



Bhutan Telecommunications and Broadband Policy

2014

Ministry of Information & Communications
Department of Information Technology & Telecom



Glossary of Terms

As used in this Policy and associated Strategic Plan of Action, the following terms have the meanings shown:

Terms	Definitions
Authority	Bhutan InfoComm and Media Authority
BPC	Bhutan Power Corporation
Broadband	Refers to high speed communications access services
BT	Bhutan Telecom
Government	Refers to the Government of the Kingdom of Bhutan
ICT	Information and Communications Technology
Ministry	Ministry of Information and Communications
RNR	Renewable Natural Resources
ISP	Internet Service Provider
IDD	International Direct Dialling
IT	Information Technology
USF	Universal Service Fund
FDI	Foreign Direct Investment
TV	Television
VOIP	Voice over Internet Protocol
FBO	Facility Based Operator
SBO	Service Based Operator
MVNO	Mobile Virtual Network Operator
MSO	Multiple System Operator
QoS	Quality of Service

ITU	International Telecommunication Union
ROW	Right of Way
IPv6	Internet Protocol Version 6

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1. Introduction

The Royal Government of Bhutan (RGoB) recognises Telecommunications and Broadband as important contributors to the socioeconomic development of the country. They have a vital role to play in enhancing competitiveness, increasing productivity and economic development, and promoting greater social inclusion to mention a few. Telecommunications and Broadband are the foundation on which “An ICT enabled, Knowledge-Based Society as a Foundation for Gross National Happiness”¹ will be built.

Increasing and widespread use of Mobile and Internet services coupled with technological convergence has necessitated the need for a consolidated Telecommunications and Broadband policy. Bhutan has witnessed impressive progress in ICT in the last decade. The Bhutan ICT Policy and Strategy (BIPS) 2009, which has guided the development of the sector is found insufficient moving forward especially in the areas of Telecommunications and Broadband given the fast changing nature of the sector. Therefore, a policy on Telecommunications and Broadband is required. The Bhutan Telecommunications and Broadband Policy 2014 will guide and shape the development of telecommunications and broadband sector in the country in the coming years. It provides guidelines, principles and rationale on how to go about developing and promoting the sector. The main objectives of the policy are: connectivity for all, strengthening of rules and regulations, creation of conducive environment for private investments and competition leading towards an efficient market and affordable broadband and telecom services.

The development of broadband infrastructure and broadband services are at the forefront of any telecommunications policy. However, given that broadband must develop on the bedrock of telecommunications and also given that the issues confronting them are intertwined RGoB has issued a converged Telecommunications and Broadband Policy. Therefore this policy includes elements from both, either integrated or differentiated as relevant. From the perspective of RGoB and the stakeholders, the policy must be considered as thus.

¹ Ida International, 21st October, 2012, Bhutan ICT Roadmap

2. Background

Bhutan has come a long way since 1963, when the first works for building a Telecommunications network was initiated as part of the first five year plan for modern economic development of the country. Bhutan Telecom, the first fully state owned Telecom operator came into existence on 1st July 2000 with the corporatisation of the erstwhile Department of Telecommunications which was established in 1970. On June 2nd 1999, Internet and Television services were launched as part of Silver Jubilee Celebration of the reign of His Majesty, King Jigme Singye Wangchuck, the Fourth Druk Gyalpo.

In 2003, Bhutan Telecom launched the first mobile communication service in the country. Since then, Bhutan's development in the sector has been phenomenal. In 2008, Tashi InfoComm Limited, a private Telecom operator started its operation. Today, between the two operators, mobile sector has achieved up to 76.6% penetration. There are four licensed ISPs (Internet Service Providers) currently serving internet and hosting facilities. Between leased lines, fixed broadband, 3G, GPRS/EDGE and dial up, the country has achieved sizable access of internet to the population with a take up of 40.9%.

Recognizing the importance as well as the capital intensive nature of a contemporary high speed backbone network in the country, the Government took on itself to establish fibre optic infrastructure throughout the country. In partnership with BPC, the MoIC has rolled out fibres throughout the country on power transmission and distribution infrastructure. So far fibre optic cables have reached 20 districts and 187 gewogs. The fibres have been leased to the telecom operators for free to keep the price of services low. Bhutan Telecom and Tashi InfoComm are already providing services using this infrastructure.

In terms of international competitiveness, in 2012 (the date of the most recent index), the ITU ranked Bhutan 118² out of a total of 157 countries in terms of ICT development. From a regional perspective, Bhutan ranks 22 out of 28 countries of the Asia and the Pacific region. These rankings suggest that Bhutan although climbing up from previous rankings has much to do to gain from the benefits of ICT in general, and broadband in particular, compared to other countries regionally and internationally.

² ITU, Measuring Information Society, 2013.

3. Telecommunications and Broadband Policy – A Living Document

Telecommunications and Broadband development is occurring in a dynamic social, market and technological context. The opportunities, needs and solutions are changing rapidly. Bhutan Telecommunications and Broadband Policy needs to be flexible and adaptive to reflect the pace of change and ensure that the best outcomes are delivered to the Bhutanese society at any point in time. This policy is a living document, and will be reviewed and revised regularly to ensure maximum currency and effectiveness.

4. Bhutan Telecommunications and Broadband Policy Principles

The objectives set out in this policy seek to ensure maximum benefit to Bhutan as a whole, supplementing other efforts to promote national welfare. The following principles will guide the development of Telecommunications and Broadband sector:

Market driven: Telecommunications and broadband infrastructure provision and service delivery will be achieved through the operation of market forces. The government will support in establishing backbone infrastructure and rolling out services to areas which are not commercially viable.

Universal access: Telephony and broadband services shall be made accessible to all Bhutanese. All dimensions of access including availability, affordability and capacity to use shall be addressed.

Affordability: The Government shall ensure that telephony and broadband services at entry levels shall be made affordable for all people in Bhutan.

Leadership: Leadership in telecommunications and broadband usage at all levels of society, especially by the private sector shall be promoted. The Government will lead by transforming its own processes and public sector services.

5. Scope and Practical Focus

This policy provides an over-arching framework for programs in the 11th Five Year Plan and beyond. The policy is a major component of overall national ICT Policy.

Practical focus, with emphasis on specific targets and measurable deliverables, is provided in Strategic Action Plan under **part D**.

A. Telecommunications

1. Objectives

The objectives of the Telecom Policy are to:

- Ensure development of Bhutan's Telecommunications Sector in line with international trends and that people of Bhutan are able to enjoy quality ICT services.
- Ensure that Telecommunications sector provides a strong foundation for Bhutan's ICT enabled Knowledge based Society, and a true engine for its socio-economic progress.
- Guide and facilitate evolution of the sector to attain its full potential.
- Ensure that a conducive environment for infrastructure, regulations, private sector participation and government support is promoted.
- Promote innovations in the sector.
- Promote green Telecommunications and ensure environmental responsibility.

2. Policy Elements

2.1 Universal Access

For the purpose of Universal Access, Telephony and entry level Broadband are defined as basic services. The government will ensure that access to these services is available to village level.

In areas where service provision is not economically viable, government will take recourse to Universal Service Fund.

2.2 Universal Service Fund (USF)

Universal Service Fund has been very effective in improving access to basic telephony and mobile services in the country. The government will continue with the system.

USF fund will comprise of license fees and a percentage of annual gross revenue collected from operators.

2.3 Green Telecom

Telecommunications sector will be developed in line with RGoB's environment policy. Measures will be taken to ensure those telecommunication infrastructures are not established in a

way that degrades the environment and effects biodiversity of the country. The number of such structures shall be minimized through infrastructure sharing. The government shall promote the use of clean and energy efficient technologies. It will also ensure effective e-waste management.

2.4 Licensing Framework

The Government shall adopt a converged and technology neutral licensing framework to encourage innovation, diversity and competition leading to affordability, choice and quality of services.

2.5 Competition Framework

The Government shall promote a vibrant and competitive Telecommunications market. To this end, a conducive regulatory environment that will promote private investments including public private partnership and curb anti-competitive behaviour will be established.

2.6 Mobile Development

Given the growing significance of the sector as an enabler of economic development and social cohesion, the government will initiate steps to make value added services affordable and accessible to all businesses and citizens. When the existing exclusivity expires after 2013, the market may be opened up based on sound proposals and market trends. Priorities shall be given to 100% local bidders through a selective selection process.

2.7 Quality of Service (QoS)

The Government shall ensure quality of service by requiring service providers to provide quality of service guarantee to consumers following International standards and best practices.

A System shall also be put in place for ensuring health, quality and maximum uptime for the national fiber network.

2.8 Consumer Protection

Service providers shall be required to provide service level agreements (SLAs) for all their services. In addition, consumers shall be protected under the prevailing Consumer Protection law. The Government will carry out consumer protection awareness and issue regulations to this effect.

2.9 Security and Privacy

The Government shall ensure availability, confidentiality and integrity of Telecommunications network and Information flow. It shall also protect privacy of consumers. The government will require Telecom operators to adhere to the highest standards of safety and security.

2.10 Spectrum Management

Since spectrum is a limited and valuable resource, the government will ensure prudent and optimal utilization to spread ICT services throughout the country. The government shall review spectrum utilization on a regular basis and device measures for efficient utilization.

2.11 Consolidation of Fiber Assets

Providing access to affordable and reliable communication facilities to the citizens of Bhutan and establishing the National ICT Backbone is a national priority. The government having appreciated the small size of the broadband and telecom market in Bhutan has initiated the National Broadband Masterplan Project to roll out fibers to all the twenty (20) Dzongkhags and two hundred and five (205) gewogs to bring fast and reliable services to the people. Further, the premise for the government in establishing fibers till the gewog level is also based on the fact that investment in the fibers cannot be commercially viable for any operator in the country at present. Therefore, the consolidation of all existing fibers had been carried out from this perspective.

Further to reduce the cost of connectivity, no depreciation and O&M cost shall be loaded to the lease rent until such time cost recovery becomes feasible. The intent of the government here is to ensure a level playing field for all operators and to help improve competition at the service level.

To make this infrastructure available to the industry in a fair and sustainable way, the government shall come up with a framework for “Leasing Fibers” detailed in section D of this document.

2.12 Infrastructure Sharing and Right of Way

The government will make available all infrastructures belonging to it and its corporations for establishing telecommunications infrastructure. It will also facilitate faster Right of Way (ROW) approval.

2.13 Disaster Communication

The Government shall leverage Telecom and ICT infrastructure to prevent, mitigate and manage disasters. It shall work with relevant players to establish a robust communication system for use during disaster. Telecom operators shall be mandated to follow International standards and best practices for contingency planning.

2.14 Emerging Trends

The Government shall ensure that Telecommunications sector keeps itself abreast with global developments and trends.

2.15 Regulatory Framework

A regulatory framework to enable and guide development of the sector in an efficient and effective manner shall be adopted. Regulations shall promote innovation, competition, customer services, fair play and environmental responsibility.

2.16 Institutional Setup

Given the criticality of the sector a strong agency to guide and promote the development of the sector is necessary. A Telecom Division shall be established under DITT at the earliest. The division will be upgraded to a department under MOIC in due course.

2.17 Skills and Capacity Development

The Government shall ensure proper skills development across the sector. It will put in place a Human Resource Development plan to help the sector to grow. Collaboration with academic institutions to bridge the gap between academic curriculum and what is required in the field shall be carried out.

B. Broadband³

1. Definition of Broadband in Bhutan⁴

For the purpose of this Policy, entry level broadband will mean a minimum download speed of 512 kilobits per second (kbps). The Government in consultation with relevant stakeholders will amend the definition from time to time to arrive at ITU Broadband Commission's definition.

2. Objectives

The objectives of the Broadband Policy are:

- To contribute towards well being and health of the people by provisioning of broadband-enhanced health services.
- To contribute towards increased economic welfare of Bhutan and its people by creating sustainable employment opportunities and making Bhutan more attractive for business investments and tourism.
- To promote social development and cohesion through broadband and conserve Bhutan's culture and tradition.
- To enhance Public and Private Sector Efficiency and Performance through use of Broadband.
- To enhance education and training through Broadband.
- To harness on benefits of mobile broadband for increased innovation and opportunity especially in taking public services to the people.
- To promote development and access of local content via broadband.
- To enhance Global Integration and International Relations by enabling connection of Bhutanese businesses and communities with the wider world.

³ Broadband is the name given to always on, high speed access services that provide connection to the internet and to other information services. A range of definitions are possible as discussed in Chapter 2 of the ITU's Broadband Commission report, Broadband: A Platform for Progress (May, 2011). However the recommended working definition at page 19 of that report is the approach adopted in this Policy, namely: "The Broadband Commission sought to focus on considering some of the core concepts of broadband as an always-on service (not needing to make a new connection to a server each time a user wants to go online), and high-capacity: able to carry lots of data per second, rather than the particular arrival speed of the data."
(http://www.broadbandcommission.org/Reports/Report_2.pdf)

⁴While Broadband refers to the connection, it is to be treated as an ecosystem; firstly of infrastructure that needs to be put in place, and then of services and application that can be accessed over this connection. This needs to be in line with Awareness among the people on Broadband usage and the trust in such an environment; the Accessibility of such services and infrastructures and; Affordability of such facility so that the people may make use and benefit from it.

3. Short to Medium Term Goals for National Broadband Policy

3.1 To achieve critical mass of broadband service uptake during 11th FYP: The Government will work with the private sector to achieve this.

3.2 To have in place a competitive structure for the provision of broadband in Bhutan: The Government will examine and remove legal and regulatory barriers to competition. It will ensure that market for broadband services operates competitively.

3.3 To achieve broadband service availability to 80% of both urban and rural communities during the 11th Five Year Plan: 80% of people of Bhutan shall have accessibility to entry level broadband services or better. USF will be used in areas that are not economically viable.

3.4 To ensure affordability of entry level Broadband: The Government along with relevant stakeholders shall ensure that an entry level broadband service is available to all at an affordable price.

3.5 To support all academic institutions to have access to Broadband: 100% of all academic institutions in Bhutan shall have broadband access.

3.6 Government to lead the broadband evolution by delivering its services online over broadband: A significant programme of e-Government transactions that can be performed online and enhanced by broadband shall be developed and progressively implemented during the course of the 11th Five Year Plan.

3.7 Lead Government applications: In addition to above, Government shall develop a range of lead applications for delivery of new, enhanced or extended services online using broadband.

C. Implementation responsibilities

1. Ministry of Information and Communications

The Ministry of Information and Communications will be responsible for ensuring implementation of the Policy. It will carry out overall implementation, monitoring and review of the Policy and related Plan, working through the Committee as appropriate. Annual report on status of implementation will be submitted to the e-Gov Executive committee.

2. Telecommunications and Broadband Committee

The e-Gov Executive committee under e-Gov Governance Structure will also serve as the Telecommunications and Broadband Committee which will steer the implementation of this policy and oversee the development of the sector. Additional members from Telecom operators, ISPs and BICMA shall be included.

The role of the Committee will be to ensure that the Telecommunications and Broadband Policy and the Strategic Action Plan are implemented and to ensure accountability on the part of the Ministries, Departments and Agencies responsible for each action or program item under part D.

D. Framework for Leasing Fibers

During the 10 FYP, the government had undertaken the National Broadband Master Plan Implementation Project (NBMIP) to build a nation-wide fiber optic infrastructure for the country. Under the project, Optical Ground Wire (OPGW) and All Di-electric Self Supporting (ADSS) fibers have been rolled out in all twenty (20) Dzongkhags and one hundred and eighty seven (187) Gewogs. Additionally the government has consolidated all existing OPGW belonging to Bhutan Telecom and Bhutan Power Corporation for which they have received fair compensation.

Since fibers are limited, using them in a sustainable way to reach maximum population and to provide quality service is a key policy objective. Therefore dark fibers shall be made available to licensed telecom operators/ISPs currently in operation, fulfilling the conditions detailed below:

- a. A Lessee shall take managed services to all twenty (20) Dzongkhags using the fiber infrastructure within a reasonable timeframe. This is to ensure a level playing field for all service providers and to fair competition.
- b. Only one pair of dark fiber along any physical route shall be allocated to one licensee. Allocations shall be made based on formal requests made by the Lessee to the government.
- c. A Lessee shall not assign or sublet any fibers in part or in their entirety to any other entity. Lessees are however permitted to lease managed services.
- d. The applicable tariff lease of the dark fiber pairs shall be according to the revised BICMA Telecommunications Tariff Order, 2009 and amendments thereof. The tariff applicable to a Lessee for a pair of fiber/Km per annum to the Government shall be zero until otherwise notified.
- e. The RGoB reserves the right to revise the tariff in future if deemed appropriate.
- f. Dark fibers shall not be allocated to any Cable Operators or MSO at this time. They may however lease the bandwidth from any ISP.

E. Strategic Action Plan

Item	Goal	Description and target	Responsible
1	Competition and Investment: Establish a light touch regulatory framework to promote competition in the market	<p>1.1 Examine ways in which availability and affordability of broadband can be enhanced through the removal of any unnecessary regulatory constraints and financial imposts, together with re-design of schemes to encourage investment in broadband delivery. Specifically, and without limiting the generality of this item, examine the prospect of creative removal of regulatory burdens and administration from operators including the detailed approval of retail tariffs for all broadband service options.</p>	<p>Ministry, in conjunction with Authority and other stakeholders</p>
		<p>1.2 Facilitate Local Loop unbundling</p>	<p>Ministry in conjunction with Authority</p>
		<p>1.3 Review existing regulations pertaining to competition</p>	<p>Authority</p>
		<p>1.4 Establish a system for faster approval of Right of Way</p>	<p>Ministry in conjunction with Authority and relevant stakeholders</p>
		<p>1.5 Examine and determine the feasibility of improving broadband and other service delivery and take-up in Bhutan through the following additional licensing initiatives:</p> <ul style="list-style-type: none"> (1) Mobile network operator licence; (2) Mobile Virtual Network Operator licence(s); and/or (3) Reseller or other service-based licences. (4) IDD and ISP (If feasible, implement) 	<p>Ministry, in conjunction with the Authority and in consultation with industry stakeholders</p>
		<p>1.6 Conduct a study of Telecommunications Tariff</p>	<p>Ministry in conjunction with relevant stakeholders</p>

2	Community access	<p>2.1 Review the operation of the Universal Service Scheme to determine whether:</p> <p>(a) It is meeting its objectives;</p> <p>(b) The current objectives need to be amended; and</p> <p>(c) The Community Centre program needs to be augmented by other programs for delivering broadband services to villages and local communities.</p>	<p>Ministry in conjunction with Authority, Local Government, Department, local government representatives and public and industry stakeholders</p>
		<p>2.2 Determine the minimum entry level speed for broadband from time to time to meet the changing needs of users – noting that the May 2012 entry level is a capacity of 512 kbps</p>	<p>Ministry, in consultation with all stakeholders</p>
		<p>2.3 Ensure that broadband service speeds are measured in terms of the speed experienced by the end user. Ensure that end users are informed of actual speeds and that licensed service providers implement plans to ensure that the speed delivered meets the description of the service offered.</p>	<p>Authority</p>
		<p>2.4 Review the arrangements and terms of operation for the Community Centres to ensure that they are achieving the objectives for which they were established and make amendments to the arrangements in conjunction with all stakeholders.</p>	<p>Ministry, in consultation with local government and community representatives and all stakeholders.</p>
3	Individual availability	<p>3.1 Achieve availability of broadband at the minimum entry level or higher speeds to 80% of the literate population of Bhutan.</p>	<p>Ministry, working with all other relevant stakeholders</p>
		<p>3.2 Encourage fixed and mobile service providers to include a range of price packages for broadband in their service offering schedules, and review the appropriateness and adequacy of the range on an on-going basis.</p>	<p>Authority in conjunction with all service providers and ministerial stakeholders</p>
		<p>3.3 Study feasibility of Legalising application of Voice over IP (such as Skype to Skype) in Bhutan – subject to necessary consumer protections and study of licensing mechanism</p>	<p>Authority</p>

4	Affordability	<p>4.1 Undertake a study into the causes of penetration (or lack of it) for broadband services, and examine responses that might assist, including ways of improving affordability.</p>	<p>Authority in conjunction with service providers and all stakeholders</p>
		<p>4.2 An entry level broadband service option to be available to all at an affordable price, as a mandated offering in the service schedules of all licensed service providers. Once the regulated price of the mandated broadband service offering has been established for each service provider, remove price controls on other retail broadband offerings.</p>	<p>Authority in conjunction with all service providers and ministerial stakeholders</p>
		<p>4.3 In order to reduce costs of internet access:</p> <p>(a) examine the feasibility of Bhutanese ISPs peering on a non-paying basis and without having to use other networks; and</p> <p>(b) examine the feasibility of establishing internet termination points in India, either instead of or as well as, the current locations.</p>	<p>Ministry in conjunction with ISPs</p>
5	Broadband penetration	<p>5.1 Within the overall availability target of 80% by 2018, determine the penetration target that shall apply within each Gewog for each year of the Plan</p>	<p>Ministry, in consultation with Authority and industry stakeholders</p>
		<p>5.2 Monitor service take-up by Gewog, and examine patterns to determine if there are applications or implementation arrangements that, if adopted more broadly, will facilitates greater and speedier take-up of services.</p>	<p>Ministry in consultation with Authority and industry stakeholders</p>
		<p>5.3 Examine and implement incentives for broadband service take-up by individuals and households and incentives for service providers to set and achieve challenging targets for penetration, including collaborating with service providers to provide free Wi-Fi spots in public areas.</p>	<p>Ministry, in consultation with Authority and industry stakeholders</p>
6	School access and education	<p>6.1 All primary , secondary schools and youth centres to have broadband</p>	<p>Ministry of Education</p>

		access	
		6.2 Establish Bhutan’s research and education network (DrukREN)	Ministry in conjunction with RUB
		6.3 Primary and secondary school syllabuses to be formatted for complete delivery, as necessary, via broadband means. Promote the use of digital content for learning and teaching in schools, through the development of appropriate enriched content for broadband delivery.	Ministry of Education
7	Transactions with Government	7.1 Coordinated examination within each Ministry of relevant transaction processes and development of a prioritised e-Government programme for implementation, with initial applications being determined on the basis of their likelihood to encourage broadband service take-up.	Ministry, in conjunction with all ministries
		7.2 Digitisation of government records for archive and efficient access and retrieval.	Ministry, in conjunction with all stakeholders
8	Lead applications in Government programs	Addition to above, Government to develop a range of lead applications for delivery of new, enhanced or extended services online using broadband in Health, Education, Tourism, Finance, Foreign Affairs and Agriculture, specifically.	Ministry, in conjunction with all ministries
		8.1 100% of hospitals and health units to be connected to broadband for remote diagnostic and supervisory support – covering: (a) Referral Hospitals (b) District Hospitals (c) Basic Health Units	Ministry of Health, in conjunction with MoIC
		8.3 Develop comprehensive patient data bases to enable all Bhutanese to be provided with the best possible care and attention wherever they are present with health issues in Bhutan – possibly with specific patient groups with chronic conditions involving high-cost treatment to be covered	Ministry of Health, in conjunction with MoIC

		initially.	
		8.4 Tourism planning and information on broadband availability for tourists and tourist organisations, via Tourism Council and tourist operator websites	Tourism Council
		8.5 Develop detail plan for overall RNR statistics system for decision making and provision of clearances	Ministry of Agriculture and Forests
		8.6 Enable online payments: a) Identify enabling policy requirements to be adopted b) Develop online payment gateway in relation to payment to be made to Government for fines, permits, taxes, passports and other services.	Ministry of Information and Communications, in conjunction with Ministry of Finance , RMA and financial institutions
9	Recognition of ICT Champions	9.1 Design and implement a scheme for the identification and public recognition of outstanding leadership and entrepreneurship in the application of broadband to advance Bhutan's society and/or economy.	Ministry, in conjunction with relevant other ministries and public stakeholders
10	Data collection to measure broadband progress	10.1 Review existing arrangements, and, if necessary, design and implement enhanced data collection and reporting arrangements to enable baseline and progress to be understood and for achievement of the Policy and Plan goals to be measured and communicated.	Ministry, in conjunction with relevant other ministries and public stakeholders
11	Universal Access	11.1 Implement the sustainability of universal services through USF and PPP mechanism	Ministry in conjunction with Authority
		11.2 Mandate operators to contribute a percentage of their annual gross revenue towards the USF	Authority
12	Consumer Protection	12.1 Establish a consumer protection framework to be adopted by the telecom operators based on consumer protection Act 2012	Ministry in conjunction with Authority
		12.2 Conduct consumer awareness campaign	Ministry in conjunction with Authority
13	Security and QoS	13.1 Develop minimum QoS framework to	Authority in

		be adopted by the operators	conjunction with MOIC
14	NGN and IPv6	14.1 Establish Telecommunications and Broadband committee to specifically look after NGN development in the country and the overall implementation of the policy.	MOIC in conjunction with Authority telecom operators and other stakeholders
		14.2 Develop IPv6 migration plan	MOIC in conjunction with the Telecom & Broadband committee
15	Green Telecom	15.1 Enforce infrastructure sharing rules	Authority
		15.2 Minimize use of fossil fuels for telecom equipment by switching to clean energy.	Ministry in conjunction with Authority and the Telecom Operators
		15.3 Encourage use of energy efficient devices	Ministry in conjunction with Authority
16	Disaster communication	16.1 Establish single hotline number	Ministry in conjunction with relevant stakeholders
		16.2 Develop business continuity plan for communication during disasters and crisis in the country	Ministry in conjunction with Disaster management, Operators and other relevant stakeholders
17	Skills Development	17.1 Develop a comprehensive skill development plan to meet HR requirements in new technologies	Ministry
18	Telecom Division	18.1 Establish a Telecom Division within the Department of Information Technology and Telecom	Ministry

Appendix 1: Benefits of Broadband

The availability of high quality and affordable broadband services in Bhutan is essential to facilitate innovation, economic growth and development, and to reinforce social inclusion and cultural norms. The benefits of broadband continue to grow. They include:

- Economic transformation at sector and firm level, and the necessary adaptation of public and private sectors to meet the challenges and imperatives of operating on the global economy
- Productive efficiency as business and government processes are made more effective
- Dynamic efficiency as new processes and innovations are encouraged, with innovation leading to further innovation and improvement
- Social inclusion as people build and reinforce communities online, and support the reach and interactions of individuals and groups
- Reinforcement and preservation of culture and cultural norms
- Development of new products, services, and applications to enrich the cultural, social and business life of Bhutan
- Improved public administration and service delivery through the development of e-Government online transactions to improve quality save cost and increase access and convenience.

Appendix 2: Statistical Base

The latest available measures for the sub-sector overall are set out in Table 1 below, together with the trend on each measure for the past five years. Table 2 sets out other relevant information on ICT-readiness in Bhutan.

Table 1: ICT and Broadband Measures for Bhutan

Measure	2006	2007	2008	2009	2010
Fixed telephone lines	31,526	29,857	27,475	26,348	26,292
Fixed telephone lines per 100 inhabitants	4.67	4.34	3.92	3.69	3.62
Fixed internet subscription	5,820	6,000	6,000	6,656	9,827
Fixed internet subscription per 100 inhabitants	0.86	0.87	0.86	0.93	1.35
Fixed broadband internet subscriptions			2,060	3,100	8,675
Fixed broadband internet subscriptions per 100 inhabitants			0.29	0.43	1.20
Mobile cellular subscriptions	82,078	149,439	253,429	338,938	394,316
Mobile cellular subscriptions per 100 inhabitants	12	22	36	47	54
Percentage of individuals using the internet	4.52	5.92	6.55	7.17	13.6

Source: ITU – statistics collected from member countries.

Note: Figures are at 31 December for each year.

Table 2: Fixed internet access services in Bhutan

Measure	2008	2010	Unit
International internet bandwidth	980	3,343	Bit/s per internet user
Households with computer	5	6	% of households
Households with internet	3	5	% of households
Individuals using the internet	6.60	13.60	% of individuals
Gross enrolment ratio (secondary)	56	62	% enrolled
Gross enrolment ratio (tertiary)	7	8	% enrolled
Adult literacy rate	52.80	52.80	% literate

Source– ITU - statistics collected from member countries