REPUBLIC OF NAMIBIA

MINISTRY OF INFORMATION AND COMMUNICATION TECHNOLOGY

National Broadband Policy for the Republic of Namibia (2018-2022)

ACKNOWLEDGEMENTS

The Government of the Republic of Namibia and the Ministry of ICT are immensely grateful to the International Telecommunication Union (ITU) through its Regional office for Africa and Southern Africa, for the technical assistance and financial support provided for the development of the National Broadband Policy (NBP) and its associated Strategic Implementation Plan (SIP 2018 – 20223). This was done under the auspices of the Assistance to African Countries for Developing National Broadband Plans of the ITU. The NBP 2018 is the product of coordinated and sustained efforts of a Task Team established by the Ministry of Information and Communications Technology (MICT) and stakeholders whose invaluable input initially led to the development of this NBP and the associated IAP.

It would not have been possible to develop the (NBP) and its associated IAP for Republic of Namibia without the invaluable input from the Minister in charge of ICT of the Republic of Namibia, senior officials in the MICT led by the Permanent Secretary. ICT industry regulator, the Communications Regulatory Authority of Namibia (CRAN), Telecom Namibia Limited, Namibia Broadcasting Corporation(NBC), Paratus Telecommunication, Mobile Telecommunications Limited. (MTC), Bidvet IT (PTY) Ltd and all telecommunication and broadcasting licensees who took time to participate in extensive consultations that helped shape this Policy.

Also acknowledged are various officials from other Government Ministries, the business community, ICT experts and the rest of the stakeholders who provided integrated inputs and insights to enrich this Policy and implementation plan, ensuring its relevance to the current and unfolding environment in Namibia. We specifically extending our sincere gratitude to many people whom we interacted in the course of the development of this for their participation and invaluable input throughout the process of development of the NBP and the associated IAP.

This comprehensive Policy and Plan represents the nation's commitment to using ICT and broadband in solving development problems with innovative solutions and approaches that are effective, scalable and replicable. It is hoped that the same collaborative commitment and spirit with which this NBP and SIP has been developed will be carried forward for the successful

implementation of the NBP through the associated IAP to ensuring the achievement of the ICT vision and vision 2030 of the Republic of Namibia.

Contents

FOREWORD

The revolution in information technologies has changed the society fundamentally and will probably continue to do so in the foreseeable future as Information Technology has in one way or another pervaded almost every aspect of human activities. The pervasive use of electronic services and the widespread use of the internet highlight some of the developments that have profoundly changed our society. In the last fifty years, Information and Communication Technologies (ICT) have been instrumental in the creation and development of sustainable growth. The global economy is currently dependent on and is shaped by the benefits arising from ICTs. This rapid development and uptake of technologies has in turn created opportunities for growth in a new competitive space (Overarching ICT Policy of 2009, p. 2).

Recent studies reveal that broadband is becoming an important economic actor and is therefore becoming more of a national policy issue. The World Bank has found that in low and middle income countries, every 10 percentage point increase in broadband penetration accelerates economic growth by 1.38 percentage.

Namibia's socio-economic development requires the maximum utilisation of existing and planned infrastructure. This also requires appropriate education, training and skills. Further, the development of a broadband policy should be viewed from the perspective of the existing communications infrastructure, broadcasting infrastructure, postal services infrastructure and that of energy which is necessary for powering the communication and broadcasting systems.

In developing this Policy, the main port of call has been the Namibian Government's Vision 2030 document which stipulates that ICT must be the most important sector in the economic development of the country by 2030 coupled with the Overarching ICT Policy 2009 (OICTP 2009) which provides the vision and policy direction that has necessitated the development of this Policy, The purpose of this document is to set out the Information Technology Policy for the Republic of
Namibia.This policy aims to progressively provide the framework for the holistic development of Broadband in the Republic of Namibia, and contribute to the realisation of the Vision 2030 and its associated National Development Plans. The growth of ICT in Namibia can only succeed with increased broadband access and a reduction of the cost of telecommunications services.

This Policy thus builds on the Vision 2030 for the Republic of Namibia, the Fourth National Development Plan NDP 4 (2012 – 2017),the Fifth National Development Plan NDP 5 (2017-2022) and , the Overarching ICT Policy 2009 (OICTP 2009) for the Republic of Namibia, ICT Sectoral Policies for Republic of Namibia, Relevant Laws and regulations and the SADC Guidelines for Development of Broadband Plans which collectively have been a solid guide to the final

construction that is the National Broadband Policy and Associated Strategic Implementation Plan for Achieving a Digital Economy for the Republic of Namibia.

The policy is intended to guide the Republic of Namibia in implementation of broadband for the benefit of all citizens. It applies to all ICT matters related to broadband including the mainstreaming and embedding of broadband into all sectors of Namibia's economy.

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Minister for Information and Communication and Technology
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2018

ACRONYMS AND ABBREVIATIONS

ADSL	-	Asymmetric Digital Subscriber Line
BB	-	Broadband
BBC	-	Born Before Computers
CAPs	-	Community broadband Access Points
CERT	-	Computer Emergency Response Team
CoE	-	Centre of Excellence
CRAN	-	Communications Regulatory Authority of Namibia
CRASA	-	Communications Regulators Association of the Southern Africa
EU	-	European Union
FCC	-	Federal Communication Commission
GDP	-	Gross Domestic Product
GNI	-	Gross National income
ICTs	-	Information Communication Technologies
IoT	-	Internet of Things
IT	-	Information Technology
Kbps	-	Kilobit per second
KPIs	-	Key Performance Indicators
M&E	-	Monitoring and Evaluation
Mbps	-	Megabit per second
MSCC	-	Multi Sectoral Community Centers
MTC	-	Mobile Telecommunications Limited.
NBC	-	Namibia Broadcasting Corporation

NBP	-	National Broadband Policy
NBS	-	National Broadband Strategy
NBSC	-	National Broadband Steering Committee
NDP5	-	Fifth National Development Plan
NDS	-	National Development Strategy
NGA	-	Next Generation Access
NRA	-	National Regulatory Authority
OICTP		Overarching Information Communications Technology Policy for the Republic of Namibia 2009
OTT	-	Over the Top
PA	-	Public Authorities
PLC	-	Project Life Cycle
PoPs	-	Points of Presence
PPP	-	Public and Private-sector Partnerships
QoS	-	Quality of Service
R&D	-	Research and Development
RIID	-	Research Innovation and Industry Development
SADC	-	Southern Africa Development Community
SANBS	-	South Africa National Broadband Strategy (2013)
SAPOA	-	Southern Africa Postal Operators Association
SATA	-	Southern Africa Telecommunications Association
IAP	-	Implementation Action Plan
SMEs	-	Small and Medium Enterprises
SOEs		State Owned Enterprises

UASF - Universal Service Access Fund

UN - United Nations

USO - Universal Service Obligation

USP - Universal Service Provider

WACS - West Africa Cable System

WTO - World Trade Organisation

GLOSSARY

Broadband - High-speed data transmission, such as cable, ISDN (Integrated Services Digital Network), LTE and LTE-A (Long Term Evolution and Long Term Evolution-Advanced) mobile technologies, Fibre and DSL (Digital Subscriber Line). It is generally taken to mean bandwidth higher than 2 Mbps.

Convergence - The integration of industries that up to now have largely operated separately from one another, but meshing along a specific value chain or bundling from different services at the applications end. Convergence is driven by the digitisation of the presentation, transmission, storage, processing and creation of information.

Deregulation - Process by which Governments remove, reduce, or simplify restrictions on business and individuals with the intent of encouraging the efficient operation of markets.

Electronic Business (e-business) - The exchange of information within or among enterprises by electronic means for the purpose of conducting business transactions or other relative activities

Electronic Commerce (e-commerce) - The conduct of commerce in goods and services, with the assistance of telecommunications and telecommunications-based tools

Electronic Connectivity (e-connectivity) - Remote connectivity and the provision of the capability of a real-time, secure, two way interactive connections between enabled systems.

Electronic Data Interchange (EDI) - The use of Information Communications Technology (ICT) and information processing to conduct business transactions, often in an integrated network combining different media, such as voice, text and data processing.

Electronic Government (e-government) - Government's use of technology , particularly web-based applications, to enhance the access to and delivery of Government information and services to citizens, business partners, employees, other agencies, and government entities.

Industry - A segment of the economy concerned with the production of goods and services.

Information and Communications Technology (ICT) - Any communication device or application, encompassing radio, television, cellular phones, personal digital assistants, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as video conferencing and distance learning. ICT refers to the technologies, including computers, telecommunications and audio-visual systems that

enable the collection, processing, transportation and delivery of data, information and communications services between users.

Information highway - All the changes in computing, new information technologies and systems, and related products affecting society and the economy

Information kiosk - Dispenses free information in various forms; and also offers users a PC based terminal for Internet access. Information kiosks form part of Multi-Purpose Regional Community Centres.

Information Society - A term used to describe a modern population that is conversant with – and actively using - information and communications technology. A society where the creation and exchange of information is a predominant social and economic activity

Information Technology (IT) - The study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware

Public postal operator - A national postal operator in which the majority shares are owned by the Government and which is legally obliged to provide universal postal service.

Public Private Partnerships (PPP) - An approach to facilitate cooperation between the public and private sectors in delivering important Government policy initiatives. PPPs can take various forms.

National Regulatory Authority - A public institution established by legislation to control, by using rules and regulations, the provision of telecommunications, broadcasting and postal services.

Sector - A distinct part of a market that can be described, categorized and targeted according to its own criteria and characteristics.

Small and Medium Enterprises (SMEs) - Smaller enterprises with an annual turnover of not exceeding N$10 million; these enterprises are fully owned by Namibian citizens.

Telco-OTT (Over-The-Top) is a conceptual term that describes a scenario in which a telecommunications service provider delivers one or more of its services across all IP networks, predominantly the public internet although sometimes telco-run cloud services delivered via a corporation's existing IP-VPN from another provider, as opposed to the carrier's own access network. It embraces a variety of telco services including communications (e.g. voice and messaging), content (e.g. TV and music) and cloud-based (e.g. compute and storage) offerings

Universal Access (telecommunications) - Accessibility of a telephone, not necessarily in one's home, but through some means such as a public pay telephone or community resource centre providing telephone facilities. The objectives underlying the concepts are the similar, to make available and maintain affordable communications services.

Universal access (postal) - Acceptable criteria used for defining postal service access standards which include among others: frequency of mail collection and delivery, post office opening times, distance between post offices (average area covered) and number of inhabitants served by a post office.

Universal postal service - A defined set of postal products and services of general public interest to which customers are entitled to use without discrimination in terms of accessibility, price and quality throughout the country. Universal services include but are not limited to the basic postal services. The scope of the postal services offered under universal postal service would be defined by legislation or by other customary means taking into account of the needs of the public and other national social and economic conditions.

Universal service - Service available, as far as possible, to all the people without discrimination on any basis with adequate facilities at reasonable cost; a Universal Service Provider (USP) provides these services.

Universal Service Obligation (USO) - Specific obligation imposed by postal law or license on the postal operator to provide a defined set of postal services to a specified community and locality usually under a regulated pricing system. In the event that such obligation results in financial loss of the postal operator a transparent compensation mechanism has to be put in place.

EXECUTIVE SUMMARY

As the world rapidly blends into a global village, connectivity and online presence become constant consumables and necessary ideals upon which national economies now lie. Progressively, the demands of the information society have made broadband a key enabler in pursuit of online presence and global belonging. Universal access to an affordable, quality and open broadband ICT infrastructure and services for all citizens is now a global pursuit. Broadband has the potential to make positive contribution to socio-economic development of Namibia hence the need to develop broadband which is currently at its formative stage.

Undoubtedly, as more and more traditional services become dependent on the internet, so does the role of broadband become more prominent. This critical role is acknowledged in Namibia's National Development Strategy as further echoed in the vision 2030 which acknowledges the exchange of technology and information throughout the world as a key globalization pillar. For a robust broadband ecosystem to be achieved, the linchpin comprising networks, devices, applications and users that hold the ecosystem together must be continually and harmoniously maintained in order to ensure that the mutually beneficial interrelationships are ever complementary. In an ecosystem characterised by distinct policies and practices for each constituent component within the system, unity of purpose is ever important.

The broadband policy is aligned to both National and cross-border commitments. These include Vision 2030, Fifth National Development Plan (NDP5), Harambee Prosperity Plan (HPP), Communications Act No: 8 of 2009, e-Government Policy for the Public Service 2005, e-Government Strategic Action Plan, Information Technology (IT) Policy for the Public Service 2008, Overarching ICT Policy 2009, ICT Sectoral Policies, Universal Access Service Policy, SADC Guidelines for Development of Broadband Plans, SADC Integration Agenda, Broadband Commission. The success of this Policy will hinge on the governance of broadband, the alignment of the broadband projects to other national plans and goals, strategic focus on both the broadband supply and demand needs, the funding models available and deployed for broadband projects and initiatives, the broadband delivery models and objective measurement of progress through definition of targets, performance tracking and monitoring and evaluation (M&E).

1 INTRODUCTION

1.1 Broadband Policy for Namibia

The role of Broadband Services as an enabler of economic and social development in countries is widely recognized in various published empirical studies and in documents such as the report of the Broadband Commission for Digital Development. Universal access to an affordable, good-quality and open broadband ICT infrastructure and services for all citizens will contribute to national development policy aims contained in Vision 2030 of the Republic of Namibia through increased innovation and productivity of all sectors of the economy both in urban and in rural areas where the majority of Namibians live. Consequently, 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 services has in terms of meeting the most basic needs of the households, communities, public administrations and businesses in Namibia. Specifically, ICT is both a stand-alone economic sector and an enabler of the other sectors of socio-economic development due to its cross-cutting nature. Further, access to ICT and the development of ICT related skills in the younger population are national imperatives in enabling Namibia's participation in an increasingly globalised economy.

Broadband networks have been cited as offering perhaps the greatest opportunity to make rapid and solid advances in global social and economic development across all sectors. In the twenty-first century therefore, broadband networks need to be considered as basic critical infrastructure like roads, railways, water and power networks. Indeed, countries that have harnessed the potential of Information and Communications Technologies (ICTs) have attained significant social and economic development; they are rapidly transforming into information and knowledge-based economies.

Within the broadband ecosystem, each of the players is affected by the policies and practices of the others creating a complex series interrelationships that affect user experience and the incentives for further innovation and investment in broadband. Thus in 2014, the Broadband Commission in its annual report recommended that countries should aim at-

(i) Launching national broadband plans;
(ii) Monitoring, reviewing and updating ICT regulations;
(iii) Promoting education for all including the use of broadband as well as the skills and talents necessary for broadband;

(iv) Reduction of taxes and import duties on telecommunications/ICT equipment and services;
(v) Acceleration of investment in Broadband infrastructure;
(vi) Enhancement of demand for broadband services through new initiatives and local content;
(vii) Engaging in ongoing monitoring of ICT developments;
(viii) Utilizing Universal Service Access Funds (USAFs) to close the digital divide.

The Government of Namibia has responded to these recommendations significantly and will continue to do so in order to create an enabling environment for the deployment of broadband for all Namibians. So far a number of policy and regulatory initiatives including the Overarching ICT Policy of 2009, General Policy Guidelines on Universal Service and Access in Communications (2013), and various regulations for the ICT sector, have been undertaken and this policy is aimed at building on that foundation to move the country higher up in the universal broadband development.

The following process was followed in the development of this National Broadband Policy:

(i) Preparation of baseline data collection questionnaires to assess the status of broadband in Namibia, validation of the questionnaire, collection of data,
(ii) Opening meeting between the ITU and the NBP Task Team in the Ministry of ICT to clarify expectations on and process for the development of the NBP and associated SIP,
(iii) Face to face consultation with each stakeholder to fill any gaps in the questionnaire responses,
(iv) Preparation a of a draft fact finding report and circulation to stakeholders for comments,
(v) Stakeholder consultation workshop to present the aims and methodology for the development of the NBP and associated SIP,
(vi) Preparation of Draft NBP and associated SIP and circulation of the draft to stakeholders for comments,
(vii) Face to face consultations with each stakeholder to receive comments and clarify aspects of the draft,
(viii) National Broadband Policy validation Workshop all stakeholders,
(ix) Preparation of Final National Broadband Policy with further consultations and submission to the Ministry of ICT of the Republic of Namibia,
(x) Processing of the Policy and the associated SIP for approvals and adoption.

2 BACKGROUND

Namibia is a vast country covering 850,000 square kilometres land area with a population of 2,533 million. It borders the South Atlantic to the West, Angola to the North, Botswana to the East and South Africa to the South. Urban population is 46.7 % (2015) of the total population with an urbanisation rate of 4.16 % (annual rate of change 2010 - 15). The population in rural areas is sparse with an accompanying need to deploy the most appropriate broadband solutions. The population pyramid indicates that Namibia has a young population which should be the main focus for the adoption of ICT for socio-economic development.

The goals of the Fifth National Development Plan (NDP5) of the Republic of Namibia are;

- Achieve an Inclusive, Sustainable and Equitable Economic Growth;
- Build Capable and Healthy Human Resources;
- Ensure Sustainable Environment and Enhance Resilience; and
- Promote Good Governance through Effective Institutionsthe ICT services identified as an enabler of the achievement of these goals.

In recognition of the critical role that broadband ecosystem plays in socio-economic development of countries, and in order to provide enabling environments that ensure broadband access, the Republic of Namibia has prepared this national broadband policy and an associated Implementation Action Plan (IAP) in line with its National Development Strategy (NDS) and taking into account the decisions made at Southern Africa Development Community (SADC) level with regard to the development of broadband networks and services as a vehicle for socio-economic development. Specifically, the SADC Ministers in charge of ICT encouraged all Member States to formulate a National Broadband Policy/Plan/Strategy or include broadband in their universal access/service definition by 2017. This Broadband policy responds to the needs of the Republic of Namibia contained in its NDPs and are based on the broadband ecosystem framework and the recommendations of the Broadband Commission with regard to the development of broadband; and on how to harness it as a catalyst for sustainable development.

Section one provide the background and highlighted the importance of broadband in the ICT as an enabler of all sectors in Namibia, the rational that includes national and cross-border commitments and the guiding principles that include the broadband pillars. Section two include the policy direction by explaining the Vision, Mission, goal and the Objectives. The section that follows indicate the policy strategies and Targets that are supported by the Implementation framework comprising of the ICT policy vision Legislation, regulation and the sector development Plan. Section four comprise of resource mobilisation that shows how public and private sector will be involved in this project and its supported by the monitoring and evaluation to the end

section five addresses all the aspects of coordination of the implementation of the national broadband. The policy document ends with the overall policy review and conclusion.

3 RATIONALE

Namibia intends to achieve universal access and service in respect of the full range of information and communications technologies. The objectives of the National Broadband Policy is to bridge the digital divide in Namibia by ensuring the whole population of Namibia will be provided with broadband connection at competitive prices and according to industry standards. With the National Broadband Policy, we wish to address key issues such as access, affordability, quality and usage. Closely related to these issues are content development and positive use of the Internet. This broadband policy aims to respond to the need for a framework for a holistic development of Broadband in the Republic of Namibia which is universally available and affordable and transform Namibia into a digital economy. In coming up with this policy, reference has been made to the national and cross border commitments.

3.1 National Commitments

The broadband policy is aligned to compliment National commitments and aspirations which are as follows:

(i) Vision 2030 for the Republic of Namibia, the Namibian Government's Vision 2030 stipulates that ICT must be the most important sector in the economic development of the country by 2030.

(ii) Fifth National Development Plan NDP5 (2017-2022), outlines a development strategy to improve the living conditions of every Namibian. It will ensure that Namibia has universal access to information, affordable communication and technology infrastructure and services.

(iii) Harambee Prosperity Plan (HPP), is a targeted Action Plan to accelerate development in clearly defined priority areas, it ensure that the following ICT targets are met, Broadband Infrastructure Development, Ensuring Accessibility and Affordability of Broadband. Promote e-services and innovations and Confidence and security of broadband network.

(iv) E-government Policy for the Public Service 2005;the use of Information and Communication Technologies in public administration, combined with organizational change and new skills, in order to improve public and democratic processes and strengthen support to public policies.

(v) e-government Strategic Action Plan 2014 – 2018, the e-Government Strategic Action Plan for the Public Service of Namibia, therefore contains and defines the details of the GRN's comprehensive five-year plan to transform its delivery of information and services through e-government Information Technology (IT) Policy for the Public Service 2008 The purpose of this document is to set out the Information Technology Policy for the Republic of Namibia.

(vi) Overarching ICT Policy 2009 (OICTP 2009), the purpose of this document is to set out the Overarching Policy in the context of the convergence of Telecommunications, Broadcasting, Information Technology, and Postal sectors for the Republic of Namibia.

(vii) Universal Service and Access Policy (2013), seeks to promote an enabling environment within which regulatory authorities and operators can interact to achieve telephony and broadcasting service and promote Internet and broadband access to the nation.

(viii) Communications Act No: 8 of 2009, Provide for the regulation of telecommunications services and networks, broadcasting, postal services and the use and allocation of radio spectrum; for that purpose the establishment of an independent Communications Regulatory Authority of Namibia.

3.2 Cross Border commitments

The broadband policy is aligned to compliment National commitments and aspirations which are as follows:

(i) SADC Integration Agenda Promotion of sustainable and equitable socio-economic growth.

This will be achieved by having proper and affordable broadband services readily available to Communities. Promotion of common political values especially among the populations who can access relevant information more readily and thus participate in political Decisions. Promotion, consolidation and maintenance of democracy, peace and security. These can be assured through a proper policy and regulatory framework which allow for deployment and use of broadband services in these key areas of human development.

(ii) SADC Guidelines for Development of Broadband Plans

Aims to strengthen and harmonies' policy and regulatory frameworks for the integration of African telecommunication/ICT markets.

(iii) Broadband Commission

The Commission was created to promote the adoption of broadband-friendly practices and policies to spread the benefits broadband Internet can offer and to ensure that broadband Internet technologies accelerate progress towards meeting the MDG.

3.3 Broadband definition The Broadband Commission for Digital technology did not explicitly define the term broadband in terms of specific minimum transmission speed because countries differ in their definition, generally broadband is referred to as a network infrastructure capable of reliably delivering diverse convergent service through high capacity access over a mix technology.

As per the SADC Ministers directive strive to set a minimum download speed of 1Mbps as a broadband entry level, which shall be reviewed with the aim to increase the download speeds on a per country basis in line with targets contained in the broadband plan of each country. The definition of broadband coverage includes geographical and population coverage for telecommunication networks and coverage of the population for broadcasting. Specifically, and for the purpose of this policy broadband is defined to mean a minimum of 1 *Mbps down load speed available to 80% of the population.*

4 GUIDING PRINCIPLES

This broadband policy complements and builds on the OICTP 2009 and is intended to ensure universal access to and use of quality and affordable high capacity broadband services for all Namibians for socio-economic development. Based on international and regional benchmarks, the guiding principles, pillars and enabling platform that underpin this broadband policy are as follows:

4.1 Broadband Policy Guiding Principles

The guiding principles that have informed the formulation of this policy and that will be instrumental in the implementation of the action plans under the policy are

(i) Alignment of the NBP with the National development vision and plans, namely Vision 2030 of the Republic of Namibia;

(ii) Infrastructure whose requirements and targets are set out in this Policy;

(iii) Universal access and usage of ICTs;

(iv) Affordability, availability and quality of broadband services;

(v) Broadband for socio-economic development in health, education, government, and in all sectors of the economy;

(vi) ICT skills linked to ICT deployment, applications and content development;

(vii) Development of ICT industry by promoting investment and innovation;

(ix) Sustainable development using broadband, including the use of renewable energy, to achieve eco-friendliness and addressing e-waste problem associated with broadband development.

4.2 Broadband Pillars

The findings of studies on broadband strategies and plans in the SADC member states and literature from other regions such as the European Union (EU) suggest that a national broadband strategy should address at least six key areas/themes which are important for its successful implementation and which should be supported by a platform comprising confidence in and security of networks, services, users, users and governance which also includes a monitoring and evaluation framework. The broadband policy pillars in this Policy are aligned with the definition of the Broadband ecosystem and with the SADC Guidelines for broadband development. Though the policies articulated in OICTP 2009 are still relevant for the development of ICT in Namibia, broadband-specific pillars are emphasized in this policy to complement the already existing policies.

Six key focus areas of the NBP strategy and plan:

(ix) Infrastructure;
(x) Connectivity and Devices
(xi) Content, Applications and Innovations including Research and Development (R&D) in these areas;
(xii) Capacity Building and Awareness which are pertinent demand side issues;
(xiii) Finance and Investment
(xiv) Policy, legislation, and regulation

4.3 Enabling Platform to Support Broadband Pillars

The five broadband pillars (focus areas) are supported by an enabling platform comprising:
(i) Confidence and security of networks and services;
(ii) Governance structures, with clear roles and responsibilities for broadband development.

5 POLICY DIRECTION

5.1 Vision

An informed ICT smart Namibia.

5.2 Mission

To create an enabling environment for a universal access to broadband infrastructure.

5.3 Goal

This Policy aims to achieve reliable and affordable broadband infrastructure services for all.

6 Broadband Policy Objectives

In order to implement universal broadband in the Republic of Namibia, the following policy objectives will be pursued to achieve the broadband targets.

(i) To ensure universal access to broadband Infrastructure and services
(ii) To promote development of content, applications and innovation,
(iii) To support efforts aimed at capacity building and reducing digital divide,
(iv) To provide an enabling environment for broadband deployment,

7 BROADBAND STRATEGIES

In order to harness the potential of ICT as a catalyst for sustainable development the Government of Namibia has adopted the following Six strategic action areas on the measures and commitments needed from the government and other stakeholders to fully leverage the potential of broadband and ICT for sustainable development.

(i) Provide quality and affordable broadband country wide.
(ii) Enable the use of e-application in government and other sectors of the economy.
(iii) To create an enabling policy, legislative and regulatory environment for broadband deployment.
(iv) To drive demand and stimulate public and private sector innovation and investment.
(v) Establish a comprehensive monitoring and evaluation framework for broadband deployment and development.
(vi) The cost of entry-level study of the Gross National Income (GNI) per capita for mobile broadband to be carried out.

Enhance digital literacy amongst Namibians. In this regard the Government of Namibia, through this national broadband policy (NBP) and its associated Implementation Action Plan (IAP) is set on the path of realizing universal broadband for all Namibians through specific policy objectives, targets and action plans covering the complete scope of the broadband ecosystem.

7.1 Broad Broadband Policy Targets

The Republic of Namibia will endeavour to develop its broadband ecosystem according to its unique requirements but also taking into account regional broadband initiatives that have been approved at SADC level. Pursuant to Decision 5 of SADC Ministers in charge of ICTs (Walvis Bay, Namibia June 2015).the following are the six **minimum** broadband targets for SADC Member States which Namibia has adopted:

1. 95% of the ***population*** to be covered by broadband services by **2023**;
2. 100% Broadband Infrastructure coverage to schools by 2022 to allow e-learning;
3. 90% of the Broadband Infrastructure coverage to health facilities to allow e-health by ***2023***;
4. 50 institutions to have e-application content by 2030
5. 100% Public Sector agencies to have access to Broadband Infrastructures to allow e-governance by ***2020***;

6. # Baseline Survey to be conducted to determine broadband demand gab in Public Institution
7. # Broadband Affordability study to be conducted by 2023
8. # of Awareness campaign carried out by 2023
9. National Broadband Committee to be fully established by 2020
10. E waste Policy to be completed by 2020

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8 IMPLEMENTATION FRAMEWORK

Conversantly, the success of all broadband initiatives depends on appropriate policy implementation framework comprising a national ICT policy vision, legislation, regulation and sector development plans.

8.1 Institutional Framework for Implementation of Broadband

The broad framework for the development of broadband comprises governance, implementation, financing/investment, and demand and supply of broadband:

8.1.1 Governance of broadband

This involves the manner in which broadband issues are being managed; and their oversight for the orderly development of broadband. The Government of Namibia shall ensure the following key functions of broadband governance:

(i) Control for the programme in the policy by ensuring that all interests are aligned and that all responsibilities and accountability points are in place and tracked;
(ii) Monitoring delivery which involves managing the risk and ensuring that the National Broadband Strategy (NBS) is delivered according to schedule, budgets and objectives; and,
(iii) Incentivise the generation of demand e.g., in health, education, transport, agriculture, tourism etc.

8.1.2 Linkages and Collaborations for broadband Implementation

This aspect means 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. To this end, the government shall promote collaboration, linkages and cooperation across all sectors with regard to broadband development and usage. Further, Government will ensure that each institution charged with the delivery of various aspects of broadband effectively executes its mandate through a monitoring and evaluation mechanism.

8.2 Legal and Regulatory Arrangement

The policy, legal and regulatory objective is to facilitate reform in laws, policies and standards that create an enabling broadband environment and harmonizing relevant laws to ensure legal sufficiency and a competitive broadband environment. In this regard a number of legal and regulatory interventions focusing on the complete scope of the broadband ecosystem will be implemented in order to realise the vision and mission of this policy. These interventions are as follows:

8.2.1 Demand Side of Broadband

To stimulate the demand for broadband the government will promote content development, e-applications and innovations, ICT training, and creation of awareness regarding the benefits and safe use of broadband services

8.2.2 Supply Side of Broadband

In order to implement the supply side of the broadband, various initiatives including deployment of appropriate ICT and related technologies, ensuring security of networks, services and users; and guidelines to support broadband shall developed and implemented. These include:

(i) Broadband Spectrum Plan guidelines;

(ii) Infrastructure Sharing Regulations (based on the SADC framework);

(iii) Open Access to Broadband Infrastructure Regulations (also based on SADC guidelines);

(iv) License Exempt Spectrum Regulations (also based on SADC guidelines);

(v) Adaptation of SADC Guidelines for Development of National Broadband Plans

8.3 Resource mobilisation

8.3.1 Investment in Broadband

Broadband deployment is capital intensive and though governance is a challenge when it comes to capital projects, it is critically important particularly when public and private sector are involved on such projects. In this regard, 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 public and private sector partnerships (PPPs) is a huge challenge and it must have a clear delivery structure in place.

In this regard, Namibia is set up for success through their National Broadband Plans (NBPs) because they have a clear ambition to convert the NBP into benefits for citizens. Beside proper governance, which will be ensured by the Government of Namibia, financial resources and effective delivery mechanisms are also required and will be ensured under the leadership of the Ministry of ICT. Since investment can be by government (public), private sector (commercial partners/sources) or through PPPs, it is important to have in mind the business case implied by

these investments because the private sector needs fair return on investment and the requisite governance structures for PPPs. The key stages in governance which shall be followed in the implementation of this policy will include:

(i) Definition of strategy;
(ii) Stakeholder consultation/alliance;
(iii) Funding arrangements;
(iv) Ensuring delivery mechanism;
(v) Execution/implementation framework with focus on timelines and deliverables including penalties for none compliance or late delivery;
(vi) Value for money and fulfilment of objectives through a robust responsibility; and
(vii) Accountability for monitoring and evaluation on the basis of clear targets and key performance indicators (KPIs).

In this regard, the Government will implement PPP as one of the investment mechanisms for broadband in addition to other investment vehicles.

8.3.2 Financing of Broadband

This relates to the modes through which broadband development receives funding from various sources of funds including investment both by government and private sector.

(i) **By private sector.** Since the ICT sector in Namibia is liberalized and that this process is ongoing, the financing of broadband shall be predominantly done by the licensees who shall invest in broadband in line with their licenses and the accompanying license conditions that shall be stipulated by the regulator of the ICT sectors.

(ii) **By Government**. Besides this private investment and in the framework of "provision of basic broadband infrastructure to stimulate demand and uptake of broadband services", the government shall set minimum targets and fund initiatives for broadband services in the following areas:

- Schools
- Hospitals
- Police stations
- Connection of constituencies
- Government offices

(iii) **Through public-private sector partnerships (PPP).** 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 shall be mobilized through public-private partnerships (PPP). To this end MICT will work together with the Ministry of Finance to operationalise the PPP arrangements in the broadband development. Ultimately, the sale of broadband capacity under the PPP should be open, transparent and non-discriminatory to avoid the distortion of the associated market.

(iv) **Incentive regulation**. This will be done by simplifying licensing regimes, making available more spectrum while taking into consideration national goals, scarcity of and the imperative to efficiently use of spectrum by licensees; and regulatory obligations.

(v) **Other financing mechanisms.** The other modes of financing broadband envisaged in the policy will be as follows:

- supplier credit,
- grants and loans from development partners; and
- Build operate and transfer (BOT)

8.4 Monitoring and Evaluation Framework and Reporting

Unless a robust framework for monitoring and evaluation (M&E), and reporting which addresses all the aspects of coordination of the implementation of the national broadband policy and associated implementation plans (SIP) is put in place, the goals of the policy will not be realized.

In this regard, a comprehensive M&E programme is provided for to guide the implementation of this policy. The M&E for this policy will follow the National Development Plan (NDP) monitoring framework. The results of the M&E will be used in the program and overall policy reviews. Besides the programs, measurements will also be made on the policy targets including on quality of services. To this end specific indicators will be developed under the guidance of the National Broadband Steering Committee (NBSC) and be monitored and measured on predetermined basis within the policy period.

8.4.1 Delivery, Affordability and Quality of Broadband Networks and Services

It is necessary that the promise of this policy be delivered through programmes and projects focusing on the pillars/ focus areas that underpin the policy. In this regard, a number of success factors and approaches to the implementation of the policy and strategy are recommended.

8.4.2 Success factors and approach for Broadband delivery

In order to deliver broadband, the following will be ensured:

(i) Technical capability for implementation;
(ii) Contract management which is crucial because 40% to 50% of cost increases are due to poor contract management;
(iii) Success criteria which should be developed and a measurement framework created; and
(iv) Information and data where there should be 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.

Further, each broadband program that shall be implemented according to the following approach:

(1) Comprehensive planning for each of the 6 broadband pillars or focus areas;

(2) Project management approach;

(3) Focus on outcomes and measurement of these outcomes.

8.4.3 Affordability

Affordability remains a serious challenge to the demand side of broadband services leading to low levels of adoption and use of broadband services in Namibia and in most countries in Africa, including those 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 (Mauritius and South Africa) having achieved United Nations (UN) target of 5% of GNI per capita. The barrier to broadband demand is a result of not doing the following: planning, consulting stakeholders, using data for evidence based decision making, creating enabling environments for open access, infrastructure sharing, implementing mobile broadband where appropriate, developing and executing a robust 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 through the use of services by citizens, it implies that the factors that impact affordability and hence demand and use of broadband services should be addressed and incorporated in the national broadband policy, strategy and plans as a bare minimum. Consequently, besides the fact

that this policy has been developed through wide consultations with stakeholders, an action plan on affordability of broadband services is included as a specific plan of action area in this National Broadband Policy.

8.4.4 Quality of Broadband Service

All licensees shall provide broadband services of acceptable quality that is comparable to international standards for such services. Further, licensees shall ensure that their broadband systems (networks, devices and software) comply with international standards and are interoperable to ensure that there is seamless accessibility to broadband services across all networks. In this regard, the regulator (CRAN) has a prescribed broadband service quality standard for all broadband licensees.

8.5 Advocacy and Dissemination

For the full benefits of this policy to be realised, an active and robust communication strategy must be in place. Extensive awareness will arm the people with the information and willpower to drive the objectives of this policy. To this end, the trickle down of information from the formulators of the policy starting with the Ministry of Information to implementers of the policy to the final consumers must be pursued. This will ensure that the end users of broadband products and services are informed and therefore capable of contributing to the improvement of this policy through public participation for example. Proper outreach of this policy will ultimately entail rollout of tailored approaches that are aimed at disseminating the policy objectives and direction to the various cadres of society. From children, to the less educated, to those living with disabilities, to the unconnected, the under-served, the donors, the policy makers and all other stakeholders. An all-inclusive approach will ensure that the strategies to be adopted are customized to meet the respective needs of the cadres targeted.

Curriculum review, basic and simple interpretation, awareness creation, capacity building, electronic media advertisement including indigenous languages outreach may serve as fitting modes of outreach. Print media is also useful especially in reaching out to potential donors.

9 IMPLEMENTATION ACTION PLAN (IAP) AND ROLES OF STAKEHOLDERS

The policy shall be implemented through programmes for each policy pillar and support platform with specific project elements under each programme. During the implementation stakeholders will play certain roles that are pertinent to the NBP and the associated IAP.

Implementation Action Areas

The details of action plans are presented in the appendices where the focus of SIP is on the following areas:

(i) Governance
(ii) Infrastructure
(iii) E-services and innovations
(iv) Research, Innovation and Industry Development
(v) Capacity building and content
(vi) Policy and regulatory harmonization
(vii) Confidence and Security of networks and services
(viii) Promotion of Broadband
(ix) Affordability and quality of broadband
(x) Government Funding and Incentives
(xi) Competition
(xii) Consumer protection and values
(xiii) Internet access
(xiv) ICT and Environment

Roles of Stakeholders

There are various stakeholders who shall play important roles in the implementation of this Policy. The following are the key roles of stakeholders with regard to the implementation of the NBP and its associated IAP.

(i) Parliament shall approve the NBP and enact necessary laws to fully operationalize the NBP
(ii) MICT is the custodian of the NBP, will monitor its implementation and be responsible for the review of the NBP
(iii) Regulator (CRAN) shall draft and ensure implementation of regulations in line with the NBP
(iv) Licensees
    (1) provide broadband services of acceptable quality and at affordable prices;
    (2) provide consumer education
    (3) be part of the develop the demand side of the BB ecosystem not only the supply side;
    (4) Develop content and e-applications.

(v) Office of the Prime Minister (OPM) to coordinate implementation of broadband in all Ministries and departments of Government

(vi) Consumer organizations

(1) Articulate consumer concerns
(2) Demand for acceptable quality of service and pay for it

9.1 Broadband Delivery Strategy

National Imperative to Succeed

The key to the success of broadband strategy is a national imperative to succeed – a shared vision and sense of urgency to ensure that a strategy is successfully implemented. A national imperative to succeed and programme management perspective are necessary for the effective delivery of broadband. This focus will be guided by effective governance which has a national imperative to succeed and program management discipline.

The national imperative to succeed must be visible to citizens from the political side as evidenced by leadership, role modelling, and demonstrated commitment by the National Broadband Steering Committee (NBSC) and from the Minister in charge of ICTs who should be the chair of the National Broadband Steering Committee. Further, success can only be realised by proper planning**,** since 60% to 90% of challenges can be addressed with proper planning/reviewing the national broadband (NBP) delivery plan.

Programme Management Perspective

This perspective will be adopted to avoid confusion in governance which can lead to delays, frustration and cost overrun. The programme management perspective is necessary because each programme under the NBP (such as e-health programme) will have specific projects which need to be coordinated. 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 broadband plans are:

(i) Universal education including implementation of virtual class rooms;
(ii) Delivering health to rural areas including mobile health, telemedicine etc.;
(iii) Broadband in agriculture and livestock;
(iv) Promotion of broadband targeting various segments namely household, business, schools, public sector and government;
(v) Homeland security;
(vi) Transportation including smart transport.

Demand Side of Broadband

Further, the delivery of broadband strategy shall focus on the demand side of broadband as follows:

(i) Development of e- applications, and creation of local content and ensuring sustainability of these initiatives by providing funding and demonstrating a business case to justify the funding;
(ii) Pricing and quality of broadband services to ensure that it is not a barrier to the uptake of broadband services – this involves addressing the affordability of broadband;
(iii) Equipping the citizens with e-skills through training and education to improve ICT literacy including deliberate and targeted literacy programmes for the people born before computers (BBC) – the elderly people. This is underestimated in most cases but is critical for the adoption of broadband service usage hence the need to invest in this area as part of the broadband projects

Supply side of Broadband

As part of the delivery of NBPs, policy actions on the following issues pertinent to the supply side of broadband should be taken:

(i) Opening of vertically integrated markets;
(ii) Technology and service neutrality in the licensing/authorization of deployment of broadband and promoting over-the-top (OTT) IP based services by providers who do not own the network;
(iii) Promotion of Open Access in exchange for public funds such as deployment of passive (layer 1 – dark f fibre) networks, and/or layer 2 (lit-fibre) and the imperative by the regulator to decide on whether to apply infrastructure or services based competition;
(iv) Infrastructure sharing by clearly formulating and implementing what the sharing mechanisms should be;
(v) Availing spectrum for rural expansion
(vi) Fiscal support and funding such as grants, and loans based on a robust 'business case' to justify the investment/funding;
(vii) Closing the broadband gap by facilitating the connection of rural areas. This will be promoted through incentives to stakeholders to invest in rural areas. The incentives can be in the form of government targeted funding as initial or 'seed capital', or tax incentives to encourage investors into these areas.

10 POLICY REVIEW

Owing to the dynamism of the information age, it is essential to ensure that this policy is reviewed and updated on a regular basis so that it adequately addresses and responds to current and emerging trends. This should be a progressive commitment involving all the stakeholders. Under the OICTP 2009, it is proposed that the Ministry of ICT establishes mechanisms for the collection of relevant information from operators and other stakeholders through which information on relevant issues, trends and other matters that may affect the ICT sector shall be identified and thereafter be utilized for periodic reviews of this policy. Consequently, the approach to the review of this policy will follow the same process of collecting relevant information on broadband indicators from stakeholders in the framework of the monitoring and evaluation, and reporting that is part of this policy document. There will therefore be quarterly individual project reviews annual review of programmes for each policy pillar, bi-annual reviews of the policy and a comprehensive policy review after five years. Specifically, there will be a bi-annual programme review for each broadband pillar, bi-annual policy implementation review against all targets and comprehensive policy review in the fifth year against the National Development Plan (NDP). The NBSC shall set the parameters for these reviews during the first three months of the promulgation of the policy.

11 CONCLUSION

This Policy has captured the aspirations of the Namibians as part of the global information society. The Policy direction and objectives envisioned have highlighted the destination to which, as a people, we aim towards with the implementation action plan detailing the roadmap upon which this voyage is to be charted. Once approved, the mandate of implementing this policy will be activated. With various stakeholders involved, tremendous commitment required and an active desire to see this process to its successful destination, the journey ahead holds the promise of Namibians as a people steadily striding towards digital inclusion the progress of which will be underpinned by a robust monitoring and evaluation process through which performance indicators, the gains made, the obstacle encountered and the adjustments calling will be elaborated. As we set sail therefore, we so do with confidence that the course has since been charted in the form of this broadband policy and all that is left is steering the ship.

APPENDICES

Appendix I: Performance Management Framework

12 Performance Management Framework

12.1 Strategic Mapping

To ensure performance management of the deployment of this policy, this framework, which clearly demonstrate strategic mapping of the whole national broadband plan where strategic objectives are linked with the broadband strategy thematic areas or pillars and the performance measures which address each of the strategic objectives with clear measureable performance indicators is presented (see Table II-1) to guide the various stakeholders in the discharge of their responsibility under this NBP.

Table II-1. Strategic Mapping of the National Broadband Policy

Vision [for each Pillar/thematic area]	**Strategic objective/strategies**	**Action**	**Outcome/ Remark**	**Timeline**
Infrastructure	To avail broadband networks for all Namibians	Deploy BB infrastructure for international, national, provincial and local loop (last mile) access	The whole of Namibia is covered with BB	2020
Connectivity and devices	Access to broadband networks and services, and use by all Namibians	1. Address barrier to connectivity at international, national and local 2. Ensure affordable devices to access broadband services	All Namibians can access and use affordable broadband services locally and internationally 2. All Namibians can afford broadband devices	2020

Content, applications and Innovations-	To ensure creation and availability of relevant content, e-applications and innovative services for all Namibians	1. Establish/ strengthen Research and Development (R&D) in these areas 2. Set up a technology park 3. Create local content to be accessed by users of broadband	There is relevant local content for all Namibians There are e-applications in all sectors of the economy, such as e-education in all levels of education (100%), e-health in at least 70% of all health facilities	**2020**
Capacity Building and Awareness;	To build adequate capacity to deploy and broadband and utilize broadband services in all sectors by all Namibians	Build or enhance the capacity of existing institutions to be Broadband centres of excellence	1. All Namibians have an appreciation of the potential of broadband 2. All Namibians are able to use broadband for socio-economic development	**2020**
Policy, legislative, regulatory and institutional environment	To ensure orderly deployment and use of broadband for socio-economic development of Namibia	1. Approve the BB policy and associated IAP 2. Harmonise policies, legislation and regulation with guidelines approved at SADC regional level	1. National development policies across all sectors are harmonized with regard to ICT 2. Broadband is embedded in the universal goals of all sectors of the economy	**2018**
Finance and Investment.	To ensure adequate resources are available for investment in broadband	1. Implement fiscal incentives for broadband deployment 2. Implement PPP for broadband deployment	There is adequate finances to implement broadband	**2020**

		Establish universal service fund		
Confidence and security of networks and services;	To ensure that all Namibians are safe and secure while using online services	Enact laws and formulate regulations with regard to electronic transactions and cyber security	There are laws that support and safeguard citizens while operating online	**2018**
Governance of broadband	To ensure adequate and effective governance of all broadband matters in Namibia	1. Set up the NBSC2. Set up task terms (working groups on each BB pillar)	1. Broadband coordination committee is set up 2. Broadband program (pillar) task terms (working groups) with clear roles and responsibilities for broadband development	**2018**

12.2 Monitoring and Evaluation of Broadband Plan

Crucial to the implementation of this policy is establishing whether the stakeholders are implementing the activities as planned and whether each project under each policy pillar is on track and determining the challenges experienced during the implementation phase and establishing the remedial actions. A robust monitoring, measurement and evaluation framework with clear timelines for deliverables should be prepared and publicized to all implementing agencies to ensure proper tracking of progress. Further, responsibility for this function should be clearly defined and assigned to avoid ambiguity on who is responsible for results and outcomes in this area of the NBP. A template is provided for the monitoring of broadband deployed (Table II-2. Each BB task team will be required to prepare a similar plan for each project.

Table II-2. Monitoring and Evaluation for Broadband

Pillar	Projects	Supply Target	Demand Target	Timeline	Outcome/Remark
E.g., Infrastructure	Metro broadband wireless network	100%	Adoption by 60% of population	2018	Have BB available for use by all citizens

Key performance indicators

In order to monitor the extent to which BB has been adopted and is being used in Namibia, data on the following indicators should be collected on regular basis and analysed. The results of this analysis should then be used to take corrective actions to ensure that the country is on the right broadband development trajectory. The minimum (not exhaustive) set of indicators against which the progress on broadband development should be assessed are as follows:

- Tariffs for International Bandwidth
- Domestic Connectivity
- Wholesale ADSL
- Point to Point Internet Connection
- Domestic Leased Circuits
- Internet Subscribers
- Type of Internet Access
- ICT Access and Use by Households
- ICT Access and Use by Individuals
- ICT Usage in Education
- ICT Usage in Business
- ICT Usage in Government
- ICT Sector as a Growth Driver
- ICT use in health

In summary, some of the most important considerations for implementation of broadband should include the following:

(i) Definition of broadband using the ecosystem approach as per SADC Guideline for Development of Broadband plans;

(ii) Elaboration of content development strategy and of strategies for other broadband pillars

(iii) Elaboration of open access in the context of competition to address affordability;

(iv) Checklist on the monitoring and evaluation framework to guide on timelines for reviews; and

(v) Measuring broadband by regularly making reference to appropriate indicators for broadband.

Appendix II: Broadband Delivery Strategy

13 Broadband Delivery Strategy

13.1 Governance and Management

As stated earlier in this policy, governance shall include leadership from the highest government level by the Ministry in charge of ICT who shall set up a multi-stakeholder National Broadband Steering Committee (NBSC) charged with overseeing the development of broadband by various institutions with a clear coordination framework for broadband development according to this policy. The key functions of governance of the NBSC are as follows:

(i) Control of 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; and
(iii) Incentivise the generation of demand e.g., in health, education, transport, agriculture, tourism, mining, etc.

Similarly, the key steps in governance which Namibia will follow are:

(i) Strategy and policy definition and commitment;
(ii) Stakeholder consultation/alliance and 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; and
(vi) Measuring and assuring value for money and fulfilment 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 shall include NBSC and Broadband Task Teams (or Working Groups) to deal with the various pillars of broadband in Namibia 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 the NBSC and working groups are presented in Box III-1a and Box III-1b, respectively.

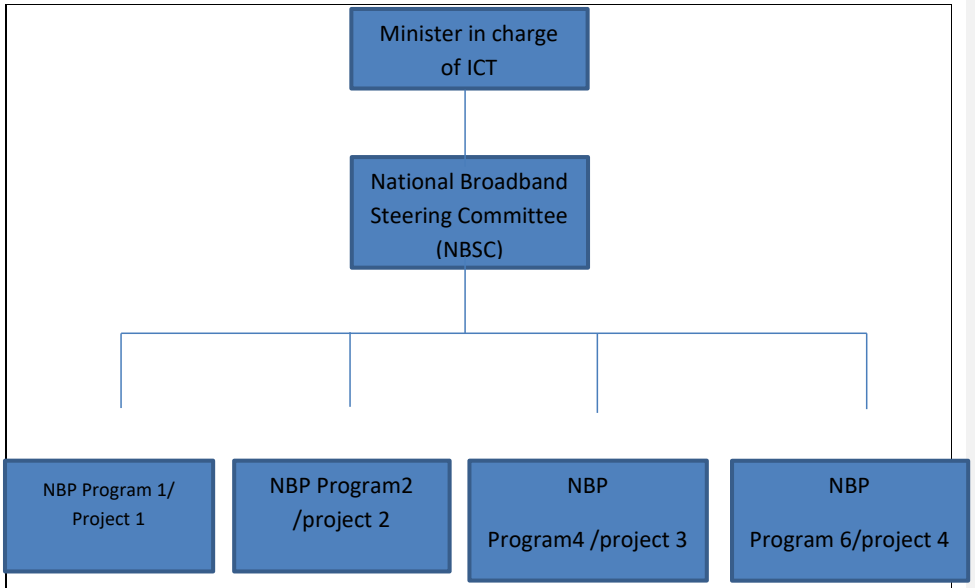
Box III-1a. Coordination Committee Role and Activities	**Box III-1b. Working Group Roles and Activities**
• Establish key principles and objectives • Implement high-level targets in Clause 6.2 • Define and appoint Working Groups • Oversee and advise Working Group deliberations • Host Public Forum and Consultations • Develop a consensus agreement on harmonizing strategy inputs • Prepare draft National Broadband Implementation program document • Oversee creation of Action Plans to define implementation steps • Collaborate on establishing a follow-up regime	• 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 cooperation – **Economics**: Costs, demand, economic impacts – Recommendations

An example of the broadband coordination (through a the NBSC) mechanism is presented in the next sub-section (s12.2)

13.2 National Broadband Plan/Strategy Coordination

A well-coordinated implementation framework is required to ensure proper implementation of the NBP. Coordination is required 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



NBSC: National Broadband Coordination Committee

Figure III-1. Governance structure

The NBP program could be in education, health, agriculture, tourism, mining or any other area while there can be several projects under each NBP program area (Pillar) e.g., under the education sector, there could be virtual classrooms, monitoring of the health of elderly citizens under 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 NBP activities, progress, challenges to the Government;
(iii) Seeking funding, directly from Government, funding institutions and private sector;
(iv) Negotiating 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 national broadband steering committee (NBSC) with whatever assistance they may require from government; and
(vi) Provide secretarial services to the NBSC

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

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

14.1 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 relevant to one or more identified objectives/strategies/focus areas, and 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; and
(v) linkage and mutual dependence with other projects.

14.2 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. Namibia's broadband targets for the year 2030 are presented in Table III-1.

Table III-1. Namibia's broadband targets to 2030

Target	Penetration measure	Baseline (2015)	By 2017	By 2020	By 2030
Broadband access in Mbps (user experience)	% of population	21.2% Internet access (256k to 2Mbps); 38% over mobile broadband	50% at 2Mbps	90% at 3Mbps 50% at 100Mbps	100% at 10Mbps 80% 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 10Mbps	100% at 10Mbps	100% at 100Mbps

Source: Usage and Population Statistics. Internet world Stats and Republic of Namibia

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. The QoS regulations for Namibia are already in place where there no distinction is made between rural and urban because every Namibian should access the same quality of service wherever they are.

Example of Broadband Plan elements together

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 3):

Box III-2. 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 2018
– Ministry responsible, USAF funding; collaborate with operators, local stakeholders

Example of Summary Broadband Plan segment

A typical broadband plan segment showing focus area/pillar, outcome, strategy, responsibility and project is presented in Table III-2.

Table III-2. Sample Summary of broadband plan segment for the Ministry of Education

Focus Area/ Objective	**Outcome**	**Strategy**	**Responsibility**	**Projects**
Education	Target			
1.Broadband connections in schools	50% of schools by 2018	Community broadband access networks, linked to schools	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 supplier	1. School ICT devices project

Checklist on Delivery of the NBP

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

(i) Technical capability (with special focus on interfacing and integration capabilities) 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; and
(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 sides with clear understanding of the drivers of both the demand and supply sides;
(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 but that also include timelines, penalties etc.; and
(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.

Appendix III: Coverage of Broadcast Services in Namibia

15 Coverage of Broadcast Services

The status of the broadcasting subsector is presented in Box IV-1 (Regulator Perspective) and Box IV-2 (Operator Perspective)

Box IV-1: Regulator Perspective

Please provide YES/NO response to the following statements. If NO, please provide a brief explanation such as extent of coverage (as at present), statement on quality (as either Poor, fair or Good), content (as irrelevant, somewhat relevant, relevant etc.)

1. The entire Namibia is able to receive countrywide radio coverage **(YES/ NO)**
   ± 80% population coverage
2. The entire Namibia is able to receive countrywide TV coverage **(YES/ NO)**
   ± 70% DTT population coverage
3. The entire Namibia is able to receive good signal quality of radio broadcasting services countrywide **(YES/ NO)**
   ± 80% population coverage
4. The entire Namibia is able to receive good signal quality of television broadcasting services countrywide **(YES/ NO)**
   ± 70% DTT population coverage, subscription based satellite television is expensive
5. The entire Namibia is able to receive a variety of relevant Radio channels countrywide **(YES/ NO)**
   ± 80% population coverage
6. The entire Namibia has countrywide variety of relevant radio content **(YES/ NO)**
   80% population coverage
7. The entire Namibia is able to receive a variety of relevant TV content countrywide **(YES/ NO)**
   70% population coverage by public broadcaster, subscription satellite TV is expensive
8. All Namibians are able to receive affordable radio services in all parts of the country **(YES/ NO)**
   80% population coverage
9. All Namibians are able to receive affordable TV services in all parts of the country (**YES/ NO**)
   70% population coverage by public broadcaster, subscription satellite TV is expensive
10. The migration from Analog to digital TV has been completed **(YES/NO)**
    ITU requirements met, but still expanding coverage
11. All citizens of Namibia have access to affordable digital TV decoders **(YES/NO)**

The status of broadcast services from an operator's (Namibia Broadcasting Corporation) perspective is presented in Box IV-2

Box IV-2. Operator Perspective

Excerpt of a survey on the Namibia broadcasting subsector where a YES or NO response was requested followed by a brief explanation

1. The entire Namibia is able to receive countrywide radio coverage **(NO)**
Only 78% population coverage on FM

2. The entire Namibia is able to receive countrywide TV coverage **(NO)**
Only 76.7% TV coverage once all analogue transmitters migrated to DTT, 93.2% DTT coverage if all planned new sites are implemented.

3. The entire Namibia is able to receive a variety of relevant Radio channels countrywide **(NO)**
The Namibia Broadcasting Corporation (NBC) broadcasts in 10 languages, but not all languages cover all areas (depends on population distribution).

4. The entire Namibia is able to receive a variety e of relevant TV channels countrywide (**NO)**
All areas covered by DTT will receive all channels carried by the Namibia Broadcasting Corporation (NBC) (see coverage in 2. above)

5. The entire Namibia has countrywide variety of relevant radio content **(YES/ NO)**
Radio content is relevant countrywide, but coverage is not 100%.

6. The entire Namibia is able to receive a variety of relevant TV content countrywide **(YES/ NO)**
TV content is relevant countrywide, but coverage is not 100%.

7. All Namibians are able to receive affordable radio services in all parts of the country **(YES/ NO)**
Radio services are affordable, but coverage is not 100% of the population.

8. All Namibians are able to receive affordable TV services in all parts of the country (**NO**)
(a) TV coverage is not 100%, (b) not all Namibians have electricity, and (c) not all Namibians can afford a TV set.

9. The migration from Analog to digital TV has been completed **(YES/NO)**
DTT coverage is over 70%, not all analogue sites migrated due to financial limitations.

10. All citizens of Namibia have access to affordable digital TV decoders **(YES/NO)**
The decoders are heavily subsidized, selling for N$ 199 each and half-price for pensioners and other special categories. However, even at that price there may be citizens unable to afford a decoder, but then they probably would not have been able to afford a TV set either.

From the findings presented in Box IV-1 and IV-2, it is clear that there is still work to be done to ensure that all Namibians receive quality and affordable broadcast services. There is also concurrence between the regulator and the operator on the extent of coverage of the broadcasting services.

Appendix IV - Affordability of broadband

16 Affordability of broadband

16.1 Obstacles to broadband diffusion

Research on the variables affecting broadband diffusion is quite extensive. For example, Hauge and Prieger (2010) point out that income, educational level of the head of household and household age composition are the main predictors of broadband adoption. Other studies mention variables that are more specific to countries or regions. Navarro and Sanchez (2011, quoted in http://broadbandtoolkit.org/6.8.2) indicate that, *ceteris paribus,* gender is a strong predictor in Latin America, where females are 6% less likely to adopt broadband. At the highest level of analysis, the residential broadband demand gap is the result of three obstacles: (1) **Limited affordability where** certain portions of the population either cannot acquire a device or purchase the subscription needed to access the Internet; **(2) Limited awareness of the potential of the service or lack of digital literacy; and (3) Lack of relevance or interest**: the value proposition of applications, services, and content does not fulfil a need of the adopting population

Each of these three obstacles is driven by one or a combination of four structural variables:

(i) **Income levels**: the socio-demographic group, measured by income, does not only influence the affordability barrier, but is also correlated with limited awareness and lack of relevance
(ii) **Education levels**: the education attained by the potential user influences the degree of digital literacy and is related to interest in accessing the Internet.
(iii) **Age**: similarly, the age variable is inversely related to digital literacy and content relevance
(iv) **Ethnicity**: as a result of linguistic and/or cultural factors, ethnic group belonging can impact the level of interest in accessing the Internet

Limited affordability

16.2 Affordability remains a serious challenge to the demand side of broadband leading to low levels of broadband development. It is a barrier to broadband demand as 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. The specific factors affecting the development of broadband are high retail prices, high wholesale prices and lack of transparency; and lack of local broadband ecosystem (such as content) in most SADC Member States.

Achieving affordability is therefore approached by assessing the broadband demand gap. This process begins by measuring the demand gap, namely *what percentage of the population can purchase broadband yet still do not?* Once this gap is quantified, it is necessary to understand the causes of this so called "market failure." It could be because a portion of the **population cannot afford** to purchase a subscription at current prices; or because they **lack the necessary digital literacy** that allows them to access the Internet. It could also be that while potential users have a computer (or comparable device), they **cannot find any online content, applications, or services** that would motivate them to purchase broadband service.

16.3 Broadband cost as percentage of income

In order to further illustrate the nature of affordability problem the cost of broadband as a percentage of an individual's income varies widely across the world and within countries in Africa. Its impact on affordability of broadband is a major factor in the demand for broadband in SADC, Africa and elsewhere in the world which should be addressed.

The components that determine the total cost of ownership of the technology comprise device acquisition and other one-time costs, service subscription retail pricing (with multiple sub-components), and service taxation. These components serve as the basis for the potential policy initiatives addressing the broadband affordability obstacle.
Consistent with the definition of the elements of the broadband ecosystem elucidate three key elements that comprise its internet (also referred to as) ecosystem, namely: Applications and content; Devices; Networks; and Power supply.

Besides these three, reliable power supply is critical for the development of broadband; it should not be treated as an integral part of the deployment of the broadband policy.

Appendix V: Status of Broadband ICT in Namibia

17 Status of Broadband ICT in Namibia

17.1 Overview of the Namibia ICT Sector

The Fifth National Development Plan (NDP5) highlights the following challenges for the ICT sector in Namibia which are yet to be addressed -

- Lack of modern ICT Infrastructure in rural areas
- Lack of understanding of the relevance of ICT which results in low resource provision and usage of available ICT capacity
- Limited internet access at public facilities in rural areas
- Insufficient electricity in rural areas
- Low capacity and expensive telecommunication networks
- Poor quality of service
- Inadequate capacity (human and financial resources) to implement projects that may already have been formulated
- High import taxes on ICT equipment and high fluctuations in exchange rates which further push the cost of imported equipment higher and this is impacting affordability
- High unit cost of rolling out to vast geographical area

17.2 ICT Baseline Data

The following are the present baseline data on ICT in Namibia:

- Namibia established West Africa Cable System (WACS) connectivity in 2011;
- There are 140 Post Offices countrywide;
- Telecom Namibia has laid about 7755 Km fiber optic cable across the country
- Currently the Government has established 26 Semi Multi-Sectoral Community Centers (MSCC) across the country;
- There is only one (1) Point of Presence (PoPs) for access to the public service information.
- There are 342 FM transmitters, 57 TV transmitters and 36 studios.
- Telecom Namibia has established 193 base stations / PoPs for Broadband Coverage.
- MTC has established 661 active base stations / PoPs for Voice and Data connections, of which 221 are providing broadband (>1mbps) data services.

17.3 Broadband Specific Challenges

Besides the sectoral level challenges that face the whole of the ICT sector in Namibia, there are broadband specific challenges which include:

- Right of Way, co-siting and sharing of infrastructure; including approval processes with local authorities
- Regulation and taxation regime
- Vandalism of infrastructure
- Investment and funding for broadband
- Affordability
- Coverage and access of broadband
- Rate of exchange uncertainty which results in high cost of imported equipment
- Spectrum management and use.

17.4 Implementation of Broadband in Namibia

The Government of Namibia recognizes the need to be part of the global information society as contained in the Overarching ICT policy of 2009 (OICTP 2009) that "ICT has a pervasive impact on the Namibian economy, and contributes to economic growth, industrial development, poverty eradication and equal opportunity." During extensive consultations on the development of Broadband Policy and associated Strategic Implementation Plan (SIP), that involved meetings with national officials, interviews with licensees and multi-stakeholder consultation (Windhoek October 29, 2015), the current status of Broadband in Namibia is summarised as follows:

(i) Limited broadband access in rural areas;
(ii) Poor quality of service experienced by users in urban and rural areas
(iii) Highly priced broadband services ;
(iv) Inadequate ICT skills among service providers and the general public to deploy and use broadband services respectively;
(v) Inadequate quality of service where, in most cases, the broadband capacity received by the customers is much lower than advertised by the service providers;
(vi) Need for more enhanced governance and institutional capacity to coordinate the implementation of national ICT programmes in government and in all sectors of the economy;
(vii) Lack of the legislation on cyber security to ensure confidence and security in the use of online services;
(viii) inadequate investment in broadband due to high profit orientation by current licensees and potential investors;
(ix) inadequate content, applications and innovations in/for Broadband.

18 Broadcasting in Namibia

18.1 Coverage of broadcasting services

The TV broadcast coverage is currently below 80% of the population and will improve to 93.2 % DTT coverage if all planned new sites are rolled out. Similarly only 78 % of the population is covered by FM broadcasting.

Further, not all Namibians are able to receive affordable TV services in all parts of the country due to the fact that: (a) TV coverage is not 100%, (b) not all Namibians have electricity, (c) not all Namibians can afford a TV set. This situation points to the need for policy interventions on coverage, electricity supply and affordability.

18.2 Barriers to broadband deployment among broadcaster operators

From a Broadcaster point of view, the major barriers to the deployment of broadband service by Broadcasters are-

(i) Lack of existing infrastructure;

(ii) Network deployment capital cost issues. Specifically, if a Broadcaster is not able to readily access commercial financing institutions for extension of broadband to last mile customers because although loans are available, the cost is high. Further, it is not difficult for broadcasters to receive licenses for broadband roll-out if the business case and expertise are in place.

(iii) High cost for the subscriber, either in terms of up front charges (initial cost) or monthly charges for access to pay TV. This is as a result of the fact that Namibia is a large, sparsely populated country, which increases the cost per user.

19 Affordability of Broadband

The findings of a study leading to the development of this policy revealed that cost (hence affordability) to enter for a potential consumer is a barrier to the diffusion and uptake of ICTs – and by extension broadband - in Namibia.

Affordability of broadband services is a crucial demand side consideration for broadband. For example, at the highest level of analysis, the residential broadband demand gap is the result of three obstacles: (1) *Limited affordability* where certain portions of the population either cannot acquire a device or purchase the subscription needed to access the Internet; (2) *Limited awareness of the potential of the service or lack of digital literacy*; and (3) *Lack of relevance or interest* where the value proposition of applications, services, and content does not fulfill the need of the adopting population.

Each of these three obstacles is driven by one or a combination of four structural variables:

(i) **Income levels**: the socio-demographic group, measured by income, does not only influence the affordability barrier, but is also correlated with limited awareness and lack of relevance;

(ii) **Education levels**: the education attained by the potential user influences the degree of digital literacy and is related to interest in accessing the Internet;

(iii) **Age**: similarly, the age variable is inversely related to digital literacy and content relevance; and

(iv) **Ethnicity**: As a result of linguistic and/or cultural factors, ethnic group belonging can impact the level of interest in accessing the Internet. It is acknowledged that Namibia is a multi-ethnic society and that some content may not be in a language understood by other communities hence the need to ensure that there is appropriable local content for all Namibians irrespective of their age, gender, ethnic community and physical ability.

This NBP addresses this demand side variable with specific policy actions (Appendix I) to ensure that the cost of broadband to a user is within 5 % of the Gross National Income (GNI - being monthly disposable income) by 2020; and that barriers related to demographic factors are also addressed through education and creation of awareness of the potential and benefits of broadband.

20 Enablers of Broadband Deployment in Namibia

A summary of the survey of the status of the environment created by government to support broadband deployment in Namibia is presented in Table 1 while the situation with regard to creating confidence and security online, ICT skills and applications and content are also presented.

20.1 Enabling broadband deployment in Namibia

Table 1 indicates on a scale of 1 to 5 the extent of to which the Government of Namibia is ready to deploy broadband by examining its ranking on eight enabler of broadband.

Table 1. Enablers of Broadband Deployment in Namibia

No	Status of broadband ecosystem	(1) Not yet considered	(2) Considering the Act	(3) Have plans in place	(4) Implementing the action	(5) Fully implemented the action
1	Launching national broadband plans		X			
2	Monitoring, reviewing and updating ICT regulations				X	
3	Promoting education for all including the use of broadband as well as the skills and talents necessary for broadband		X			
4	Reduction of taxes and import duties on telecommunications/ICT equipment and services	X				
5	Acceleration of investment in Broadband infrastructure	X				
6	Enhancement of demand for broadband services through new initiatives and local content	X				
7	Engaging in on-going monitoring of ICT developments					X
8	Utilizing Universal Service Funds (USFs) to close the digital divide		X			

Source: Baseline Survey of Broadband in Namibia (2015 October)

From Table 1, there is a need for Namibia policy makers to prioritise fiscal incentives such as tax reduction on telecom network, broadcasting and ICT user equipment, accelerating of investment in broadband such as through competition, setting up of universal service access fund, enhancing demand for broadband and promoting education for use of broadband to all citizens of Namibia.

20.2 Confidence and Security Online

In order to build confidence and security online the Government of Namibia has drafted relevant laws which are yet to be enacted. Therefore though relevant Bills have been drafted, there are no laws at the moment to ensure confidence and security in/of online transactions and services; and for protection of vulnerable members of the Namibia society such as children.

20.3 Applications and Content

With regard to applications and content, there exists a Technology Park and ICT incubation center (s) in Namibia namely the University of Science and Technology of Namibia (NUST) which needs enhancements to serve as a fully-fledged Technopark and ICT incubation center. This notwithstanding, there is no adequate local content for use by citizens for socio-economic development. This situation is an indication of the urgent need to develop relevant broadband content and applications.

20.4 Skills and Centers of Excellence

A baseline survey with regard to adequacy of ICT (and broadband) skills revealed that there are no adequate ICT skills in Namibia. Specifically, there is lack of training in technical skills at certificate and diploma level, whilst there is limited graduation of IT students at degree level. Further, the available ICT skills are not equitably distributed throughout Namibia. The ICT skills are largely limited to the capital of Namibia, Windhoek.

20.5 ICT Industry in Namibia

Though the ICT industry is fairly well developed in Namibia in terms of provision of ICT enabled services, it is under-developed in terms of (1) manufacture of ICT devices, (2) software development, and (3) development of applications. There is thus a great potential for the development of the industry to fill these gaps by innovators and investors.