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ANNUAL REPORT

2022 - 2023

BHUTAN INFOCOMM & MEDIA AUTHORITY

འབྲུག་བར་དོན་བརྒྱུད་འབྲེལ་དང་བར་བརྒྱུད་དབང་འཛིན།



Vision

A dynamic ICT and Media ecosystem contributing towards the growth of a digital economy and informed society



Mission

- To ensure access to fair, reliable and affordable ICT and media services
- To foster an environment for innovation and encourage investment in the ICT and media sector
- To ensure fair and sustainable competition in the ICT and media sector
- To ensure courteous and responsive service to customers



BHUTAN INFOCOMM & MEDIA AUTHORITY

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ANNUAL REPORT
2022-23

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FOREWORD

The Bhutan InfoComm and Media Authority (the Authority) is pleased to present the 14th annual report for the financial year 2022-2023.

In this financial year, as a converged ICT and media regulator, the Authority has developed several important frameworks such as SIM-based IOT and quality of internet broadband service to enhance the regulatory environment and enforcement, and to ensure compliance with the convergence of emerging technologies. Additionally, we have conducted several studies to gain insights into new technologies including mm band for 5G, mobile number portability, feasibility of spectrum auction, and TDD in band 40 for the quality of services in 4G networks.

The Authority is proud to mention that we continued our work towards achieving our target of providing universal access to ICT services where subsidies were provided through the Universal Service Fund (USF) to connect remote and unconnected rural communities. With the completion of RCP Phase VI in December 2022, 68 villages in 10 Dzongkhags have been connected with 4G data and 2G voice services. The Authority has diligently verified all the project sites including the connectivity.

Public service delivery is an integral part of the Authority's mandate and despite human resource constraints, we worked tirelessly to reduce the turnaround time for the provision of our services. In addition to enhancing the quality of service, the Authority periodically reviewed and analyzed the Key Performance Indicators (KPI) of the two telecom service providers and also carried out radio spectrum monitoring including electromagnetic radiation of telecom infrastructures.

To enhance the digital cable TV industry and its services in the country, the Authority has completed the integration of all cable TV operators with either of the Multi-Service Operators (MSO). All BBS channels are now directly fed from its studio to the MSO headend through a dedicated optic fiber. This has enhanced the quality and reliability of our local channel distribution in the country. In addition, we could now access the entire cable TV subscribers' details from the MSOs transparently for any public policy planning purposes.

As an organization committed to our core values of teamwork, innovation, professionalism, integrity, and accountability, we shall strive to achieve the maximum impact with limited human and financial resources. We are determined to fill every gap and institutionalize the best regulatory practices suited to our country.

In coming out with this report we would like to thank the erstwhile BICMA Chairman Dasho Secretary, erstwhile MoIC and board members for their constant advice and guidance. I also express my gratitude to Hon'ble Lyonpo and Dasho Secretary, MoICE for their valuable support.

Last but not the least, I extend my heartfelt appreciation to the entire team in the Authority for their unwavering dedication and hard work for achieving beyond our annual work plan. We look forward to achieving much more in the coming year in terms of better connectivity and developing up-to-date frameworks for creating an enabling ICT and Media industry environments.

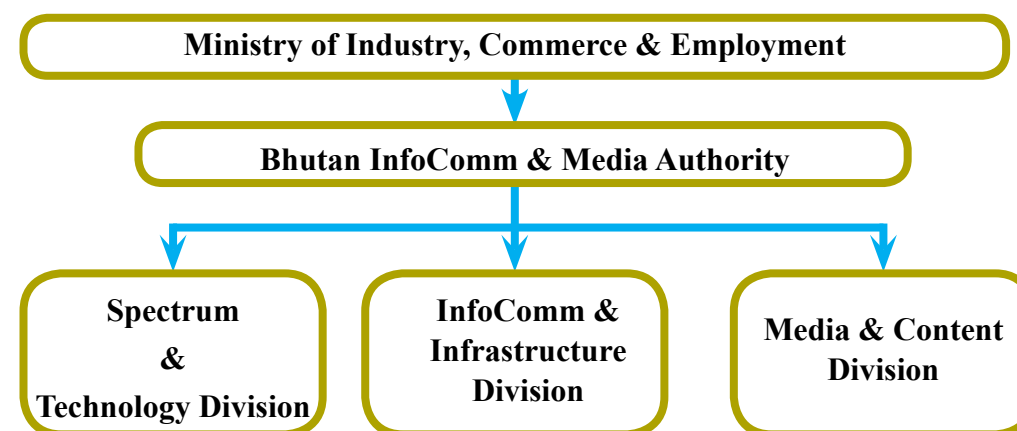

(Jigme Wangdi)
Director

Civil Service Reform

In accordance with the Civil Service Reform Act of Bhutan 2022, the Bhutan InfoComm and Media Authority (Authority) has been administratively put under the Ministry of Industry, Commerce and Employment (MoICE) and a formal signing of handing-taking ceremony was carried out on January 9, 2023 in the Ministry's office.

In addition, the National Film Commission (NFC) and Media Council of Bhutan (MCB) have been merged with the Authority. A formal signing of the handing-taking note was carried out on January 11, 2023 in the Authority's office. With the merger, a total of eight (8) officials from the Media Council of Bhutan and the National Film Commission joined this Authority.

Following the merger and reorganization, the Authority's divisions were renamed and restructured as follows:



Spectrum & Technology Division

- » Spectrum planning, engineering, auditing, pricing, allocation, licensing,
- » Spectrum monitoring nationwide,
- » Telecommunications & radio communications standards development,
- » Telecommunications Quality of service efficiency & reliability monitoring nationwide,
- » Developing Technical Rules & Regulations
- » Carry out research studies on the emerging technologies & recommend for policies,
- » Satellite communications regulations, Collaboration with ITU & APT,
- » Review and refer the periodic ITU recommendations & implement
- » Management of complaints, follow-up & redressal.

Infocomm & Infrastructure Division

- » Planning & management of Universal Service
- » Programmes Project for connectivity
- » Management & regulation of cable television services nationwide
- » Management & regulation of multi-service operators national wide
- » Fiber lying technical standards & guidelines development
- » Planning, management & monitoring of national fiber resources
- » Economic & tariff regulation for ICT services
- » Maintain & promote competition through tariff regulations
- » Determine tariff, rate, fees & charges for licensed services
- » Accounting separation, cost benefit analysis of services
- » Management of complaints, follow-up & redressal

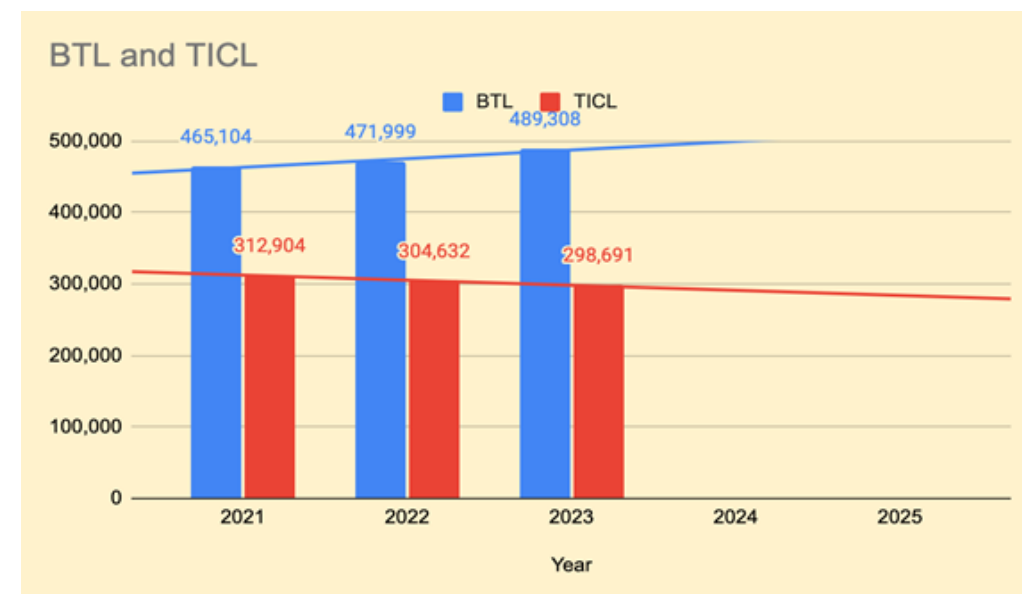
Media & Content Division

- » Licensing, regulation & monitoring (Broadcasting (TV & Radion), Publication (Newspapers, Periodicals & Publications Houses), Printing Presses,
- » Carry out research & monitor trends
- » Develop standards & guidelines
- » Enhance ethical & professional standards amongst media enterprises & media practitioners
- » Accredited & certify journalists
- » Review of content on ICT & media services including books
- » Review of content on ICT & media services including books,
- » Issuing filming permits
- » Facilitate/organize/promote film awards & film festivals
- » Promote co-production,
- » Management of complaints, follow-up & redressal

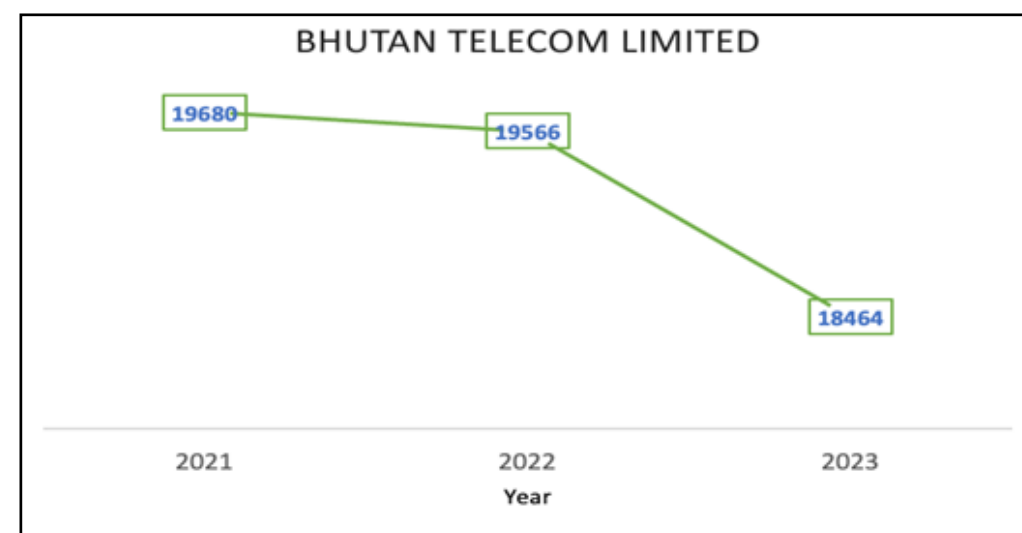
ICT AND MEDIA SECTOR AT A GLANCE

1. ICT Sectors

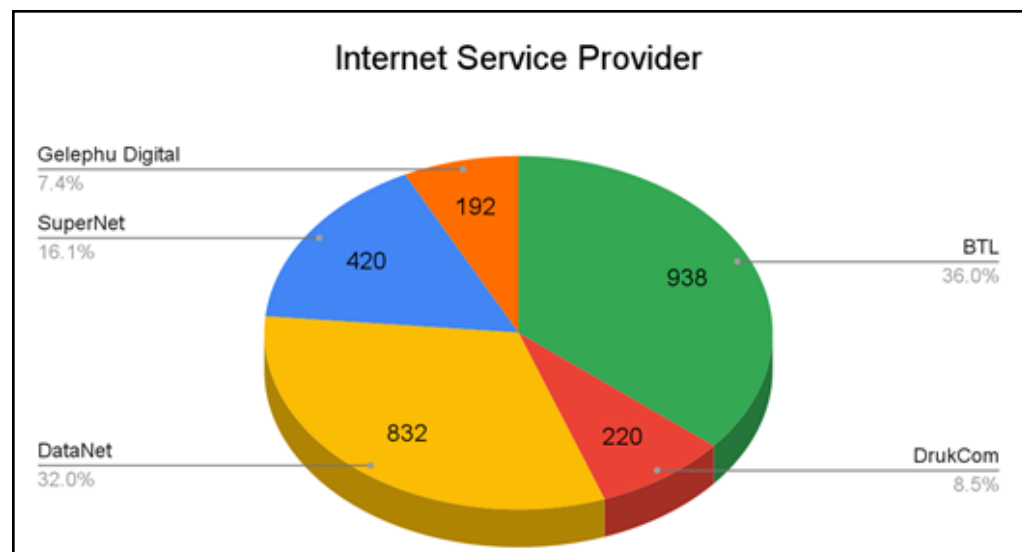
1.1 Mobile Subscribers and its Market Share



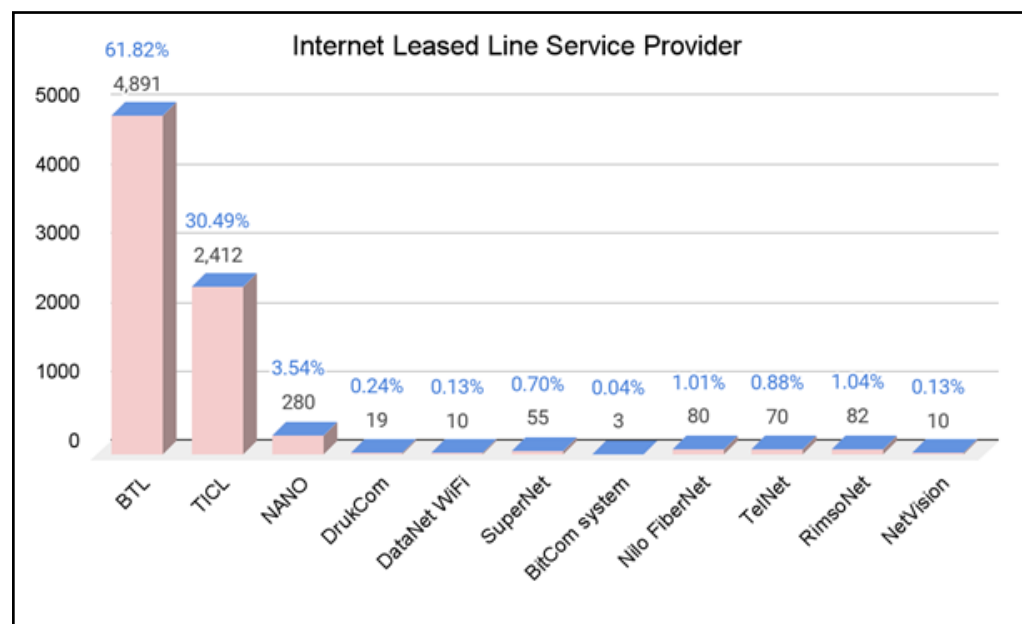
1.2 Fixed Telephone Subscribers



1.3 Fixed Broadband Service Provider and its Market Share



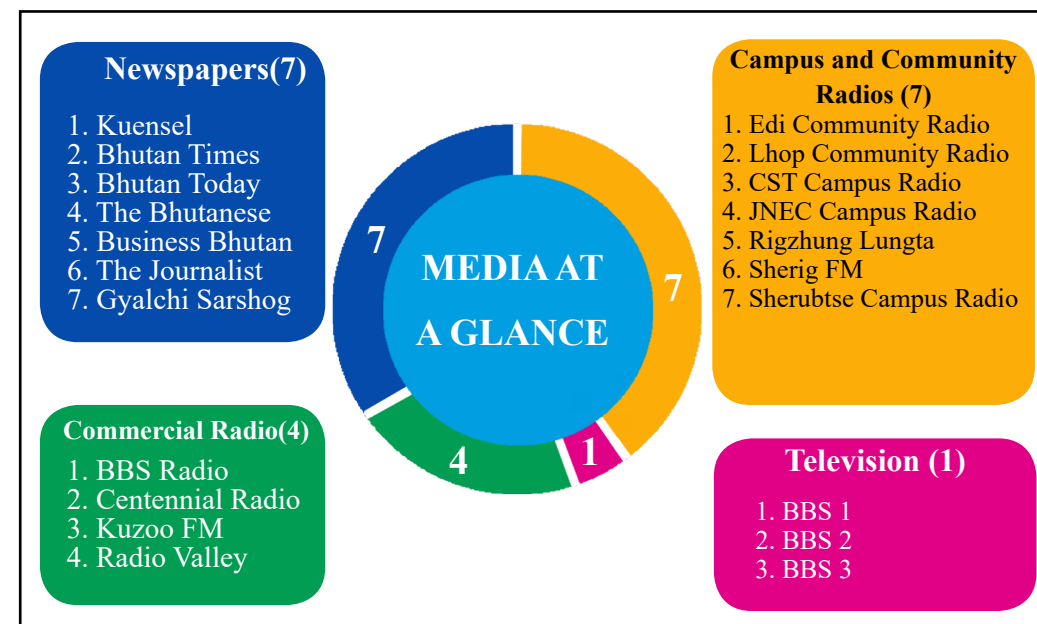
1.4 Internet Leased Line Service Providers



1.5 Licensed Over the Top (OTT) players



2. Media and Broadcasting Sector



REFLECTION OF THE ACTIVITIES

During the Financial Year 2022-2023, the Authority implemented the following major activities:

1. Regulatory Frameworks:

1.1. Formulation of New Regulatory Frameworks:

In keeping with the advancement of technology and to protect ICT and Media consumers, the Authority developed the following regulatory frameworks:

a. Standards for Fixed and Mobile Broadband Quality of Services

The Authority, in order to benchmark and ensure that the service providers provide the required quality of services, developed the quality of fixed and mobile broadband standards. The standards shall be applied to the fulfillment and monitoring of mobile/cellular broadband services, fixed broadband services, fixed telephony services, and cable television services.

b. Mobile Network (SIM) based Internet of Things (IoT) Numbering Plan of Bhutan

The IoT applications and its implementation is significantly growing around the world. Similarly the IoT applications are also gradually being implemented in Bhutan in various sectors such as agriculture, utility companies, transportation and logistics, energy, telecom, healthcare, remote monitoring etc. As it is imperative that Bhutan will see an increase in the usage of IoT applications with time, the Authority developed the Mobile Network (SIM) Based IoT Numbering Plan of Bhutan with the following objectives:

- i. To ensure an efficient and effective management and utilization of number resources,
- ii. To establish an effective national numbering framework for SIM based IoT deployment in compliance with recognised international standards,
- iii. To ensure the continuous availability of numbers for SIM based IoT devices and enable the users to use the allocated numbers responsibly,
- iv. To promote and establish a transparent and equitable system in the allocation of numbers.

The Mobile Network (SIM) Based IoT Numbering Plan of Bhutan was developed and it shall apply to all the Network Service Provider and the IoT Service Providers who use the number resources for any SIM based IoT deployment within the kingdom of Bhutan. Subsequently the plan was also approved and updated with the International Telecommunication Union (ITU).

c. 2300 MHz Band Plan

With the increase in the demand for mobile broadband services, it is critical to enhance its Quality of Services (QoS) delivered to the customers. Recently, there were issues of degraded mobile broadband QoS especially during the lockdown period and it is found critical that every possible solution is studied and implemented for enhancing the mobile broadband QoS.

The network densification through deploying more mobile networks is one of the solutions to enhancing the mobile broadband QoS. However, owing to the limited land space especially in urban areas has significantly posed challenges to the telecom operators in expanding their mobile broadband networks. The other solution to solving such issues is through enhancing the network capacity by issuing more frequency spectrum to the telecom operators. The telecom operators in Bhutan have deployed 1800MHz (Band 3) and 700MHz (Band 28) for 4G LTE and these spectrum bands have been fully utilized and there was a need for additional frequency spectrum. The available spectrum in 2300 MHz (band 40) is considered suitable for deploying the 4G LTE in Bhutan. Therefore, the framework and band plan for the 2300 MHz band has been developed and allocated to the two telcos to enhance the mobile network capacity in urban areas.

1.2. Review of Existing Regulatory Frameworks:

a. Terms and Conditions for Publication Houses

The terms and conditions for publication houses were revised in accordance with the revised Rules and Regulations for Publication. As per the revised Rules and Regulations, publication houses are categorized into three categories: Newspaper publication houses, Book publication houses, and Periodical publication houses. A single terms and conditions have been developed for the Book publication houses and Periodical publication houses since they have similar modes of operation.

b. Terms and Conditions for TV Broadcasting License

The Authority reviewed and revised the license terms and conditions of the TV Broadcaster following consultation with the stakeholders where changes were made including the license fees. The broadcasting license of Bhutan Broadcasting Service Corporation Ltd. (BBSCL) has been renewed on 3 June 2023 for a period of 15 years along with the signing of the revised license terms and conditions.

c. Terms and Conditions for Telecommunications License

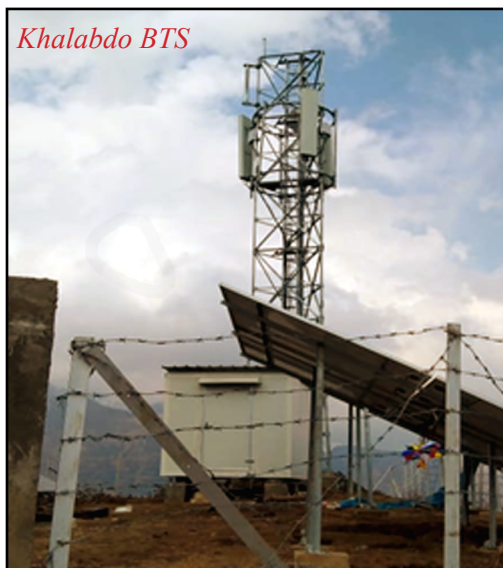
As the Telecommunications license of mobile operators expires in 2023, the Authority reviewed the existing Telecom License Terms and Conditions with additional obligations, changes in the fee payment structures, and the payment schedules which was later consulted with operators, GovTech Agency and endorsed by the Cabinet. The Telecommunications license of both mobile operators will be renewed for the next fifteen years until 2038.

2. Rural Communication Programme (RCP)

2.1 RCP Phase VI

Rural Communication Programme(RCP) is one of the programmes carried out by the Authority to provide mobile network connectivity (2G voice and 4G data services) in rural parts of the country. The programme is funded through the Universal Service Fund (USF) to assist telecom service providers (TSPs) build the mobile network infrastructure and the connectivity with grants or subsidies to achieve universal access to ICT facilities and services.

RCP Phase VI and RCP Phase VI Supplementary 1 were initiated on 19 March 2021 and 24 September 2021 respectively to provide mobile network



connectivity to 68 remote villages by the telecom service providers for the duration of 18 months. The programme was completed in December 2022 and March 2023 for BTL and TICL respectively, and the physical evaluation of the programme was carried out based on the completion report submitted by them.

2.2 Verification of Unconnected Villages

The initial step towards implementation of the Rural Communication Programme in rural areas is to identify the remote villages/households without mobile network connectivity. This data can be received in the form of complaints by individuals or Local Government Officials. Data is then validated with physical verification of the mobile network connectivity in those villages/Households. The physical verification involves testing the Quality of Service (QoS) such as signal strength and data throughput.

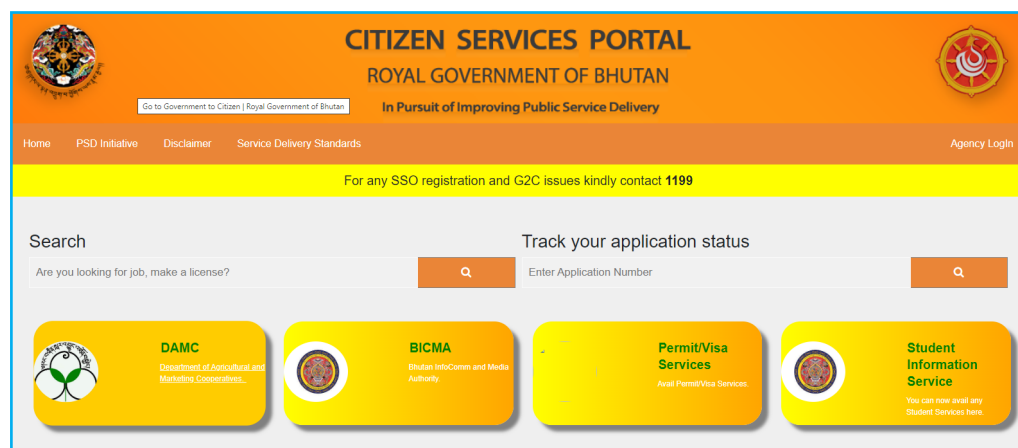
The verification of unconnected villages/households listed in a database of unconnected households with mobile connectivity is completed but ad-hoc complaints received from different Dzongkhags for mobile connectivity issues are still undergoing verification. For the financial year 2022-2023, the Authority carried out verification of 54 villages from 12 Dzongkhags and found 164 households unconnected. While some of the villages have been included in the network expansion plans of the Telcos, the remaining ones will be included in the next RCP Phase. The list of verified villages along with the network status can be referred to in Annexure 1.



3. Online Licensing System

To facilitate easy access to regulatory services for the ICT and Media Industries, an Online Licensing System was developed and launched on January 11, 2023. The system is hosted along with other G2C services and can be accessed at <https://www.citizenservices.gov.bt/>. The online system facilitates the following online services pertaining to CATV, ISPs, Radio Broadcasting, Newspaper Publication House, Book Publication House, Individual Publication Permit, Certificate for Book Registration, Printing Press, Apparatus License, Type Approval License, and Amateur Radio License:

1. Application for Issuance of In-Principle Approval/License
2. Application for Renewal of License
3. Application for change of License
4. Application for Cancellation of License
5. Application for Extension
6. Resubmit application



4. Advocacy and Awareness Programmes

The Authority carried out the following advocacy and awareness programmes related to ICT and media activities which were either circulated in social media platforms in the form of audio-visuals or a team of officials visited Dzongkhags/Gewogs in-person to discuss on various services such as:

- Digitization of Cable Television Services, Ku- band dish permits and its Rules and Regulations
- Mandates and functions of the Authority and its various services licensing procedure and Online licensing system, content regulation, Journalist accreditation, certificate of book registration, filming activities

- Monitoring of cellular tower's Electromagnetic frequency (EMF) and mobile network Quality of Service (QoS)
- Internet Leased Line
- Role of Parents in the Age of Social Media

5. KOICA's Country Focused Fellowship Program on Capacity Building for Bhutan Film Industry



A team of 12 professionals from the Bhutanese film industry, comprising of producers, directors, editors, and actors, along with representatives from the Bhutan InfoComm and Media Authority (BICMA) attended the two-week-long training program in South Korea from 05-16 June 2023 under the KOICA's Country Focused Fellowship Program.

The program, facilitated by Korean film experts, combined theoretical and practical sessions to provide a well-rounded learning experience. Additionally, the program also included visits to esteemed universities and film studios to foster familiarity and immersive learning.

It is expected that the knowledge and skills gained from this training program will empower the Bhutan film industry to produce high-quality films capable of competing on the international stage, ultimately contributing to the overall growth and development of the film and related sectors in Bhutan.

This training program represents the ongoing support and commitment of the South Korean government to foster the growth of the local film industry. Since 2012, KOICA has been actively supporting the local film industry, and in 2018, they included the initiative under the Country Focused Fellowship Program to further enhance this support. To date, over 120 industry professionals, including government officials, have benefited from the support.

6. Spectrum Monitoring Equipment/System

6.1 Procurement of Spectrum Monitoring Equipment/System

The Authority had only a portable spectrum analyser and a fixed spectrum monitoring equipment. In order to enhance the capabilities of the Authority in the field of spectrum monitoring, the Authority procured two Mobile Direction Finding Radio Spectrum monitoring systems and a Fixed Radio Spectrum monitoring equipment.

The procured equipment will help the Authority to trace and locate the unauthorized radio frequency usage and also will assist in solving the radio frequency interferences in the country.

Two Mobile Direction Findings Radio Spectrum Monitoring System



Receivers (Signal Shark 310)



Antennas (DFA 2)

One Fixed Radio Spectrum Monitoring System



Receiver (FMU 308)



Antenna (BAS 12)

6.2 Hands on Operational Training for Radio Spectrum Monitoring Equipment/System

Since Bhutanese firms/suppliers were not capable of providing the operational training on the procured Radio Spectrum Monitoring Equipment/system, the experts from manufactures had provided the in person training for both the equipment.

1. Mobile Direction Finding Radio Spectrum Monitoring Equipment/System

The experts from manufacturers Fas tech, Narda have conducted the 5 days Hands on operational training on Mobile Direction Finding Radio Spectrum Monitoring Equipment/System.



2. Fixed Radio Spectrum Monitoring Equipment/System

The expert from the manufacturers (LS Telecom) has conducted 5 days of hands-on operational training on Fixed Radio Spectrum Monitoring Equipment/System.



6.3 Installation of Fixed Monitoring Station

The fixed Radio Spectrum Monitoring system which was procured from the LS Telecom is installed at the BICMA office. The Fixed Spectrum Monitoring equipment consists of the radio frequency front end, an embedded computer, Receiver, an Omnidirectional antenna, storage, and network connection, and carries out the following task depending on the required frequency range:

- Raw data
- Noise-free data Frequency channel occupancy (FOC) data
- Overview data (Summary of the Channel Occupancy)
- Automatic Violation Detection (AVD) features automatically verify the conformity of the measured spectrum with the expected spectrum.
- Fixed Spectrum monitoring such as FM, VHF, and UHF with demodulation audio features.



7. Verification of Telecommunication Tower's EMF Radiation

In order to ensure that the Electromagnetic Field (EMF) emission exposure from all Cellular Base Transceiver Stations (BTS) is safe and within the prescribed standards, the Authority carried out the measurement of EMF exposure from BTS stations in the country. The Authority has completed the EMF exposure measurement of 62 towers during this financial year as mentioned in the table below:

Sl.No	Dzongkhag	Number of Tower Monitored	Remarks
1	Chukha	8	All the measured towers were found safe and within the permissible range
2	Samtse	2	
3	Sarpang	6	
4	Zhemgang	3	
6	Pema Gatshel	13	
7	Samdrup Jongkhar	30	

The measurement of EMF exposure is carried out based on the safety standards developed by the International Commission on Non-ionizing Radiation Protection (ICNIRP).

8. Quality of Service Monitoring

In order to ensure the reliability of the mobile services provided by the telecom operators, the Authority monitored the Quality of voice and data services on a regular basis based on the monthly Operational Support System (OSS) generated report.

The parameters used to determine the Key Performance Indicator (KPI) of the voice and data service of the mobile communication network are:

1. Packet Drop Rate: Measured as a percentage of packets dropped with respect to packets sent.
2. Data Throughputs: Measurement of the speed of data upload or download.
3. Call Drop Rate: Measured as a percentage of calls dropped with respect to the total number of calls made.
4. Call Setup Time: Measurement of the overall length of time required to establish a circuit-switched call between users.

The monitored areas include various places of Thimphu, Sarpang, Samdrup Jongkhar, Zhemgang, Pema Gatshel, Mongar, Trashigang, Chukha and Samtse Dzongkhags. Based on the reports, the four quarterly reports were compiled and published for better understanding and awareness of the public.

9. Mobile Tariff Monitoring

One of the important functions of the Authority is to protect consumers of ICT and Media services, among others, the rates charged, and the quality of ICT services provided. The ICT services are provided by the ICT Service Providers to the customers as per the approved rates and tariffs. It is important to monitor and verify whether the Service Providers provide and abide by the approved rates and tariffs. Therefore, the Authority carried out quarterly assessments of the tariff implementation by the Service Providers, especially the Telecom Services, and published the report quarterly on the website for public reference. The assessment mainly verified and validated whether the Service Providers are providing the following services to the customers as per the tariff rates approved by the Authority:

- a. Mobile voice call and Short Message Service (SMS) charges implementation (assessment of whether the Service provider charges the voice calls and SMS as per the approved tariff rate).
- b. Mobile data allocation (assessment of whether the subscribed data volumes are provided as per the approved package/tariff rate).

From the tariff monitoring, it was observed that both the telcos are providing their voice and data services to the customers as per the tariff rates approved by the Authority.

10. Spectrum Monitoring

Radio Spectrum Monitoring is a process of observing the radio frequency spectrum usage to realize its efficient utilization and to minimize radio frequency interference. The two types of radio frequency monitoring systems are based on fixed and mobile radio frequency monitoring systems.

The Authority carried out fixed radio spectrum monitoring every month and in addition also carried out mobile radio spectrum monitoring in Tsirang, Sarpang, Wangdue, and Punakha Dzongkhags.

11. Calibration of EMF Equipment

Calibration is the process of comparing a reading on a piece of equipment or system, with another piece of equipment that has been calibrated and referenced to a known set of parameters. The main goal of calibration is to minimize any measurement uncertainty by ensuring the accuracy of set test equipment. The Authority had procured the EMF monitoring equipment in the year 2018 and as per the TS-EMF calibration information manual, the EMF equipment is delivered

with a traceable factory calibration. The re-calibration is recommended after a time of 2-3 years. After high mechanical stress such as drop of the sensor on a hard surface, frequent exposure to strong vibration, excessive tear or bending of the cabling, or after damage of the sensor, earlier re-calibration is necessary. The Authority, therefore, carried out the EMF calibration of the EMF equipment mainly to maintain accuracy, standardization, and repeatability in measurement as per the recommendations in the TS-EMF calibration manual. The Authority completed the calibration of the existing EMF equipment on 21st December 2022.

12. Amendment of Telecommunication Tariff Order

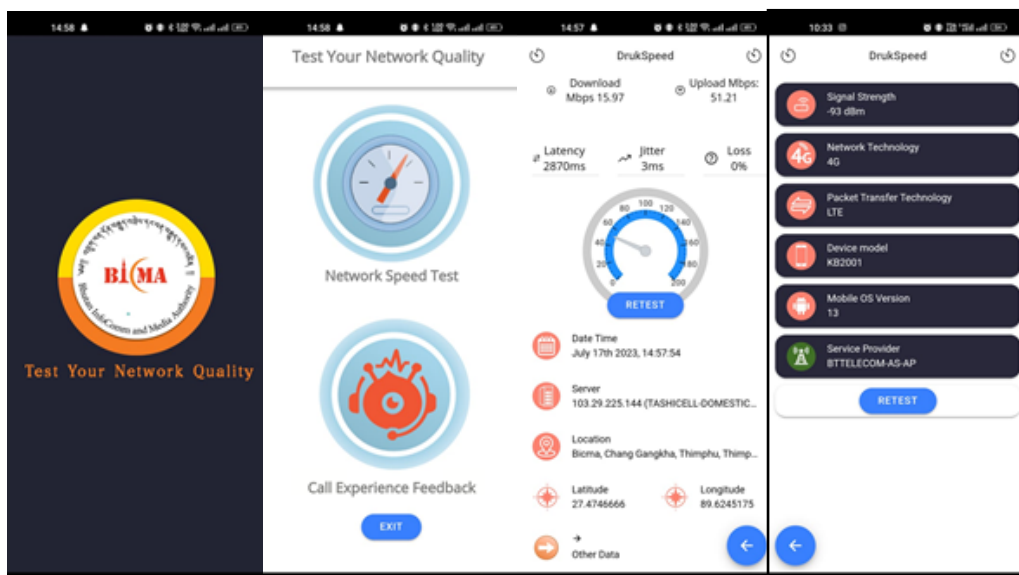
One of the mandates of the Authority is to determine the tariff, rates, and charges of licensed services through the issuance of tariff regulation, tariff orders, and directives on telecommunications tariff. Accordingly, BICMA had initially published the telecommunication tariff order in 2009 which was later amended in 2012. To keep pace with fast changing ICT and telecommunications technology, the Authority initiated the amendment of the existing telecommunication tariff order in the context of the current ICT/ telecommunication ecosystem in the country.

With the advancement of telecommunication transmission technology, transmission systems (especially fiber networks) in telecommunications have now shifted from SDH (Synchronous Digital Hierarchy) technology to high capacity DWDM (Dense Wavelength Division Multiplexing). Therefore, the amendment of the telecommunication tariff order has incorporated the technical and economical cost of DWDM transmission network and dark fiber.

The amendment of tariff order for telecommunications services includes provision for determining ceiling tariff for telecommunications services such as dark fiber, domestic leased circuit, internet leased line (ILL), and international private leased circuit (IPLC). Further, the tariff order amendment has considered the best practices adopted internationally for the development of the tariff order. With this amendment of tariff order, the ceiling tariff for high capacity transmission networks has been determined and there is a reduction in cost per bandwidth.

13. Mobile Quality of Service Application

The Authority has developed an app to crowdsource the Mobile Broadband Quality of Services (QoS) measurement, in particular the Mobile Broadband throughput (speed). The mobile app is called the “Druk Speed Test” app and is a free application which is available in google play store and apple store, and it can be used by all citizens of Bhutan. The app can perform a Network Speed Test and give a Call Experience Feedback on the local voice and data service providers’ network. It is aimed at protecting the interests of mobile voice and data consumers in Bhutan through obtaining feedback and measurement results directly from the consumers and enhancing the mobile quality of services in Bhutan. The Authority will also be able to optimize its Key Performance Indicators (KPI) monitoring in the critically affected areas as the information on critically affected areas can be obtained from the analysis of data received from the mobile app testing.

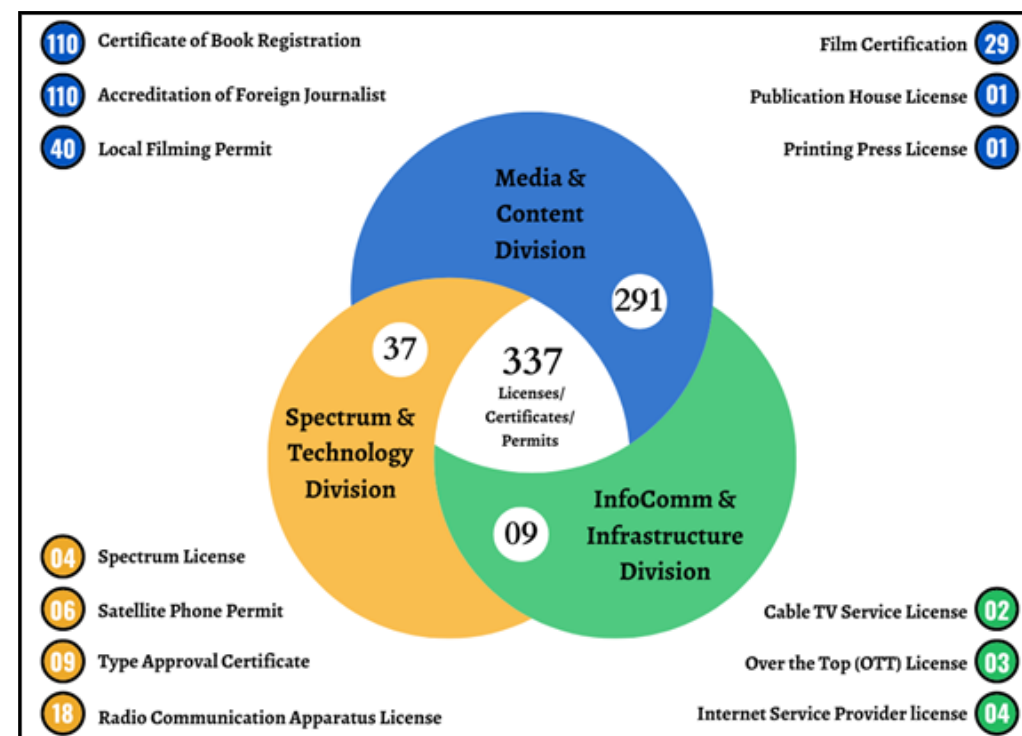


14. Complaints Handled

A total of 30 complaints were resolved by the Authority. The details of complaints can be referred to in Annexure 2.

15. New Licenses/Certificates/Permits Issued

A total of 337 licenses/certificates/permits were issued by the Authority during the financial year 2022-2023.



STUDIES UNDERTAKEN

1. Feasibility of 5G mmWave Implementation and Allocation

With the increase in the demand for mobile broadband services it is critical to enhance its Quality of Services (QoS) delivered to the customers. Recently, there were issues of degraded mobile broadband QoS, especially during the lockdown period and it is important that every possible solution is studied and implemented for enhancing the mobile broadband QoS. The study focused on the feasibility of deploying 5G in the mmWave spectrum band which could potentially enhance capacity for better 5G services in the country. It covers the 5G road map, the Deployment of the 5G NR spectrum in Asian countries, identification and allocation of 5G spectrum in SATRC countries, Deployment of 5G in mmWave, and its advantages.

2. Study on International Roaming

International mobile roaming is a service that allows mobile users to continue to use their mobile phones to make and receive voice calls and text messages, browse the internet, and send and receive emails while visiting another country. The seamless extension of coverage is enabled by a wholesale roaming agreement between a mobile user's home operator and the visited mobile operator network. The roaming agreement addresses the technical and commercial components required to enable the service.

The main intention of carrying out the study on international roaming is also to know the basic working of roaming. It is concluded that international roaming services provided by the two operators have positively impacted the total revenue of the operators. It is observed that the Roaming Charges are different for different countries and the charges are quite similar for both the operators.

3. Feasibility Study on Mobile Number Portability (MNP)

Mobile Number Portability (MNP) is a service in which customers retain their original mobile number when switching from one mobile telecommunications service provider to another. In the absence of number portability, customers have to surrender their number and must switch to a new one when they switch operators. Without MNP, customers have to bear the switching costs associated with informing people about changing their number, printing new business cards, missing valuable calls from people that do not have the new number, etc. Mobile Number Portability offers the subscriber the flexibility to retain his mobile number even when he switches to another operator in a service area.

Number portability is a feature that allows a mobile subscriber to use the same number across different service providers. The person/user has the liberty to opt for any service provider without the time-consuming exercise of letting the rest of the world know about the change of number.

4. Study on Spectrum Auction

Spectrum auction is a spectrum assignment methodology practiced in most of the countries but not in Bhutan. Therefore, the study was mainly done to see the feasibility of carrying out spectrum auctioning in our country. It covers the introduction of spectrum auction, Types of spectrum auction (auction format used globally), why spectrum auction, the process of spectrum auction and its practices in other countries.

5. Study on Feasibility of 2.3GHz Band 40

With the increase in the demand for mobile broadband services it is critical to enhance its Quality of Services (QoS) delivered to the customers. The solution to solving such issues is through enhancing the network capacity by issuing more frequency spectrum to the telecom operators. Therefore, this study paper studies the feasibility of deploying the spectrum band 40 for 4G LTE services as an additional capacity enhancement in 4G services. The study covers the LTE deployments by operators in Bhutan, LTE networks in Asia, 2.3GHz Spectrum allocation as per NRRR, Mobile handsets brands available in Bhutan, and advantages of deploying 2.3 GHz band in TDD mode for mobile services in Bhutan.

STAKEHOLDER ENGAGEMENT

The Authority carried out the following consultation meetings pertaining to ICT and Media's various issues, and for feedback and comments from the stakeholders:

Details on consultations held:

Sl.no	Consultation held with	Discussion subject	Outcome
1.	BTL and TICL	Mobile Network (SIM) based IoT Numbering Plan	Inputs and suggestions from all stakeholders have been incorporated and the plan has been finalized
2.	GovTech and Telecom operators	Telecom operators license renewal	The inputs and comments from the GovTech and Telecom operators have been incorporated and the license terms and conditions have been endorsed by the Cabinet and finalized
3.	BTL and TICL	Standards for the Fixed and Mobile Broadband Quality of Services	Inputs and suggestions from all stakeholders have been incorporated and the plan has been finalized
4	BBSCL	Terms and conditions for renewal of broadcasting license	Terms and conditions was signed after incorporating comments of BBSCL
5	Telcos, ISP, BPC, and Govtech	Stakeholder consultation meeting on Amendment of telecommunication tariff order	Incorporated the input and feedback of stakeholders in first draft of the amendment of telecommunication tariff order
6	BTL and TICL	Consultation meeting of mobile costing	Finalization of mobile cost model and implementation of findings from cost model

HUMAN RESOURCE

1. Current Staff Strength

The total staff strength of the Authority as of June 2023 is 32 (17 male and 15 female).

2. Civil Service Award and Promotion

On December 7, 2022, the following officials were awarded and promoted:

1. Ms. Deki, Sr. Admin. Asst
2. Ms. Tshering Choden, Dy. Chief ICT Officer
3. Ms. Soenam Tshomo, Dy. Chief Research Officer, Promotion + Civil Service Award
4. Ms. Gyem Lham, Finance Officer
5. Ms. Pema, Admin. Asst
6. Ms. Deki Wangmo, Personal Assistant, Civil Service Award



3. Resignation

During the same year, the following officials resigned voluntarily from the civil service:

1. Mr. Phub Gyeltshen, Chief Program Officer
2. Mrs. Ugyen Dema, Communication Officer
3. Ms. Tenzin Dema, Sr. Communication Technician
4. Mrs. Sangay Zangmo, Asst. Information and Media Officer
5. Mrs. Thinlay Zangmo, Program Officer
6. Mr. Karma Dorji, Legal Officer

REVENUE GENERATION

The Authority collected a total revenue of Nu. 117178215.3 during the financial year 2022-2023, and following are the details:

Sources of Revenue	Amount Collected (Nu)		Total (Nu)
	Fees	Penalties	
CaTV License	1874231.00	105250.00	1979481.00
Internet Service Provider License	362493.94	14600.00	377093.94
MSO License	203060.75	45000.00	248060.75
Telecom Operator's License (USF)	87412500.00	0.00	87412500.00
OTT License	40000.00	1600.00	41600.00
Spectrum License	22497093.20	1150.00	22498243.20
Apparatus License	1675738.00	69950.00	1745688.00
Type Approval	31288.45	0.00	31288.45
Amateur License	21000.00	0.00	21000.00
Rural TV Dish Installation	500.00	0.00	500.00
VSAT	10710.00	0.00	10710.00
Satellite Phone Permit	59300.00	0.00	59300.00
Book Registration Certificate	54000.00	0.00	54000.00
Publication License (House & individual)	173500.00	7000.00	180500.00
Printing Press License	237000.00	8700.00	245700.00
Broadcasting License	174500.00	50.00	174550.00
Accreditation of Foreign Journalists	108000.00	0.00	108000.00
National Filming Permits	40000.00	0.00	40000.00
International Filming Permits	1950000.00	0.00	1950000.00
Total	116924915.30	253300.00	117178215.30

WAY FORWARD

1. Rural Communication Programme (RCP)

To ensure that all Bhutanese citizens have access to safe, reliable, and affordable communication services, the Authority shall plan and implement RCP Phase VII to connect verified unconnected villages/areas with mobile networks.

2. Advocacy and Awareness Programmes

In order to protect the general public, especially the vulnerable section of the population from undesirable influences and inappropriate contents on all media and ICT services, the Authority has carried out extensive awareness programmes across the country as well as developed various audiovisual advocacy programs and educational materials on several significant themes. These include but are not limited to, raising awareness about the role of parents in the age of social media, promoting responsible usage of social media, and educating the general public on the existing rules as well as on the services offered by the Authority.

The Authority recognizes the challenges surrounding misinformation, disinformation, fake news, and issues associated with ICT and Media Services. Thus, the Authority shall continue to address these concerns and develop advocacy/educational materials to create an informed society that is well-equipped to recognize, critically evaluate and effectively navigate the complexities of ICT and media services.

Additionally, the Authority acknowledges the importance of transparency and open communication with the public. To achieve this, the Authority shall ensure that comprehensive information regarding its mandates and the services it provides is readily accessible to the public. The aim is to foster an enlightened society that is well-informed about the Authority, its mandates, and the services it offers.

3. Film Sector

While the Authority will continue to support the mainstream commercial film industry in Bhutan, in order to promote non-commercial film culture in the country and to recognise films of excellence, the Authority will organize/facilitate film events to provide opportunities for artists and content creators other than mainstream commercial filmmakers to exhibit short/documentary/art films and other independent films which do not have a screening platform.

These events will offer a unique opportunity for artists to exhibit their creativity, innovation, and distinctive storytelling approaches. They will allow young filmmakers in particular to present their fresh and original ideas, sharing

their singular stories and narratives that reflect their unique perspectives and experiences. Through these events, the Authority endeavors to provide a space for filmmakers to express their talent, skills, and passion while fostering a diverse and inclusive film community.

4. Electromagnetic Field Emission (EMF) Monitoring for 5G Mobile Sites

With the procurement of EMF monitoring antennae in the range of 3.5GHz in the upcoming financial year, the Authority will be able to carry out the monitoring of the EMF emission from the 5G Radio transmitters. Currently, the Authority only has the facilities to monitor EMF emissions from 2G to 4G transmitters and we do not have the required facilities to monitor the 5G transmitters since 5G transmissions are made in 3.5GHz.

5. Quality of Service (QoS) Monitoring for 5G services

The Authority also does not have the capability and infrastructure to monitor the QoS of the 5G services provided by the telecom operators. The Authority will therefore explore the possibility of securing funds for the procurement of required equipment to monitor the QoS of 5G mobile services and to regularly carry out field monitoring for 5G services in Bhutan.

6. Development of Regulatory Framework for Satellite Based Internet Services

Satellite-based internet application is very much relevant to countries like Bhutan as satellite communication systems can provide coverage to the remotest and most inaccessible terrain locations. Bhutan has almost achieved a hundred percent network coverage with cellular mobile service but a few rural and sparsely populated areas and the areas important for the socio-economic perspective do not have reliable terrestrial network coverage and other forms of connectivity. It is essential that there is a need to encourage the choice of technology where satellite-based internet services can be one of the technologies to enhance the penetration, coverage, and quality of internet services in the country. However, there is no regulatory framework to guide the development, licensing, and implementation of satellite-based internet services in Bhutan. In order to provide transparency, clarity and ensure effective implementation and regulation of satellite-based internet services in the country, the Authority intends to study and develop a regulatory licensing framework for satellite-based internet services implementation in Bhutan.

7. Telecommunication tariff regulation

In accordance with the Information, Communications, and Media (ICM) Act of Bhutan 2018, the Authority is mandated to regulate ICT and media facilities and services in the country. One of the mandates of the Authority is to determine the tariff, rates, and charges of licensed services in accordance with policy directives. The Authority has been regulating tariffs for ICT services through the issuance of directives, review and approval process, and through the enforcement of telecommunication tariff orders and its amendment. The telecommunication tariff order includes the tariff order for only dark fiber, domestic leased circuit, internet leased line and international private leased lines.

Therefore, the Authority plans to develop a comprehensive tariff regulation for telecommunications services covering the broad aspect of tariff for all telecommunication services. The tariff regulation is also intended to lay out tariff principles, best practices, mechanisms to be adopted, and procedures for tariff approval and its implementation.

ANNEXURES

Annexure 1: List of the villages verified by the Authority

Sl. no.	Dzongkhag	Total villages verified	Total HHs verified	Connected HHs after verification	Unconnected HHs after verification
1	Dagana	7	225	221	4
2	Tsirang	3	85	85	0
3	Haa	3	31	29	2
4	Pemagatshel	2	21	21	0
5	Mongar	5	56	51	5
6	Trashigang	9	183	130	53
7	Trashiyangtse	4	93	92	1
8	Wangduephodrang	2	30	29	1
9	Trongsa	1	10	0	10
10	Sarpang	1	9	0	9
11	Thimphu	12	85	6	79
12	Zhemgang	5	45	45	0
Total		54	873	709	164

Annexure 2: Details of complaint received and resolved by the Authority

Sl. no	Nature/Mode of Complaint Received	Subject of Complaint	Action Taken
1	CaTV, Email	Signal Disruptions	Directed concerned LCO to rectify the issue but found that the signal disruption meant by the complainant was disruptions which were from the MSO headend. However, the LCO was asked to rectify the issues if it was not from MSO hereafter.

2	CaTV, Email	Cable lines across the private property	Directed the concerned LCOs to remove the wires which were laid across the private property to a safe place as the house owner was going to renovate the house. The Authority did the follow-up calls.
3	CaTV, Phone Call	No signal	Inquired the complainant about the receipt and got an explanation from the concerned Cable Service Operator. It was found that the issue was with the bill update on others' names. However, it was resolved after the updation of bill receipt
4	CaTV, Phone Call	Signal Disruptions	Directed concerned LCO to rectify. The issue was immediately taken up by the service provider and replaced the necessary fibers to restore the services. The follow up was done.
5	CaTV, Letter	Encroachment of areas of operation	Since there was no evidence and basis for the complaint, the complainant was asked to either approach to the relevant agencies and also to meet with DrukCom
6	CaTV, Google form	Disconnection of service without notice	Complainant lodge complaint with the Authority that CATV services are cutting without prior notice to the customer. The same issue has been raised by others and directed all the LCOs to raise the invoice before disconnecting the services
7	CaTV, Google form	Signal Disruptions	The LCO was directed to resolve the issue.
8	CaTV, Google form	Signal Disruptions	DrukCom was directed to resolve the issue.

9	CaTV, Facebook Messenger	Signal Disruptions	The Authority directed the LCO to look into the issue and resolve it immediately. LCO found that there was signal fluctuation and resolved it accordingly
10	CaTV, Phone Call	No signal	The complainant lodged the complaint to the Authority that the service provider has refused to come to replace his STB after the damage and there is no CATV signal at his home. The Authority immediately directed the concerned LCO and the issue was resolved.
11	CaTV, Letter	No signal	Upon receiving the complaint, the Authority's Tsirang Branch Office directed the LCO to restore the service
12	CaTV, Facebook Messenger	No signal	The issue was forwarded to the concerned LCOs and resolved it
13	CaTV, Phone Call	No signal	The complainant lodged a complaint to the Authority that the concerned LCO has failed to come to restore the service. The LCO was directed to rectify the issue.
14	CaTV, Google form	Signal Disruptions	The issue was forwarded to the concerned LCOs and resolved.
15	CaTV, Google form	Signal Disruptions	The issue was forwarded to the concerned LCOs and resolved.
16	CaTV, Phone Call	No signal	The issue was forwarded to concerned LCOs, and the field visit was made by the Authority
17	CaTV, Phone Call	No signal	The issue was forwarded to concerned LCOs and resolved.
18	CaTV, Phone Call	No signal	The issue was forwarded to the concerned LCOs and resolved.

19	CaTV, Phone Call	No Signal (No STB)	The issue was forwarded to the concerned LCOs and resolved.
20	CaTV, Google form	Weak signal	The issue was forwarded to the concerned LCOs and resolved.
21	CaTV, Facebook Messenger	No signal	The issue was forwarded to the concerned LCOs and resolved.
22	CaTV, Facebook Messenger	No signal	The issue was forwarded to the concerned LCOs and resolved.
23	CaTV, Phone Call	Disconnection of service right after the month end	After inquiring about the issues to the complainant, the concerned LCO was directed to resolve it
24	CaTV, Email	Issues on Bill Receipt	The complainant informed the Authority about the incidents that happened where the LCOs have issued the bill receipt mistakenly for the previous months. The Authority issued the warning letter to the Noring CS
25	CaTV, Email	Issues with Channel (Aastha)	After receiving the complaints by the Authority, the issue was immediately forwarded to Etho Metho and MSO (NetCom) for the rectification
26	CaTV, Phone Call	Billing Issues	The LCO was directed to resolve the issues with the complainant and revert back to the Authority
27	CaTV, Email	Channel issues	The Authority sought the additional information on channels and found that the issues were resolved
28	CaTV, Google form	Billing Issues	The Authority sought an explanation from both the parties and found that the issues were resolved

29	CaTV, Letter	Druk MSO's complain against NetComm	Referred past documents and after discussion with the Director, an appointment with the secretary of MoICE was made and so the issue was resolved after discussion with the Secretary.
30	EMF, letter	EMF radiation from the mobile tower	<p>-Collected information on the location of the 4-legged lattice tower and the status of installation from BTL's Manager, Gelephu.</p> <p>-The team from the Authority along with BTL Manager, Thromde Official, and the Landowner carried out the site verification of the Tower near her land based on the "Standards for the Establishment of Telecommunications Tower" and also carried out the EMF test measurement</p> <p>-Issued a letter to BTL to change the position direction of the 3 sector</p>

OUR CORE VALUES



We are committed to common goal.
We are one organization, one team committed to build an environment where every person is encouraged and appreciated for his/her efforts.



We ensure results without compromise.
We work professionally and collaboratively to deliver results and facilitate our clients without prejudice



We are responsible for our actions.
We take responsibility for our actions and value the ability of our staff and organization to honour our commitments



We anticipate change and shape it to fit our purposes.
We keep pace with the rapid technological changes and employee development programs.



We do the right thing.
We are transparent, honest and ethical in all our interactions with employees, clients and the public

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