL) are typically asymmetric: the download speed is typically a few Mb/s while the upload speed is below 1 Mb/s. The Digital Agenda for Europe (DAE) targeted 100% broadband coverage by 2013.

2. **Fast broadband connections (NGN)**: these are connections gaining prominence in the many parts of Europe. Like basic broadband, they can be achieved on most transmission media, but their speed typically ranges between 30 Mb/s and 100 Mb/s. They are most often asymmetric and special conditions need to be satisfied for them to work on traditional infrastructure (typically distance of the user from the first aggregation node, number of users sharing the line, and the installation of advanced equipment.

In the SADC context, each country should define its own targets starting with an entry level agreed at SADC level (such as 512 kbps) which takes the current state of broadband in the country then revise the target progressively as the BB is being deployed.

Source: See "Guide to high-speed broadband investment" at http://ec.europa.eu/digital-agenda/en/news/broadband-investment-guide. September 2014

(v) **Ownership and Coordination for Broadband Outcomes.** Broadband is a whole-of-government, whole-of economy and whole-of society matter; and should therefore have ownership across the board. In this regard appropriate governance structures are necessary to drive the broadband agenda.

4.4 Checklist of Best-practice Broadband policy, Strategy and Plans

Based on the findings of the study[29] from Angola, Botswana, South Africa, Lesotho, Nigeria, Kenya, Morocco and Malawi, a synthesis of recommended best practices and themes for national broadband strategy and plans is as follows:

(i) **definition of broadband** by starting at entry level (e.g., Lesotho is 512 kbps download speed) and provision of a roadmap for the increase of the speeds with clear targets;

(ii) **clear policy objectives** and decisions to give expression to the national development plan/ vision;

(iii) **policy decisions** including administrative policies, demand-side policies, supply-side policies; and regulatory principles to support broadband;

(iv) **complementary strategies** for the policy objectives such as provision of power supply;

(v) institutional framework for the implementation of the strategy/plans - regulator, broadband council, licensed operators;

(vi) **action plans,** targets, and key performance indicators on outcomes,

(vii) **process** for developing the NBP which should be clear **transparent and participative and covering all the broadband pillars**;

(viii) **legislation** to give effect to the policy and strategy including the establishment of governance institutions for Broadband;

[29] For further details see ITU survey of national broadband plans status in Africa (2014 July)

(ix) as part of the process, a **public consultation notice**[30] to be issued setting out context, key issues[31] and next steps with regards to the NBP; objectives and expected outcomes of national broadband policy;

(x) **clear focus on implementation** of NBP through projects (flagship, e.g., e-health, e-education, e-agriculture; and demonstration – such as trials such as on TV white spaces) under each NBP focus/pillar/thematic area complete with its key performance indicators, targets and measurements of all relevant outcomes;

(xi) **investment strategy** for broadband e.g., public investment, public private sector partnerships in broadband rollout, private sector investment, and community based (bottom-up initiatives) in the next generation broadband network;

(xii) **holistic approach** to broadband development including targeting connectivity globally, regionally (across SADC), and nationally (in each member state)first-mile and integrated/ multiservice access devices;

(xiii) **content and applications** such as through a local content and applications development fund; and dedicated ICT entrepreneurship and R&D funds in the overall context of digital opportunity realization strategy

(xiv) **driving demand** for broadband including through stimulating demand and usage by citizens; and by the public and private sector which still remains a challenge;

(xv) **clear roles** including that of Government for policy, regulation and legislation; and facilitation of broadband;

(xvi) **universalization of broadband** including through universal service fund[32] (USF) strategy to ensure equity and inclusion;

(xvii) **budgetary provision** for broadband including through its (broadband budget) alignment with the national budget cycles

[30] For example the DoC Consultation Notice available at http://www.ellipsis.co.za/wp-content/uploads/2013/03/Consultation-on-National-Broadband-Policy-April-2013.pdf

[31] See also the Lesotho National Broadband Policy and associated Strategic Implementation Plan. Public Consultation, March 2014

[32] USAF should be set up and operationalized where it is not available. The universal fund should be funded from a combination of sources including operator levy, direct government contribution and from any lawful contribution from any approved third party

4.5 Framework for Broadband Development

Broadly speaking, the success of all these initiatives depends on appropriate framework including a regional/national development vision of ICT policy and sector development plans, legislation, and regulation. The broad framework for the development of broadband comprises governance, implementation, financing/investment, demand and supply of broadband:

(i) **Governance of broadband**

This involves the manner in which broadband issues are being_managed; and their oversight for the orderly development of broadband;

(ii) **Implementation framework for broadband**

This aspect connotes the mode of execution or how broadband is being/should be put into operation by focusing on institutions (and stakeholders) involved in the actual implementation;

(iii) **Financing of broadband**

Relates to the manner through which broadband development receives funding through various sources of funds for broadband including investment by both government and private sector;

(iv) **Demand side of Broadband**: content development [33], applications and innovations, training, and stimulation of demand (e.g., through creation of awareness); and,

(v) **Supply side of Broadband** covering technologies, security, and guidelines to support broadband deployment; these include:

a) SADC Broadband Spectrum Plan guidelines;

b) SADC Infrastructure Sharing guidelines (under development);

c) SADC Open Access to Broadband Infrastructure guidelines (under development); and

[33] A task team should be set up to deal with content development and bring out specific projects that should be included in the NBP; the same should apply to all other initiatives

d) SADC License Exempt Spectrum Plan guidelines (under development)

(vi) Monitoring and Evaluation. Unless a robust framework for monitoring and evaluation which addresses all the aspects of the national broadband plan is put in place, the goals of the plan will not be realized – though a very important consideration in broadband planning, it is the most neglected aspect of most of the plans.

5.0 BROADBAND INFRASTRUCTURE

Broadband infrastructure (access, core and transport) development is the focus, but there is an increasing focus on driving adoption and sustained use[34] of broadband by addressing the affordability. There are two main options for investing in broadband infrastructure: Access network and backbone/core network.

5.1 Choosing the right infrastructure type for first-mile connections

The access network, which comprises the connection between the end user and the nearest network node (e.g. local exchange or central office) has various options available for providing broadband connections in the access network depending on the requirements and available funding (including existing copper lines, new fibre-optic cables and wireless networks).

The optimal infrastructure choice for the first-mile connections is the subject of heated debate and the advocates of different solutions are often driven by partisan commercial motives. What we can say is that each situation will present different logistical, economical, demographic conditions, and hence different infrastructure solutions may be best suited.

Fibre connection. Although a fibre connection (FTTH/FTTP) is reputed to be the ultimate long-term solution, a mix of infrastructures can help to satisfy different requirements (see info box). The final solution will depend on the level of ambition of the region, the

[34] Alliance for affordable Internet (A4AI)

type/number of services required by the territory, and whether a state-of-the art infrastructure could help to substantially increase the attractiveness of the area to business and individuals alike. The solutions available are listed below, while their pros and cons are summarised in the table at the end of this section.

Twisted pair copper cable. The infrastructure most commonly used in the early phase of broadband is legacy telephone unshielded copper twisted pair, over which technologies, such as ADSL, have been successful in providing basic broadband connections in the past decade or so. This solution has the advantage that a copper telephone line is already present in most households. For it to be able to carry fast (or in some cases even basic) broadband connections, however, it often needs to be upgraded and this is not always possible. For short distances (few hundred metres) and good copper lines, VDSL technology can deliver fast broadband today.

Coaxial cable. A second infrastructure option for first-mile connections is represented by **coaxial cables**, typically used for TV distribution within buildings and in some urban areas for connecting buildings to a TV distribution network. This technology has slightly more room to deliver higher broadband speeds than on telephone lines. Fast broadband is becoming available on many cable-TV networks, and if infrastructure is properly upgraded and distances kept short (tens or few hundreds of metres) ultra-fast speeds may become possible in the short-medium term.

Terrestrial wireless. Whenever the upgrade of the wired infrastructure is not possible, and funds for FTTP/FTTH are not available for a certain area, an option is to build infrastructure for terrestrial wireless broadband, mainly antenna sites for point-to-multipoint connections. WiMax, WiFi (but also 4G/LTE solutions) have the advantage that no first mile infrastructure needs to be deployed except for the antenna sites. These also have the potential to cover areas in which telephone lines are too long, or of extremely poor/bad quality to be used for xDSL.

Satellite access. Satellite connections can be used to cover large, very sparsely populated areas. Satellite connections do not need to use the regional backbone and the area networks, but require the purchase of end-user equipment.

5.2 Choosing the right Infrastructure type for the Backbone and Area Networks

The backhaul and core network provide links between network nodes to allow connectivity over large distances (e.g. between towns and cities). Because traffic from a large number of end users is aggregated as it passes through the backhaul and core networks, fibre optic cable is often the technology of choice due to its high capacity. High-capacity wireless microwave links are also used. Area networks are also deployed to serve smaller geographical areas such as a city - an example is metro-fibre network.

Backbone. A regional and national **backbone network** generally consists of a ring of fibre optic cable (one cable contains several, even hundreds of optical fibres) connecting different areas of the municipality or region. The ring topology has the advantage of being robust against single fibre cuts or other faults (see info box). More advanced topologies (e.g. meshed) are sometimes used in the backbone section of the network.

Area networks. The **area networks** are also often implemented with a ring of optical fibre cable although tree topologies can be used. If funds available for the moment are very limited, the total end-users to be connected in the area are relatively few, microwave links may be used as a short- to medium-term solution. An illustration of the broadband network is presented in Figure 6a

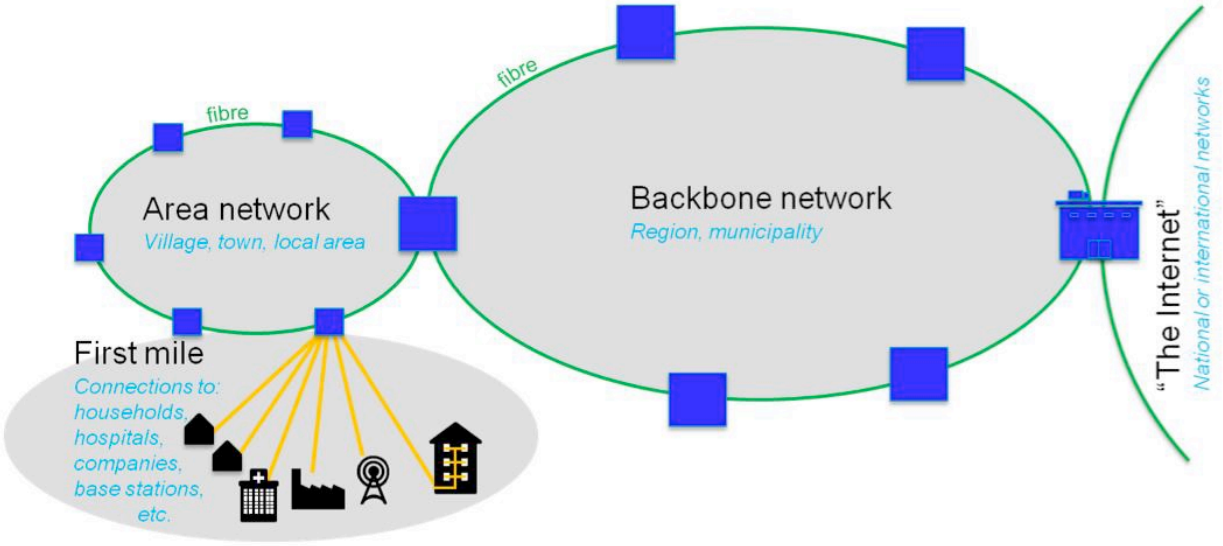
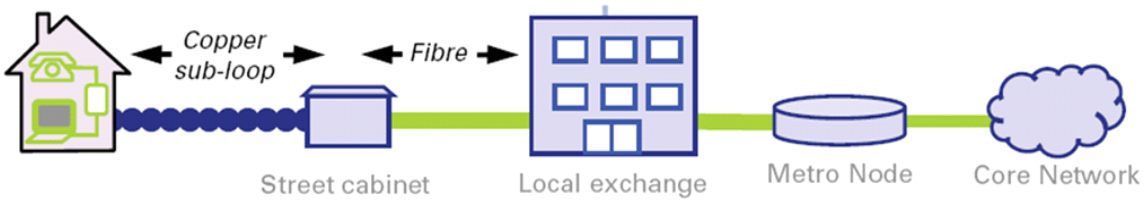


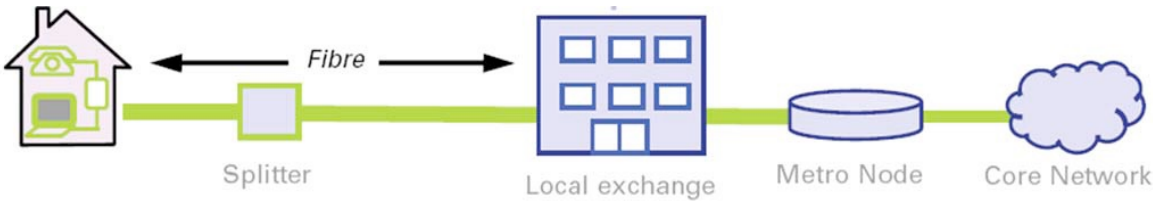
Figure 6a. Illustration of the backbone network, Area network and the first-mile connections

A further elaboration of the extent of the access and backhaul/core portions of the network is shown in Figure 6b for three examples of next generation access (NGA) technologies

Fibre to the cabinet



Fibre to the premises



Terrestrial wireless



Figure 6b. Extent of access and core/backhaul networks for some NGA technologies [Source: Analysys Mason]

5.3 Broadband Access Technologies

In the African context, these can include either or a combination of 2G, 3G, 4G, wireless fidelity (WiFi), worldwide interoperability for microwave access (WiMAX), Satellite, HSDPA, and TV white spaces (TVWS) access technologies; and fibre optic based access systems such as fibre to the home/cabinet (i.e., FTTx) among others depending on technical feasibility of their use. The use of the TVWS for broadband Internet should be preceded by assessment of the availability of spectrum followed by determination of both commercial and technical feasibility.

Comparison of First-mile infrastructure[35]. A comparison of various first-mile (access) infrastructures is presented in Table 2

[35] For further information please see also Annex A3 of the Handbook for decision makers: the state aid rules explained

Table 3. Comparison of first-mile infrastructure

	Pros	Cons
FTTH/FTTP (benchmark)	Future proof, extremely high level of service, symmetry.	High investment in passive infrastructure
Telephone copper line	1. Relatively low investment needed for passive infrastructure 2. Least disruptive for the end users	1. High (download) speeds depend on the length of copper line, the number of users, the type of applications, the amount of data traffic and the technology used. 2. New copper-based technologies (e.g.: vectoring, G.fast) can deliver high speeds but suffer from the same limitations. 3. xDSL technology is heavily asymmetrical: upload speeds are generally much lower than download speeds: this may hamper new services like cloud computing, videoconferencing, teleworking, tele-presence, etc. Higher investment needed in active equipment (with a life-time of 5-10 years). 4. Interim solution: investment in fibre infrastructure most likely postponed by only 10-15 years.
Coaxial copper line	1. Relatively low investment needed for passive infrastructure 2. Least disruptive for the end users	1. Bandwidth shared among several users: peak traffic periods of the day will reduce the available bandwidth for each user 2. The impossibility of unbundling makes service competition basically absent in the cable market. Seldom present in the digital-divide areas 3. Interim solution: investment in fibre infrastructure most likely postponed only by 10-15 years
Antenna sites for wireless	1. First mile wire connections not needed. 2. Infrastructure can be used for commercial mobile services as well	1. Bandwidth shared among several users: peak traffic periods of the day will reduce the available bandwidth for each user. Signal strength decreases fast with distance, and affected by weather. Bad weather and disturbed line-of-sight may reduce signal quality 2. Interim solution: investment in fibre infrastructure may be needed within 10-15 years.
Satellite dishes	1. Backbone and area networks not needed: low investment needed for passive infrastructure 2. Easy to connect users scattered over a relatively large area (regional, macro-regional or even national)	1. Limited total number of users can be covered in one region 2. Inherently high signal latency due to the propagation time to and from satellite: this hampers certain applications 3. Relatively high cost of end-user active equipment. 4. Bad weather and limited line-of-sight may reduce signal quality 5. Data consumption typically capped monthly or daily in current commercial offers

5.4 Mobile broadband

Mobile communications has increased the opportunities for broadband deployment through 3G, LTE etc. Some broadband statistics are presented in Box 4 showing facts and figures of mobile broadband

Box 4. Mobile broadband facts and figures

- Mobile internet subscriptions have increased nearly tenfold over the last six years, from 68 million in 2007 to 2.1 billion in 2013
- Whether in health, education, retail, payments, public services or improved productivity, the impact of mobile Internet is universally evident
- Annual economic benefit of the mobile Internet is estimated to be between US$3.7 trillion to $10.8 trillion globally by 2025 (McKinsey,2013)
- By 2017, around half or 4.25 billion of 8.5 billion mobile connections will be 3G or 4G (GSMA)
- Ericsson reports that "70% of users in the countries it researched browse the Web on mobile devices, compared with just 6% who use desktop computers."

Source: Broadband Commission Report

Though mobile broadband holds the promise for broadband diffusion in the developing and least developed countries such as some of those in SADC, this technology faces some bottlenecks that need to be addressed in the framework of BB strategy, plan and implementation, key among these bottlenecks are: lack of spectrum, lack of devices, and taxation on ICT equipment.

To address these challenges there is opportunity in the form of spectrum dividend within the overall context of digital dividend, mobile industry is focused on mobile broadband, the cost of devices is decreasing, and countries are focused on reducing taxes on broadband equipment (*e.g.* Ghana, Nigeria, and Brazil). All these initiatives should be scaled up to ensure diffusion and use of broadband for socio-economic development of populations.

5.5 Optimal use of existing infrastructure

Since inefficient use of existing infrastructure impacts the cost of broadband (e.g., investment in new infrastructure [duplication] when the existing infrastructure could be shared to reduce cost of deployment of broadband), each country should develop (or adapt) and implement infrastructure sharing framework to guide the deployment of BB by service and network operators in the country (Refer to the SADC Guidelines on this subject).

5.6 Content Development[36]

Content services in the field of education, health and agriculture recognized by international organisations such as the ITU and the World Bank as being of paramount importance to contribute to the Millennium Development Goals, MDGs (now sustainability development goals [SDGs]) and therefore have a maximum potential socio-economic impact[37]. A specific task team with requisite skills and expertise should be set up to develop the content development strategy and projects to form part of the NBP with specific guidelines[38] being developed. It is also necessary to provide for legislative mandate and authority to an entity to develop and enforce content development guidelines where this does not exist yet.

6.0 BROADBAND INVESTMENT MODELS

In this section, we describe the different financing models available to a public authority wishing to invest in a broadband project. The financing model defines how the deployment, operation and management of the broadband network can be financed by public and private players. It also includes considerations on state-aid, especially in the case of public-private co-investment - the PPPs.

6.1 Possible Investment Models

[36] See also Appendix III on elaboration of projects under each NBP pillar

[37] See also Draft Botswana National Broadband Strategy (August 1, 2013) at http://www.bocra.org.bw/sites/default/files/documents/Phase%203%20Report%20V3%201%20%282%29.pdf

[38] An example of content development guidelines (for Nigeria) is found at: http://www.nlipw.com/wp-content/uploads/Guidelines-for-Nigerian-Content-Development-in-Information-and-Communications-Technology-ICT.pdf

The most important choice a public authority faces is choosing how much to commit, and what role to take vis-à-vis the market, the citizens, and the businesses in the region. This should be considered separately from the public authority's role in deciding on the best financial resources, as argued in the section on 'How to finance the project', four investment models can be identified:

(i) direct investment: the public-run National/ Municipal Network model (aka Public DBO[39]) ;

(ii) indirect investment: the private-run National/ Municipal Network model ;

(iii) operator subsidy (aka Gap-funding or private DBO) ; and

(iv) support of bottom-up community-led initiatives: the Community broadband model

Key questions that should guide the choice of the investment model are presented in Box 9.

Box 9 - Questions for Broadband Choosing Investment Model

Some questions that a public authority will need to answer in the choice of the investment model are:

1. How can we create an engine that ensures future investment in infrastructure beyond the immediate project and funding available?
2. Are there benefits in keeping control and ownership of the passive infrastructure and in defining the deployment priorities?
3. Would we be better off keeping the ownership of the infrastructure but let an operator define and execute the deployment?
4. What are the pros and cons of involving vertically integrated operators (incumbents and others) in the upgrade or expansion of the network?
5. Do we also see scope to (of supporting) support local bottom-up citizen initiatives?
6. Given the socio-economic conditions on the ground, which level of competition is required to facilitate penetration of high quality and affordable services?

6.2 Basic business models

Depending on which market actors take up what roles (PIP, NP, SP), different business models arise. If one market actor takes all three roles, it is said to be vertically

[39] Design, build and operate

integrated, and the resulting business model is referred to as a vertically integrated model (all large telecom operators)

In some cases, especially if the vertically-integrated actor is deemed to have significant Market Power (SMP), regulation imposes that network access be opened to competitors, either at the passive or the active layer, as discussed in the section below. In that case, the network owner designs the network to deliver its own services and gives access to its competitors in forms compatible with the network design. Although sometimes incumbents refer to this model as “open access”, this is in reality a vertically integrated model with unbundling (either at physical layer, called local loop unbundling (LLU), or at the active layer, called bit stream access).If, on the other hand, the roles are separated, we refer to an open network model. In an open network the infrastructure that is available to all market participants is available at equal conditions. This can take different forms, depending on whether the network owner (e.g. a PA, a cooperative, or a private firm running a municipal network) operates at PIP level alone, or at the NP level as well. If the network owner is only involved at the PIP level, /she has two further choices: s/he may decide to leave the higher layers to market players (competition in the market), or may decide to contract the NP role to one market actor for a number of years (competition for the market) (typically three to five), with the task of providing end-user connectivity to competing service providers. Consequently, three open network business models can be identified:

(i) Passive-layer open model (**PLOM**)
(ii) Active-layer open model (**ALOM**)
(iii) Three-layer open model (**3LOM**)

In all these models, and if enough fibre has been installed, fibre in the backbone network is generally leased to third parties (such as 3G/4G operators, cable TV operators, service providers, as well as non-telecom companies like banks, TV

production companies, large corporations, etc.), independent of whether competition in the retail market (first mile connections) is at the passive (PLOM) or active layer (3LOM or ALOMs). This maximises the return on the fibre investment: the major cost in fibre deployment is not the fibre cable per se, but rather the civil works to install it, hence tens or hundreds of parallel fibres are usually deployed. Moreover, it directly or indirectly increases infrastructure-owner revenue, which can be reinvested for network expansion.

Passive-layer open model (PLOM). Under this model, an entity (e.g. the PA, a local cooperative, or a private investor, depending on the investment model chosen) builds and operates passive infrastructure to be made available to all market actors under fair and non-discriminatory conditions. This entity deploys the passive infrastructure either directly, or through standard procurement to the market (civil engineering and network deployment companies, not telecom operators). The PIP keeps ownership of the passive infrastructure and runs operation and maintenance.

Active-layer open model (**ALOM**). In this model, one entity deploys and operates the passive and active layer (hence acting as an integrated physical infrastructure and network provider). This entity places active equipment in all access nodes and builds an open, operator-neutral network over which all service providers can deliver their services to all end users.

In the value chain for the ALOM, the backbone physical infrastructure provider and network provider roles joined. The backbone network and physical infrastructure provider receives revenue from service providers to deliver their services to the end users through its backbone network and onto the first mile connections. The first mile connections are leased from the access area physical infrastructure provider. Again, the end users choose the services from their operator of choice for a service fee. In a variation of this model, the network fee is paid directly to the physical infrastructure and

network provider. In both cases, like in the PLOM, the access-area physical infrastructure provider may receive revenue from the end users.

Three-layer open model (3LOM): In the three-layer open model, the roles of physical infrastructure provider, network and service provider are explicitly separated. In this case the public authority has the same role as in the PLOM, but at the active layer, the network provider role is assigned by procurement to one company. The network provider places active equipment in all access nodes and builds an open, operator-neutral network over which all service providers can deliver their services to all end users. In order to guarantee fair and non-discriminatory conditions to all service provider (operator neutrality), the network provider is typically barred from delivering its own services.

The backbone physical infrastructure provider receives revenue from the network provider for dark-fibre lease. In order to reach the end-users, the network provider also leases passive connections (fibre, copper or simply wireless frequency bands) from the access area physical infrastructure provider to deliver services to the end users. Again, the end users choose the services from their operator of choice and pay a service fee. The service fee from the end user to the service provider generally includes a network fee, which is then passed to the network provider.

A variation of this model is where the network fee is paid directly to the network provider. The access-area physical infrastructure provider may receive revenue from the end users in form of a (one-off) connection fee to the physical infrastructure provider and/or a monthly network fee.

Choice of business model: In general, a business model which allows for a win-win situation for all stakeholders (including the end users, the local businesses, and the service providers, as well as the incumbent) will increase a project's chance of success. Some of the questions that should be asked are:

(i) How densely populated is the region? How is the population distributed?

(ii) Is the physical infrastructure allowing for easy end-user access at physical layer for a number of operators? Is the market big enough to make this business case?

(iii) Is significant amount of infrastructure owned by an operator already active as a service provider?

(iv) Are there market actors interested in taking up the NP role?

6.3 Choice of Investment Model

Attracting investment in broadband is crucial; indeed infrastructure plans exist in SADC member states that have not been implemented due to scarcity or lack of finances. Given the scarcity of resources, the model choice for investment in broadband is a crucial decision which can lead to success or sub-optimal results with regard to broadband deployment. The choice of one model over another is a decision based on the budgetary and socio-economic context of the area, the ambition level of the public authority, and the development goals for the region. For instance, inability to use or to afford ICT (due to ageing, low education, low ICT skills, presence of many SMEs/micro enterprises and a poor culture of innovation) may slow down penetration and, consequently, the penetration of ICT (as well).

Such contexts would, in most instances, be able to sustain best long term investment models that allow enough time for penetration to growth and consequently for a gradual socio-economic impact to take effect. Furthermore, since most of the benefits of an NGN infrastructure accrue mostly to the overall society and economy, short term investment models are unlikely to match the medium-long term development perspective implicit in both regional and rural development policies. The investment model adopted in a project can also significantly influence future investment. A model that involves providing grant funding to meet the commercial gap for an operator may achieve short term results and may be cheaper for an individual project.

However, the model is also less likely to create an engine for sustained future investment than a model that involves the reinvestment of profits to enlarge coverage. This may well turn out to be more expensive over the longer term, particularly where large areas (with even lower level of population density) remain uncovered.

6.4 Strengths and Weakness of Investment Models

A summary strengths and weaknesses of the four models are presented in Table 4.

Table 4. Strengths and weaknesses of investment models

Involvement/investment Model	Degree of neutrality between wholesaler and retailer	Transfer of financial risk to market actors	Revenue generation for network expansion	Control over project	Availability of an infrastructure for society
Public-run Municipal Network	High	Low	Potentially high	High	High
Private-run Municipal Network	Medium	Low	Medium	Medium	Medium
Community broadband	Medium	Low	Medium	Low	Medium
Operator subsidy	Low	High	Low	Low	Low

Further, depending on its level of involvement, a public authority will have more or less say in the definition of the business model. Demographic, commercial and cultural conditions also play a role in the adoption of one or another model.

6.5 Dealing with Capital NBP Projects

Countries can be set up for success through their NBPs if they have an ambition to convert national plan into benefits to citizens. This requires proper governance, financial resources and effective delivery mechanisms, among other consideration. Since investment can be by government (public), private sector (commercial sources) or through public and private sector partnerships (PPPs), it is important to have in mind the business case implied by these investments and effective governance mechanisms. Though the private sector require return on investment once they invest in capital projects, governance remains a challenge but is critically important particularly when

public and private sector are involved. Therefore, an understanding of necessary capabilities and where to get them, and being alert to the project life cycle (PLC) is crucial. Of particular note is that delivery of PPP is a huge challenge - must have the delivery structure in place.

7.0 HOW TO FINANCE BROADBAND PROJECTS

7.1 Different Investment Tools[40]

A Public Authority can finance a broadband project in many different ways. Typically, a mix of financing tools is used and both debt and equity financing are used in a project. In the following sections, the main financing tools available are presented:

(i) Private equity and debt raised on the financial markets from the companies in charge of deploying the infrastructure (Corporate financing)

(ii) Equity and debt contributed by the partners in joint ventures or raised on the financial market (Project finance)

(iii) Public equity or debt (soft loans, project bonds, grants, sovereign funds)

(iv) Government-backed bank loan and/or bonds (guarantees)

(v) Community-financed (bottom-up approaches, including crowd funding)

(vi) Self-financing (re-investment of revenues from network connection fees, fees to service and network providers, dark fibre rental revenues, etc.)

7.2 Revenue-based financing

If the public authority (e.g. a local government of a city) chooses a public-run municipal network investment model, it generally receives revenue from wholesale dark fibre lease and/or transmission services, as well as retail infrastructure lease or connectivity fees (or network fees) depending on the business model in place (see chapter on the business models). This can indeed become a major financing source when the network

[40] Guide to High-speed Broadband Investment

is complete and companies, public bodies and end users start using the network[41]. In practice, this source of financing only appears once the infrastructure is in place and services are being offered over the network. It is therefore suitable for attracting public sector funds and to accelerate infrastructure deployment or for lowering costs. This model may be adapted by considering its suitability depending on unique situations in each SADC member state.

7.3 Private capital and financial markets

Financial markets can be accessed for investment funds. Financial markets provide equity or debt financing, although hybrid solutions (mezzanine funding) are more and more common. Investment Firms looking for a stable return on investment may focus on safe, tangible assets such as next-generation broadband infrastructure. These are primarily:

(i) project financers such as banks, investment funds and private equity investors may be interested in providing early-stage financing, looking for a higher risk premium. These equity or debt investors may look for an exit between 3 and 5 years once the business is established and be replaced by other investors looking for a low-risk, long-term returns on their investment

(ii) infrastructure funds, pension funds and other institutional investors may invest in an established infrastructure from the above after 3-5 years and seek long term investment at lower interest rates.

Other sources, such as venture capital, normally do not invest in infrastructure and are likely to be less suitable as they are focused on short-term higher risk opportunities- and demand high interest rates with early exit options as a result.

[41] For example, the City of Stockholm currently raises around €20m in revenue per year from operators and other users of the fibre infrastructure, while the London Borough of Hammersmith & Fulham is currently tendering a Concession Agreement for the use of their CCTV ducts in order to encourage commercial broadband across its area.

7.4 Public funds

Public funds can generally be used for lending and grants, subject to any specific conditions that may be attached to their use (as identified within the description of each fund).

Grants are focused on enabling economic and social improvement and may be available at local, regional and national government levels, as well as at a SADC level, most notably the DCSBIF. Co-financing can come from other public as well as private sources. Other social enterprise or charitable funds could also provide the matched funding.

7.5 Government-backed bank loan and bonds

Many public authorities have secured a large portion of their initial financing through soft or commercial-terms bank loans. For this to be sustainable, a valid business plan must be presented (see section on the action plan), in which medium- and long-term revenue exceeds the negotiated loans (principal plus interest). If special conditions (e.g. favourable interest rates in soft loans) are obtained thanks to the government's backing guarantee, this should be treated as state-aid.

7.6 Community (bottom-up) financing

Communities can raise finance to support the development of infrastructure in their areas. Typically this takes place in community broadband projects (see investment models chapter), particularly in isolated rural communities (or clusters of these rural communities), but also in smaller urban communities. In general, this scheme is more suitable to villages or other communities with strong commitment in bringing broadband to their local area. Generally, these finance schemes consist of selling 'stock' or shares in a community company, which either implements and runs the network on its own, or commissions this through suppliers. In-kind contribution from citizens (in the form of voluntary digging work and equipment) is also often successfully used especially in rural areas. Citizens are often also asked for a commitment or 'pre contract

agreements' to take next-generation broadband services once the network is commercially operational.

> *"It is recommended that every region or member state produce a manual on how local initiatives can manage the bottom up financing and how to match it with other financing tools"(Guide to High-speed Broadband Investment, September 18, 2014, p.38)*

7.7 Financing of public-private joint ventures and private-run deployments

Sometimes, private actors owning existing infrastructure are willing to cooperate with the public authority to build a municipal network (public- or private-run). In this case, the investment effort is partly supported by the private actor, which becomes directly involved in the deployment and operation of the CAPEX-intensive passive infrastructure.

This may be a result of that entity having a significant amount of infrastructure already, which can leveraged to build a shared, open and operator-neutral broadband infrastructure rather than going for costly infrastructure duplication. Or it may arise from the PA's choice for the privately run-municipal network. Whenever the operator subsidy model (and to some extent the community broadband model) is used, financing directly to private actors arises and state-aid considerations become more crucial.

Broadly speaking, the public authority can provide financing either as an investment (equity and debt financing) or as a grant. The former enables expansion because it is considered to be 'patient capital' that is provided on longer tenures or is lent at a lower interest rate, or as credit enhancement scheme apt at lowering the risk profile of the project through the provision of e.g. junior debt. This is very attractive to other private investors as it provides greater stability to the equity base of any scheme and may improve the credit rating of the Project Company or joint venture. This encourages further private investment; in other industry sectors (e.g. construction); patient capital has been able to raise 2 to 5 times the public funds applied.

Equity Finance. In a public-run municipal (or other) network, the public authority invests in a commercial entity (which may or may not be co-owned by a private partner) that will build and operate the broadband network. This finance can be in the form of:

(i) cash or bonds that the entity can use as security;

(ii) physical assets such as ducts, fibre cables and street furniture such as lamp-posts, equipment cabinets etc.

These can be translated into a cash value, for instance the equivalent of the reduction in implementation and operating costs that can be achieved by use of the asset over the life of the business case. The authority would receive shares equivalent to the value of the investment in the entity. These must be treated in the same way as any other share paid for by 'normal market investors' in the entity alongside the authority. This is an important test of determining whether the Market Economy Investor Principle (MEIP) applies. In particular:

(i) the value of the equity share would increase in value as the value of the assets increases

(ii) the share would attract dividends declared by the entity on any profits achieved.

Debt Finance. The authority can offer finance by providing a loan to the entity. This loan would:

(i) normally be cash;

(ii) long term use of assets where the authority retains ownership and title; or

(iii) a guarantee or security against other loans taken out by the entity.

The authority can offer to facilitate this finance with banks on attractive terms to encourage other investment, in the same way as 'patient capital' above. As long as the terms and any related interest rates are equivalent to those that would be offered by commercial markets, this finance would not be considered as state aid, as the MEIP would apply[42].

[42] See the Draft Commission Notice on the notion of state aid

8.0 BROADBAND BUSINESS MODEL

This section describes the different business models available to public authorities and other market actors. The business model defines the roles and responsibilities of different actors in the broadband value chain, with special focus on the public authority. A brief definition of the three main business roles and the different actors in the value chain are presented in the opening of the section.

8.1 Network Layers and Business Roles

As outlined in the introduction, a broadband network broadly consists of a **passive infrastructure** (ducts, cables, masts, premises), and **active equipment** (implementing the technology: transponders, routers and switches, control and management servers). On top of that, **services** are delivered. The three layers are characterized by different technical and economical properties and different business roles:

(i) the **physical infrastructure provider (PIP)**, which owns and maintains the passive infrastructure;

(ii) the **network provider (NP)** which operates (and typically owns) the active equipment (incumbent operators, new independent operators, broadband companies)

(iii) the **service provider (SP)** which delivers the digital services (e-health, elderly care, TV, Internet, phone, video-conferencing, entertainment, teleworking, smart monitoring, etc.)

8.2 Actors in Broadband Value Chain

Depending on the licensing approaches in the country, the actors in the broadband value chain could be various (see an example in Box 10 showing key actors in the broadband value chain constituting the business model)

Box 10 - Actors in the broadband value chain

The **backbone Public Infrastructure Provider (PIP)** owns and operates the passive infrastructure in backbone and to some extent in the area (limited geographical location) networks. It can be a public or private actor with long-term investment plans or, in some cases, a local cooperative.

The **access area PIP** owns and operates the first-mile connections and to some extent also operates the passive infrastructure in area networks. It can be a telecom operator, a housing association, a local cooperative, the MDU owners, the municipality or the home owners also with long-term interests in the area.

The **service providers (SP)** can be small or large companies, either locally or nationally selling services to the end users over an NP's connectivity network. They only need to place equipment in a central location (e.g. the regional data centre) and interface to the NP's equipment.

The **network provider (NP)** leases dark fibre from the PIP to offer SP connectivity to the end users. It places equipment in all access nodes to which any of its end-users are connected. In the PLOM model, some NP's may offer their own services (possibly in addition to those from other SP's): they are then referred to as **integrated NP+SP**, or **infrastructure-less operators**.

The **end user** may be a private citizen, a small or large company, a hospital, a school, a public administration, etc. purchasing services over the network.

The **wholesale customers** are entities who lease dark fibre from the backbone PIP for their own communications needs. These can be 3G/4G operators, cable TV operators, banks, large enterprises, the public sector, etc.

The passive layer open-model (PLOM) is typically used by public-run municipal networks in large cities, in which the public authority takes the backbone public infrastructure provider (PIP) role (See Figure 6).

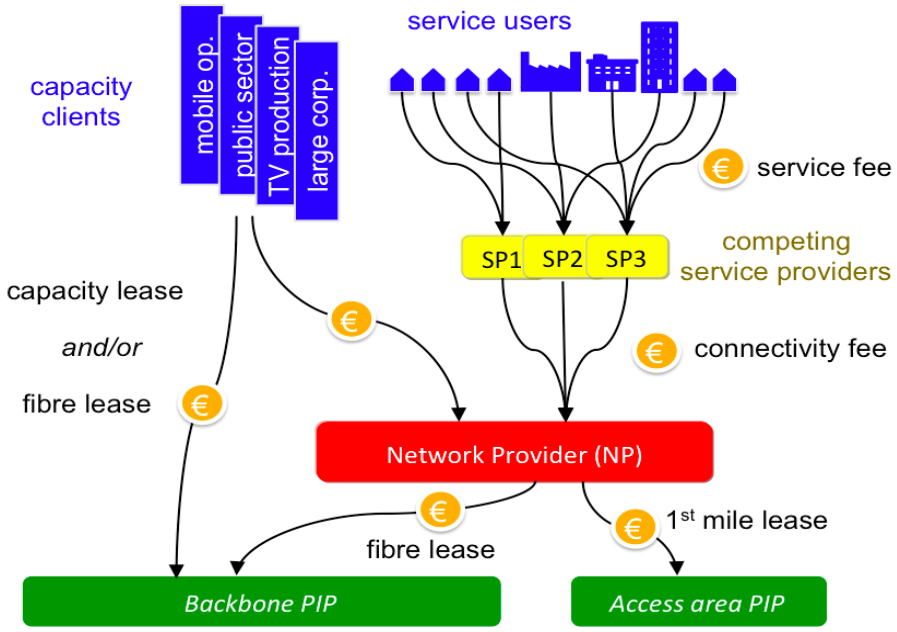


Figure 7. **Typical PLOM deployment**

9.0 REGULATORY APPROACHES TO ADVANCE THE DEVELOPMENT OF BROADBAND

The regulators play a pivotal role in the development of the ICT sector, including coordination of the activities of licensed operators and service providers. In line with their mandate, the GSR11 have identified and endorsed four regulatory best practice guidelines to advance the deployment of broadband, encourage innovation and enable digital inclusion for all[43] : (1) Funding mechanisms for promoting the deployment of broadband infrastructure, (2) Fostering private investment in broadband through incentive regulation, (3) Stimulating innovation and development of applications and services, and (4) Expanding digital literacy as described in this section.

[43] The Guidelines are based on contributions from Algeria, Belarus, Colombia, Côte d'Ivoire, Ecuador, Egypt, Jordan, Lebanon, Malawi, Paraguay, Peru, Portugal, Rwanda, Switzerland, Thailand, and the United States.

9.1 Funding mechanisms for promoting the deployment of broadband infrastructure

To achieve such ambitious targets (SD 2027), there is need to invest in quality infrastructure that is universally accessible and which provides services at an affordable price level. The important role of public funding initiatives is to complement the insufficient private investments by selecting those investment models that catalyse interest from a variety of private investors and foster open competition among all market players[44].

i. **Leveraging partnerships.** While the private sector will play a crucial role in broadband development, supportive policy and good governance are essential for the success of broadband deployment and take-up. However, when such deployments do not offer sufficient returns for private investment, public funds can be mobilized through PPP. Ultimately, the sale of broadband capacity under the PPP should be open, transparent and non-discriminatory to avoid the distortion of the associated market.

(i) **Modernizing universal service programmes and funds.** Regulators and policy makers may consider transforming existing universal service programmes into specific projects for/of digital inclusion that support broadband services for all citizens. The programmes could then be financed by revenues raised from the activities of a wide range of market players as well as from alternative sources (such government grants). Smart subsidies (such as those in Uganda) can also be used to avoid distorting the market while furthering universal service goals.

9.2 Fostering private investment in broadband through incentive regulation

It is suggested that policy makers and regulators should use provision of incentives options for the private sector to invest in the ICT sector including adoption of enabling

[44] Guide to broadband investment final report, p.3

policies, simplifying licensing regimes, making available more spectrum, reducing regulatory obligations, and offering tax incentives. Specifically, private investment should be fostered by:

(i) **Providing overall direction through a national policy.** This can by governments enacting consistent and overarching ICT and/or broadband policies which should clarify the government's commitment to fostering broadband development across all sectors and through liberalizing the broadband market and empowering the regulators to move forward with liberalization plans. In the absence of this, it is not possible to move forward the broadband agenda effectively.

Review of laws. To this end, policy makers need the support of regulators to review existing legal and regulatory frameworks in order to reduce barriers that hinder broadband roll-out and usage. This requires revising key laws such as the ICT law, e-transaction law, intellectual property law, law on the protection of personal information, and law on consumer protection among others. There is also an urgent need to recognize the challenge of climate change, including e-waste, as a priority in the political agenda of countries that have not yet factored in this challenge in order to enable allocation of resources necessary to strengthen the supervision of regulatory standards for e-waste management.

Public consultations. Further, inclusive and wide- ranging public consultations when drafting national plans, policies and strategies for the development of the ICT sector in general or the deployment and take up of broadband in particular is imperative to ensure that the heavy investments in broadband are based on the collective decisions of government, industry, and society.

Governance of broadband. The establishment of coordinating bodies, such as a national broadband or digital inclusion commission or council, encompassing the public authorities, investors and users as well as a wider range of stakeholders can serve as a platform for developing a common understanding, vision and strategy. Another way of nurturing a positive relationship with all stakeholders is the creation of enabling policy incubators to crowd- source ideas and brainstorm on innovative solutions for taking broadband to the next level.

(ii) **Rationalizing licensing regimes.** Licensing fees as well as the administrative and formal requirements to enter the market and provide service can be either enablers or barriers to broadband development and deployment. As incentive, provisional licenses may be delivered free of charge (or only covering administrative costs) during a renewable trial period ahead of the delivery of the final licenses.

(iii) **Making spectrum available for mobile broadband.** With increasing demand for more powerful, ubiquitous and seamless broadband services, distribution of spectrum for broadband wireless services is crucial to the future growth of the digital economy. By considering national goals, economic realities and market pressures, a number of issues need to be addressed by regulators and policy makers to ensure that spectrum is used in the most efficient manner. Specifically, incentive-based market-driven approach to making more spectrums available for mobile broadband services is preferable for enabling inter-platform competition and spurring innovation. For example, the footprint of mobile broadband access can be extended by leveraging on the “digital dividend” spectrum, while TV “white spaces” could be made available for secondary use at a fee thus enabling more powerful broadband services. This is because broadcasters are required to pay for spectrum in the same band, and the regulator can keep better control to ensure optimal use free of interference to existing users and require licensees to submit information on

locations of network implementation contributing to measuring the success of broadband implementation.

(iv) **Removing barriers to broadband build- out and access to broadband networks.** As much as possible barriers to broadband build-out and access should be eliminated while paying attention to the level of evolution of regulatory environment in each country. Reducing regulatory burdens and employing the least degree of regulatory intervention is essential to lower the cost of laying infrastructure, providing services to end users and stimulating new applications and digital content. Therefore, regulatory imperatives embedded in formal instruments that cannot be revised in a timely manner to address evolving circumstances will inhibit broadband growth, particularly when they impact technology choice or the operational activities associated with broadband deployment and use. Technology neutrality and other approaches to licensing is one way of addressing these barriers.

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(v) **Granting tax incentives.** The need to increase the use of existing broadband deployment by stimulation of the demand side was recognized as needing immediate attention (UBW,2014 August). In this regard "regulators and policy makers need to cooperate to reduce taxes on services, devices and equipment which will in turn increase penetration levels and pave the way for increased demand of broadband services[45]"

More broadly, targeted fiscal incentives to providers of broadband networks, services and equipment, whether fixed or mobile, can be granted to stimulate a robust and competitive broadband market place. The incentives can include relief from certain financial levies for a certain period (e.g., spectrum fees in specific areas of interest); application of a single preferential import duty on

[45] *ibid*

equipment and materials needed for deployment of broadband; exemption from value added tax on imported equipment and material that is manufactured or sold locally; and tax deductions for those directing resources at research and development of applications and digital content.

In other words, in order to spur the development of broadband requires a review on taxation on equipment (and consumer access devices), relaxing taxation on broadband equipment and devices, rationalizing licensing regimes to remove barriers (e.g., technology specific licenses), and adapting best practices such as those of the Federal Communication Commission (FCC) Rules

9.3 Stimulating innovation and development of applications and services

(i) **Nurturing the creation and adoption of applications, services and digital content.** Wide diffusion of e-government and e-finance applications and services will considerably raise consumer demand for broadband. In this regard, government agencies need to adopt pertinent applications and content to allow for greater participation of its citizens thus fostering the advent of a new digital culture. Applications such as e-Health, e-Agriculture, and e-Education initiatives help governments achieve critical national goals, for which it becomes indispensable to promote confidence in the use of ICTs. In this regard, the government through the PA in charge of broadband development should take the lead in identifying flagship projects in the priority sectors of the economy and implementing them such as in education, health and agriculture etc.

Dynamic digital content creation. Policy makers and regulators should play a key role in the broadband ecosystem by creating the environment in which dynamic digital content creation, dissemination and adoption can thrive. As a first step, a thorough and forward-looking review of the regulatory framework of the ICT sector should be carried out (where this has not yet been done) to assess

necessary changes needed to permit new and emerging services and applications, such as m-banking and social networks. Incentives for projects aimed at the creation of content for the priority sectors should be provided to enable entrepreneurs create the content and update it dynamically.

(ii) **Spurring investment in R&D activities.** Innovation is essential to the growth of the broadband economy and for ensuring the right to access, use and creation of digital content. To this end, private investment in Research and Development (R&D) should be encouraged by all possible means. In addition, when resources are available, investment should be channeled to public research and development. UASF, for instance, could be used to provide partial funding for R&D activities. Furthermore, it is desirable that government agencies, including regulators, the private sector and nongovernmental organizations cooperate to provide incentives for the public to develop innovative digital applications and content. To move this process forward, specific research areas/ projects should be identified and supported financially to generate innovations that are impactful to the society, such as in health, education, agriculture etc.

(iv) **Enforcing intellectual property rights.** Since it is essential to protect intellectual property, as this empowers researchers and inventors to lead the way to a smart and innovative digital economy, innovation can be encouraged through intellectual property regimes that balance monopoly use of inventions with building a rich public domain of intellectual material.

Specifically, enactment of laws such as e-commerce laws, cyber security, Intellectual Property Rights (IPR) law, Universal Access Service Fund (UASF) legislation, and through collaboration with the Dynamic Spectrum Alliance (DSA)- a global organisation advocating for laws and regulations that will lead to more efficient spectrum utilization - to create a legal framework across SADC that are

conducive for spurring the deployment of broadband. Lastly, diffusion of broadband requires confidence in their use by consumers, yet there exists security threats. To this end, there is need for legislation on Data Protection, Cyber Security, and Privacy laws and regulations to increase confidence in broadband and hence create demand.

Similarly, regulators and policy makers should ensure that there is a balanced, proportionate and robust mechanism for content owners to address copyright infringement in order to endow a stable and solid basis for innovation and creativity. Designing rules and procedures for copyright enforcement while ensuring consumer privacy fully means finding a delicate balance that both stimulates and protects all the different stakeholders' interests in the digital economy.

9.4 Expanding digital literacy

As the global economy evolves into one that is open, competitive and digital, digital literacy has become an essential personal and professional asset. Countries with high levels of digital literacy are more innovative and productive and are capturing a greater share of the world's trade, investment and jobs. Consequently, it is crucial for policy makers and regulators to facilitate investment in all forms of education and particularly in ICT education from early training to advanced instruction notably in the area of R&D, ICT knowledge transfer and the development of digital applications and content (in particular those related to the local culture).

Sufficient and sustainable funding should be provided to universities, computer labs and other public research institutions as well as leveraging international partnerships when/ where possible and advantageous. In summary, training and awareness would at least include the sensitization on importance and use of broadband through awareness

campaigns, capacity building in planning and deployment of broadband, establishment of research institutions, , and development of an ICT curriculum for use in all levels of learning institutions.

10.0 IMPLEMENTATION OF BROADBAND

10.1 Governance and management

Governance. This should include leadership from the highest government level including the ministries in charge of ICT, such as the DOC, e.g., Broadband Advisory Council appointed by the President and institutions charged with the development of broadband with a clear coordination framework for broadband development. The key functions of governance are follows:

(i) Control for the programme by ensuring that all interests are aligned and that all responsibilities and accountabilities are in place and tracked

(ii) Monitoring delivery which involves managing the risk and ensuring that the NBP is delivered according to schedule, budgets and objectives

(iii) Incentivize the generation of demand e.g., in health, education, transport, agriculture, tourism etc.

Similarly, the key steps[46] in governance which each country can follow are:

(i) Strategy definition: Strategy and policy definition and commitment

(ii) Stakeholder consultation/ alliance – establishing the stakeholder landscape (led by ICT ministry)

(iii) Designing and securing funding arrangements

(iv) Establishing delivery mechanism suppliers

(v) Assuring execution/ delivery contract fulfilment through an implementation framework

[46] "National Broadband Plans: Realising the benefits through better governance". Adapted from Deloitte Analysis - For details see: http://www2.deloitte.com/content/dam/Deloitte/uk/Documents/technology-media-telecommunications/deloitte-uk-tmt-final-national-broadband-plans-report.pdf

(vi) Measuring and assuring value for money and fulfillment of objectives through a robust responsibility and accountability for monitoring and evaluation on the basis of clear targets and key performance indicators (KPIs)

Management. The management should include Broadband Steering Committees and Broadband Task Teams to deal with the various pillars of broadband among SADC member states; the ICT sector regulators take the lead in the coordination of initiatives/actions. Some of the stakeholders in the actual implementation of BB are, on the demand side: telecentres, libraries and post offices, universities, schools, health clinics, public service offices and local government offices while the supply side stakeholders include network operators, service providers, and content providers. Other stakeholders are regional organizations, government agencies, Broadband Commission, and the World Trade Organization (WTO) with regard to trade in ICT services. Typical roles of a broadband steering committee and working groups are presented in Box 11a and Box 11b, respectively.

Box 11a. Steering Committee Role and Activities[47]	**Box 11b. Working Group Roles and Activities**
• Establish key principles and objectives • Agree on high-level targets • Define and appoint Working Groups • Oversee and advise Working Group deliberations • Host Public Forum and Consultations • Develop a consensus agreement on harmonizing strategy inputs • Prepare draft National Broadband Strategy document • Oversee creation of Action Plans to define	• Key issues, questions for all Working Groups: **– Status**: Current broadband investments, market, policies – **Trends**: How has broadband been advancing in this area? – **Needs**: Most critical gaps or needs to accelerate broadband – **Constraints**: What inhibits broadband development? – **Stakeholders**: Who can take responsibility? – **Linkages**: Key areas of interdependence and

[47] David N. Townsend (2014 August). Broadband Strategy development Overview and Framework. Proceedings of Universalizing Broadband in SADC workshop. Lilongwe, Malawi. August 2014

implementation steps • Collaborate on establishing a follow-up regime	cooperation – **Economics**: Costs, demand, economic impacts – Recommendations

Source: Adapted from Townsend (2014 August)

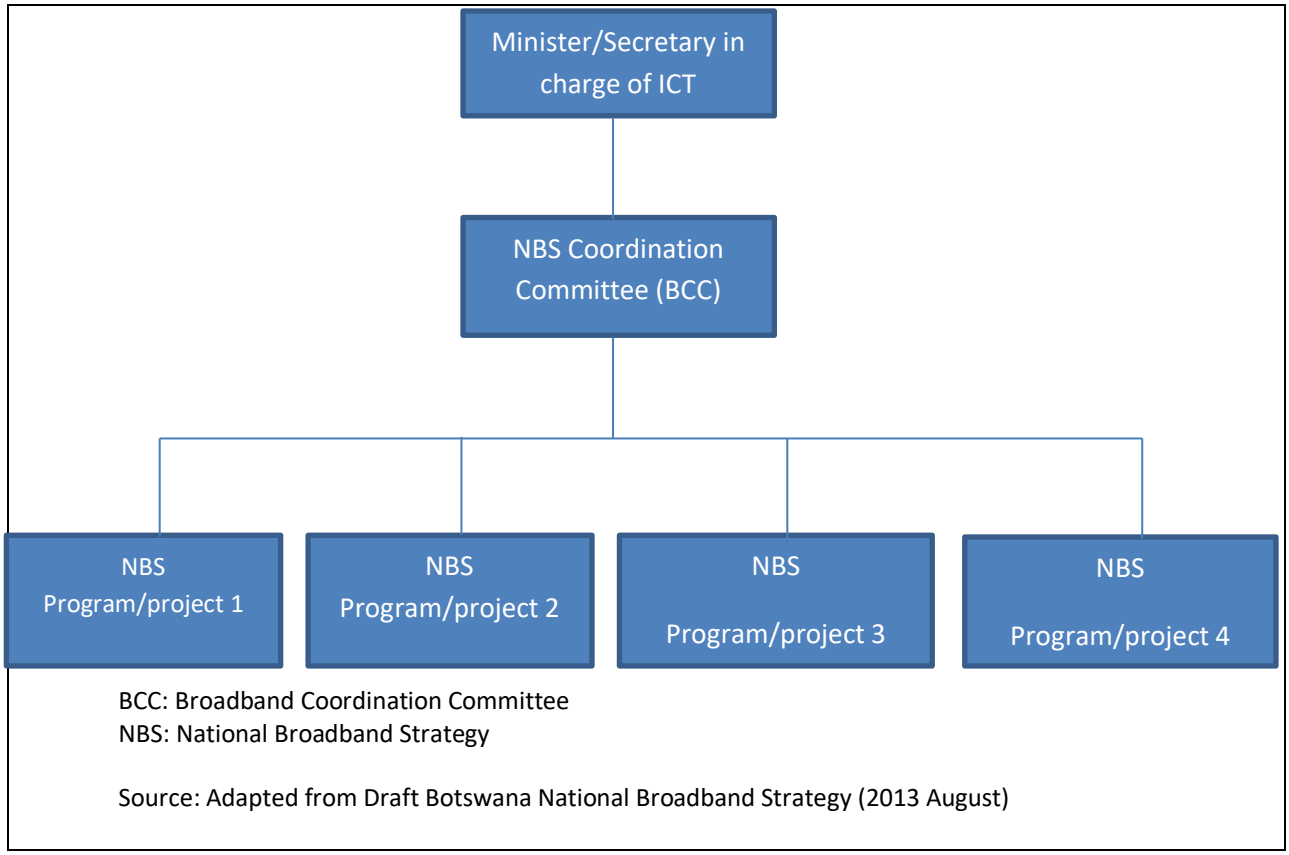
The Public Authorities (PA) in charge of the development of broadband (policy makers, regulators and/ or national broadband coordinating authorities[48] such as the NBS coordinating committee in Botswana, the Broadband Council of Nigeria[49] which was established to drive the implementation of the approved National Broadband Plan 2013-2018, the Kenya ICT Authority and the public sector in general, have a crucial role to play in the development of this new communication infrastructure and in in driving the national imperative to succeed. An example of the broadband coordination (through a broadband coordination committee, BCC) mechanism is presented in the next sub-section.

10.2 National Broadband Plan/Strategy Coordination

A well-coordinated implementation framework is required to ensure proper implementation of the NBP. Coordination is required for a number for at least three fundamental reasons:

(i) For provision of critical services such as power/electricity to schools, libraries, clinics, broader offices etc. as well as the supply of IT equipment to other facilities
(ii) To ensure that the deployment of NBP is aligned with the implementation of e-government and other government priorities/ initiatives that require broadband
(iii) To ensure that all aspects (supply side and demand side) of broadband are considered

[48] Countries have different names for the organisation set up to oversee the implementation of broadband at various levels. For example, the South Africa National government, through the Department of Communication (DoC) and Presidential Infrastructure Coordinating Committee (PICC), will co-ordinate and integrate broadband rollout across the different tiers of government, building on and learning from the significant advances already made at provincial and municipal levels.
[49] See full story at http://www.telegeography.com/products/commsupdate/articles/2013/07/22/nigeria-inaugurates-national-broadband-council/ . Accessed October 31 2014



BCC: Broadband Coordination Committee
NBS: National Broadband Strategy

Source: Adapted from Draft Botswana National Broadband Strategy (2013 August)

The NBS program could be in education, health, agriculture, tourism, mining or any other area while there can be several projects under each NBS program area e.g., under the education sector, there could be virtual class rooms, monitoring of the health of elderly citizens and the health sector, and/ or tracking of wildlife movement in tourism sector. Typical functions of the Ministry in Charge of ICT should include:

(i) Coordination of BB requirements of all government miniseries/ departments
(ii) Report NBS activities, progress, challenges to the Government

(iii) Seeking funding, directly from Government, funding institutions and private sector

(iv) Negotiate and signing contracts with service providers and with other institutions on behalf of the Government, or ensuring that the same is done by other government ministries/ institution as the case may be

(v) Assist the broadband coordination committee (BCC) with whatever assistance they may require form government

(vi) Provide secretarial services to the BCC

The functions of the BCC are primarily to elaborate and ensure delivery of projects under the NBP/ NBS; their functions should be clearly elaborated

10.3 Broadband implemented through Programmes and Projects

Programme management perspective. This perspective is necessary because each programme under the NBP (e.g., e-health programme) will have specific projects which need to be coordinated. This perspective is lacking in a number of national BB plans; the resulting confusion in governance leads to delays, frustration and cost overrun. The deployment of broadband through projects with a focus on the services that will be delivered (starting with the user) is crucial. Some of the priority areas to be addressed in the NBP can be the following depending on the particular national priorities:

(i) Universal education; e.g., implementation of virtual class rooms project;

(ii) Delivering heath to rural areas such as via mobile health, telemedicine etc.;

(iii) Transportation, e.g., smart transport to deal with traffic congestion;

(iv) Promotion of BB usage to target various segments need to be considered - household, business, government

Focus on projects. Broadband should be implemented through specific projects with clear targets and a monitoring and implementation framework. In this regard, concrete broadband implementation projects should be defined. They should be:

(i) relevant to one or more identified objectives/strategies/focus areas

(ii) aim to achieve specific target outcomes in the plan

The project elements to be defined include:

(i) project scope, objectives, targets

(ii) institutional/stakeholder responsibility (both primary and secondary)

(iii) budget requirements and source(s)

(iv) time frame, and key milestones

(v) linkage and mutual dependence with other projects

SADC member states have commenced and are at different stages of broadband development. There are examples of activities/projects in Zambia (UASF) and management of broadband within the regulator (Appendix I) and South Africa which has a Broadband Strategy (SANBS 2013) with specific projects (Appendix II) on broadband development. Similarly, Malawi (Table 5) is implementing a national broadband project; an example from Kenya is also presented to illustrate some of the projects through which broadband opportunity can be realized. The Botwana, Malawi and Kenya examples are presented in Table 5.

Table 5. Examples Broadband Projects

Country	Project	Project Description
MALAWI	Regional Communication and Infrastructure Program Malawi Project (RCIPMW)	The Government is implementing a Project called Regional Communication and Infrastructure Program Malawi Project (RCIPMW) which is aimed at removing bottlenecks to international connectivity and other barriers to market efficiency at the national levels and also increasing competition in the provision of broadband and internet services
KENYA	National Fiber Backbone	The Project involves the extension of national fiber optic cable by 30,000KM in order to support and compliment national broadband wireless network.
	National Data Centres	The main goal is to establish two neutral national data centres so as to ensure reliable hosting of local content and eliminate broadband interruptions.
	Digital Literacy	Compulsory ICT training will be conducted in all Teachers Training Colleges with the aim of achieving digital literacy among teachers.
	Media and ICT Education	Mandatory ICT sensitization and Media Education will be carried out from primary level in order to promote advancement towards a knowledge based society.

	ICT Technical Experts	This project involves the development of ICT curricula to align skills with global standards as well as industry demands hence increasing high-end technical talent crucial for development, management and maintenance of broadband services.
	Model ICT Resource Centre Per Ward	The county governments aim to establish ICT centres in all wards with the aim of increasing access and accelerating digital literacy.
	Digitization of Core Government Registries	All government ministries and agencies are encouraged to digitize core registries so as to avail critical public service delivery data in digital form and develop applications to enhance access.
	County Management Information System	The project involves the development of a robust management information system for counties so as to promote accountability, transparency and equity using ICTs.
	Facilitate ICT Innovation	The Kenya National Innovation Agency together with all Public Universities intend to establish ICT incubators in each public university in order to achieve a structured ecosystem that generates innovative and quality solutions to enhance access to digital content.
BOTSWANA	BOFINET project	FTTx for eholesale to reduce end user prices
	WiFi hotspots in public areas	For public access to the internet
	Allocation of 4G spectrum	For rollout of broadband

Source: ITU Report of Survey on the Status of the National Broadband Policies, Strategies and Plans in Africa by Dr. Thomas Senaji, July 2014

10.4 Broadband targets

In order to track the implementation of broadband, it is necessary that targets be set and monitored at regular intervals to ascertain the progress being made. South Africa's broadband targets for the year 2030 are presented in Table 6.

Table 6. South Africa's broadband targets[50] to 2030

Target	Penetration measure	Baseline (2013)	By 2016	By 2020	By 2030
Broadband access in Mbps (user experience)	% of population	33.7% Internet access	50% at 5Mbps	90% at 5Mbps 50% at 100Mbps	100% at 10Mbps80% at 100Mbps
Schools	% of schools	25% connected	50% at 10 Mbps	100% at 10Mbps 80% at 100Mbps	100% at 1Gbps
Health facilities	% of health facilities	13% connected	50% at 10Mbps	100% at 10Mbps 80% at 100Mbps	100% at 1Gbps
Public sector facilities	% of government offices		50% at 5Mbps	100% at 10Mbps	100% at 100Mbps

Source: Department of Communication (2013). South Africa National Broadband Strategy, 2013.

According to South Africa's broadband strategy, these targets are to be reviewed periodically and supplemented by pricing and quality of service targets as well as speed of installation and fault repair.

Similarly, an example of broadband targets for Kenya is as follows[51]: Figure 8

[50] For details see South Africa National Broadband Strategy, SANBS 2013

[51] For further details see also
http://www.cck.go.ke/links/consultations/current_consultations/The_National_Broadband_Strategy_.pdf

The speeds proposed from 2017 onwards are subject to review based on technological developments and other factors that may influence their revision.

Table 1: Minimum Broadband Speeds

	2013-2017	2018-2022	2023-2027	2028-2030
Urban	40 Mbps	300 Mbps	1024 Mbps	2048 Mbps
Rural	5 Mbps	50 Mbps	100 Mbps	500 Mbps

Penetration targets have further been articulated at the individual level in order to measure the access and usage levels of broadband. These targets are defined in Table 2:

Table 2: Broadband Penetration Targets

	Baseline	Target by 2017
% of penetration by households	6.3%[1]	35%
% of penetration by schools	n/a	100%
% of penetration by health facilities	n/a	100%

[1] Source: 2010 ICT Survey (page 22)

Source: Communications Authority of Kenya. Available at http://www.cck.go.ke/links/consultations/current_consultations/The_National_Broadband_Strategy.pdf

10.5 Example of Broadband Plan elements together[52]

In order to implement BB through projects, we need projects targeting specific BB components, and focus areas with clear objectives and strategy; and specific project name / description. An example is as follows (Box 12):

[52] Adapted from David N. Townsend (UBW, 2014)

Box 12. Broadband project - An example

Component: Infrastructure

Focus Area: Rural Broadband Access

• **Objective 1**: Community broadband access points (CAPs)

• **Target Outcome**: 50% of communities with access points by 2018

– KPIs = Functioning CAPs with minimum 1 Mbps, usage measures

• **Strategy**: Develop public-private partnerships with national operators, local stakeholders; coordinate with other rural broadband initiatives; ensure local community participation, capacity building, effective management and monitoring

• **Project 1**: Broadband CAP rollout Pilot Project

– 100 communities in 2014

– Ministry responsible, USAF funding; collaborate with operators, local stakeholders

10.6 Example of Summary Broadband Plan segment[53]

A typical broadband plan segment showing focus area/pillar, outcome, strategy, responsibility and project is presented in Table 6.

Table 6. Summary of broadband plan segment

Focus Area/ Objective	**Outcome**	**Strategy**	**Responsibility**	**Projects**
Education	Target			
1.BB connections in schools	50% of schools by 2018	Community broadband access networks, linked to schools	Kipsang, K.,Ministry of Education	1. Local BB access networks 2. School Connectivity
2. ICT Curriculum	Customized classroom tools	National and local collaboration on curriculum development	Ministry of Education	1. Collaborative ICT curriculum 2. ICT apps Initiative
3. School Devices	1.2 million laptops, tablets by 2018	Discounted bulk purchases, customized devices	Ministry of Education, Private suppliers	1. School ICT devices project

[53] *ibid*

10.7 Checklist on Delivery of the NBP

In order to realize an effective delivery of broadband the following should be ensured:

(i) Technical capability for implementation otherwise delivery will be delayed;

(ii) Contract management which is crucial because 40 to 50% of cost increase are due to poor contract management;

(iii) Success criteria should be developed and a measurement framework created otherwise it will not be possible to track the progress of BB delivery;

(iv) Information and data which should include a repository of data across the programme in the form of a dashboard which can be checked transparently by all stakeholders – at least the steering committee and programme/ project management teams.

In summary, NBP projects will only succeed if there is an effective delivery framework comprising:

(i) Governing structure – influenced by various factors – such as over enthusiasm (e.g., Qatar), inadequate capabilities

(ii) Alignment of projects to the national development plan (NDPs)

(iii) Focus on both demand and supply with clear understanding of the drivers of both the demand and supply

(iv) Funding of broadband which can be public, private, PPP, and/ or community based (bottom-up) initiatives

(v) Delivery model with the right incentives for everybody

(vi) Tracking and measurement of progress on of the NBP projects through definition of targets and key performance indicators for each of the project objectives and deployment of an aligned monitoring and evaluation framework

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Appendix I: Universal Service Legislation and Management of Broadband in Zambia

1. Universal Service Legislation

ICT Act No. 15 of 2009 (Principal Legislation, Zambia)

– Technology neutral licensing framework

– Section 70 creates the Universal Access and Service Fund

UAS Regulations SI No. 38 of 2012

– Serves to operationalize the UASF

– Apportions up to 50% of funds collected by Regulator as operating and license fees to the UASF

– Currently under review to enhance effectiveness and efficiencies

Other legislation that promotes UAS goals

– Colocation & Interconnection (Access) Regulations SI No. 57 of 2013

– Customs & Excise Regulations SI No. 23 of 2011 provides tax holidays to operators on Importation of active and passive network elements meant for deployment in rural areas

Example Two: For Tanzania the Legislation on establishing the universal service fund is Cap 422: UCSA Act, 2006; Regulations were published on 27th April 2009 in the Government Notice (GN) 109/2009;

Copies of these Acts are available from the ZICTA website www.zicta.zm

2. Management of Broadband

Hosted in-house by the Regulator as a Department/ Unit – Projects Unit

• Headed by a Manager reporting to the Director General of the Regulator

• Staffing – 3 persons

• Regulator offers support for key functions such as engineering/technical, accounting, legal and procurement

Director General

Manager Projects

(Manages broadband)

Support (Tech, Legal, Finance, Procurement.) Project Coordinator x 2

Appendix II - Samples Themes in the Broadband Policy 2013 - Case of South Africa

1. Strategies for Broadband, A summary of the four central strategies adopted in the Republic of South Africa National Broadband Strategy/policy (SANBS, 2013) as well as the corresponding actual policy decisions taken by the Minister pursuant to the finalization of the document. A summary of four central broadband strategies for the South Africa National Broadband Strategy (SANBS) is shown in Table II-1.

Table II-1. Summary of four central strategies for the SANBS

Strategy Intervention	**Aspects addressed by the strategy**	**Intended Outcomes**	**Indicators**
1. Digital Readiness	(i) Institutional capacity (ii)Regulation and administrative bottlenecks (iii) Efficiency and effectiveness (iv) Data and analysis for monitoring and evaluation and policy reformulation (v)Establishment of the National Broadband Council (vi) Rationalisation of SOCs	(i) An enabling regulatory and administrative environment that facilitates broadband rollout (ii)Broader public interest preserved (iii)Level playing fields with fair market conditions (iv) Dedicated council to advise Minister on policy, planning and implementation (v) Autonomy, accountability and efficiency of regulator (vi) Access, price and quality of broadband (vii) Time and cost of network build approval (viii) Degree of disruption due to network build (ix) Environmental impact of network builds (x) Targets met (xi) Coverage price	(i) Autonomy, accountability and efficiency of regulator (ii) Access, price and quality of broadband (iii) Time and cost of network build approval (iv) Degree of disruption due to network build (v) Environmental impact of network builds (vi) Targets met (vii) Coverage price

2. Digital Development	(i) Pooling of public sector demand (ii) Public sector networks (iii) Open access to network regulation	(i) High capacity future-proof network capacity procured for key public sector broadband needs at more affordable rates (ii) Government's on-going operational communications expenditure reduced through upfront capital expenditure (iii) Risk of investment in network extensions for operators reduced through anchor tenancy	• Speed, quality and cost of network capacity at Government facilities • Speed of rollout and quality of service • Network reach and price of access • Increased investment by network operators • Take up of services in public sector, schools and clinics
3. Building the digital future	(i) Mechanisms for sharing of infrastructure (ii) Coordination of infrastructure rollout (iii) Enhanced use and licensing of spectrum	(i) Where competition is viable this will produce the best outcomes but infrastructure sharing and cooperation to be enabled on network builds to reduce cost (ii) Economies of scale enabled in medium density and low income areas through government investment and guarantees in network extensions	• Network reach • Cost to communicate • Speed, quality and cost of network capacity • Speed of rollout • Increased investment by network operators • Improved penetration
4. Realising Digital opportunity	(i) Capability and capacity R&D, innovation and entrepreneurship (ii) Industry development (iii) Local content and applications	(i) Uptake and use enabled through institutional capacity and individual capability and institutional absorption (ii) More equitable access to higher quality government services (iii) Reduce pressure on scarce public sector facilities by moving resources online (iv) The benefits of broadband in terms of economic growth and	(i) Demand stimulation through: - Funding local content - Supporting apps to market - E-government services ICT startups - Registration of ICT related patents (ii) Increase demand side skills: ICT specialists, engineers,

		enhanced quality of life is realised through relevant content and applications (v) Promote growth through enabling economic infrastructure and associated industrial development	lawyers, economists Number of PhDs in area of ICT % of GDP spent on R&D Increase demand-side skills: e-literacy campaign, ICT in school curriculum

Source: DOC Presentation NBP 2013 PPC 19 February 2014

2. Sample Summary of policy decisions

In order to implement the SANBS, the Republic of South Africa has made policy decisions on various issues that are pertinent to the development of broadband; these are captured in Table II-2.

Table II-2. Policy Decisions for Implementation of SANBS

Issue	Action
Currently low penetration, high prices, poor quality of service	• ICASA to monitor and evaluate performance against the targets and compliance with quality of service standards on an ongoing basis, which are to be reported annually, and on which basis five year targets will be reviewed
Digital Readiness policy decisions	
1. Market Structure Vertically integrated incumbents hindering fair competition	• Minister of Communications to consider the viability and impact on competition of establishing open access national wholesale fibre and wireless broadband networks through the establishment of a multi-player entity.
2. Institutional arrangements Appointment process, funding arrangements, institutional design, capabilities and competencies produced negative outcomes	• Review of the regulator and universal service agency governance structure, leadership appointment process and funding arrangements to ensure requisite capability to regulate - open access - spectrum

	- competition
3. Enabling infrastructure build Hurdles and bottlenecks hampering broadband rollout	• Authority for enforcement of Rapid Deployment Guidelines to be fast tracked and progressed through DoC and SIP 15 in consultation with ICASA. DoC to engage with DEA on the development of a Strategic Environmental Impact Assessment for broadband infrastructure • DoC to engage with DEA on the development of a Strategic Environmental Impact Assessment for broadband infrastructure
4. Spectrum Delay in allocating high demand spectrum	• Ministry to expedite policy directive to release high demand spectrum in ways that ensure efficient use, wholesale access and fair competition. ICASA to assign high demand spectrum
5. Legal and regulatory framework Potential shortcomings in legislative support for Broadband policy	• The Department will undertake a review of all relevant legislation and regulation required to enable implementation of this policy
6. Analysis, Information and indicators Absence of indicators to inform national decision-making and inadequate reporting to UN and other multilateral agencies	• ICASA to prepare information reporting regulations to ensure collection of ITU universal indicators • DoC to work with Stats SA on regular production of ICT satellite account from the national accounts to assess contribution of sector to national economy • DoC to budget for and manage demand survey to comply with UN commitments to Measuring the Information Society
7. Rationalisation of State-Owned Companies	• SOCs rationalised to contribute more efficiently and effectively to national objective • The DoC, DPE, Treasury and the PICC to agree on appropriate transitional measures during the process to arrive at the rationalised entities.
8. Appointment of Broadband Council	• Broadband Council, made up of public and private sector representatives and experts appointed by Minister
Digital Development Policy Decisions	
1. Network planning and coordination • Coordination amongst all relevant role players to ensure optimal implementation and leverage of resources • DoC will coordinate implementation of the	• DoC will coordinate implementation of the digital development projects to address broadband needs and to ensure sustainable rollout

digital development projects to address broadband needs and to ensure sustainable rollout	
2. Public Sector network Enabling infrastructure for e- government and government administration	• Requirements analysis, planning, design and mechanism to pool government demand for smart procurement of connectivity required across government and other public sector entities
3. Schools network Urgently enable teaching and learning as well as school administration through broadband.	• Requirements analysis, planning, design and implementation of a national schools network by an appointed agency • Establish institutional capacity in the Department of Basic Education or a relevant agency to enable uptake and use of broadband in the basic education environment
4. Health Network Enable e-Health and National Health Insurance (NHI) for improved health outcomes	• Requirements analysis, planning, design and implementation of a national health network by an appointed agency; • Establish institutional capacity in the Department of Health or a relevant agency to enable uptake and use of broadband in the health environment
5. Community networks • Rural and poor populations and underserved areas in general not well served by network infrastructure and services • Free public Wi-Fi at points reached by the public sector networks to stimulate demand by allowing people to access the internet, including government services and to support municipal-wide public Wi-Fi networks.	• Collaborative initiative involving DoC, DRDLR, CoGTA and provinces to identify areas that require community network interventions and implementing such networks. • Integration of public Wi-Fi into the networks identified above • Fast-track implementation of Wi-Fi at public facilities by agencies responsible for these facilities and networks where the capacity already exists

3. Building Digital Future

Building the Digital Future Policy Decisions	
1. Open Access Wireless Network Creation of an open access wireless network	• The Minister of Communications to consider the feasibility and operationalisation of the network • ICASA to assign spectrum in support of the policy
2. Open Access National Broadband Network • Models, design and roadmap towards a fibre rich Open Access National Broadband Network (NBN).	• DoC facilitates process to conceptualise and develop the open access NBN
Opportunity Policy Decisions	
1. Research	• The DoC will ensure that research is done to determine the demand gap, i.e. barriers to broadband adoption to inform additional actions and demand-side targets
2. National capability Requisite e-literacy and skills to use broadband	DoC will engage with the - • Department of Basic Education on integration of ICT into school curriculum • Department of Higher Education on integration of ICT into post matric curricula • DPSA to integrate ICT skills development as an administrative and delivery tool in all government • Department of Labour and SETAs to focus on adult e-literacy, youth development and sectoral programmes
3. R&D and innovation and Entrepreneurship • Development of high level skills and critical mass R&D capability to drive innovation	• DoC will engage with relevant stakeholders to enable public and private investment in ICT R&D through implementation of the ICT RDI Roadmap • DoC will engage with relevant stakeholders for the development of professionals and postgraduates in multi-disciplinary programmes to meet the diverse skills requirements within the strengthen the ICT ecosystem • DoC will engage with relevant stakeholders to support entrepreneurship and innovation through a coordinated incubator and mobile applications laboratory programme
4. Content and Applications Absence of local content, local production and innovation in content and applications	• Establish a local content/public service content and apps production and innovation fund to incentivise public and private content development that is relevant, in local languages • Digitise existing government content • Government departments, private sector and NGOs to

	promote the awareness of locally developed applications and local content • DoC in consultation with relevant departments to develop Open Data policy to contribute to broader e-government strategy
5. Devices	• DoC will identify mechanisms and ensure implementation of device subsidies for identified segments of the population

Source: Department of Communication (DoC) Presentation NBP 2013 PPC 19 February 2014

Appendix III. Broadband Projects, Focus Issues and Working Groups

1.0 Flagship and Pilot vs. Demonstration Projects

1.1 Flagship Projects

– Cross-cutting projects, high-profile, near-term impacts

- Fiber backbone
- E-government
- E-education, etc.

1.2 Pilot/Demonstration Projects

– Smaller scale introductory projects to test methods, ideas, demonstrate viability, stimulate market

- Rural network expansion, 3G upgrades
- Public access centers
- Community broadband to selected locations

2.0 Illustrative Working Groups/ Task Teams

- Policy, Legal, and Regulatory
- Infrastructure, Connectivity, and Devices
- Content and Applications
- Capacity Building and Awareness
- Financial and Investment

2.1 Policy, Legal, and Regulatory

Key Issues:

– Competition in the broadband ICT market; licensing and regulation

– USF legislation and Fund management

– Spectrum use, needs, assignments

– Device and broadband tax rates

– Intellectual property rights (IPR)

– E-commerce laws and national certification framework

– Privacy, data protection, cyber security

– Regulations on equal opportunity: disabilities, gender, underprivileged persons, etc.

2.2 Infrastructure, Connectivity, and Devices

Key Issues:

– International backbone capacity, costs

– National fiber backbone network availability, costs, sharing

– Availability, growth, costs of retail broadband services

– Access to rights of way

– Schools, libraries, and post offices, government offices

– Broadband connectivity for large and small businesses

– Availability of telecenters with PCs, broadband connectivity

– Critical infrastructure, national security and redundancy needs

– Alternative power sources (green energy)

– PCs, handsets, smart phones penetration, sales, prices

– Taxes on devices and effects on demand

2.3 Infrastructure, Connectivity, and Devices

Key Issues:

– International backbone capacity, costs

– National fiber backbone network availability, costs, sharing

– availability, growth, costs of retail broadband services

– access to rights of way

– Schools, libraries, and post offices, government offices

– Broadband connectivity for large and small businesses

– availability of telecenters with PCs, broadband connectivity

– critical infrastructure, national security and redundancy needs

– alternative power sources (green energy)

– PCs, handsets, smart phones penetration, sales, prices

– taxes on devices and effects on demand

2.4 Content and Applications

Key Issues:

– scope of market for domestic electronic information services

– extent of availability and demand for locally developed and relevant content, including content for rural and underprivileged users

– digital literacy content available (digital learning objects)

– E-learning, e-health, e-agriculture apps

– Government services and data available on-line

– budgets and staff allocated for e-government content and apps

– content promotion programs

– market for mobile web content relative to PC-based apps

– employment in software, apps, content sectors

– entrepreneurial initiatives to develop domestic content

2.5 Capacity Building and Awareness

Key Issues:

– status of digital literacy amongst different demographics

– digital literacy training programs

– extent and effectiveness of national school ICT learning programs

–curriculum changes at secondary, tertiary and executive levels to develop the appropriate ICT skills

– E government programs with digital literacy training

– Judiciary and Law Enforcement sensitization and capacity building

– support for innovation hubs and alliances with research institutions

– corporate ICT training programs: extent, impact on workforce

– extent and effectiveness of ICT awareness campaigns

2.6 Finance and Investment

Key Issues:

– status of broadband ICTs in the financial sector

– status, extent of e-procurement, ICT-based financial services markets

– role and priorities for Universal Service Fund in financing needed broadband initiatives

– contributions, role of private financial sector in financing broadband ICT investments

– extent and status of electronic banking services

– access to e-banking, m-banking

–opportunities and constraints for e-commerce and other broadband ICT entrepreneurial businesses