

Terms of Reference (TOR)

For the selection of a Consulting Firm for the Assessment of International Bandwidth and Last Mile Connectivity Requirements to Support Digital Trade in Bhutan

Assignment Title:	Assessment of International Bandwidth and Last Mile Connectivity Requirements to Support Digital Trade in Bhutan
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Thimphu, Bhutan

Contents

1. Introduction	2
2. Objective of the Assignment	4
3. Scope of Work	4
Deliverable 1: Inception Report and Work Plan	4
Deliverable 2: Report on assessment of Broadband Market Structure and Connectivity Needs	4
Deliverable 3: IRU Bidding Documents for Procurement of International Bandwidth	7
Deliverable 4: Bidding Documents for Last Mile Connectivity for Digital Trade	7
4. Methodology	8
5. Administrative Arrangements, and Responsibilities	8
5.1. The Consulting Firm's Responsibilities	8
5.2. The Client's (GovTech) Responsibilities	9
5.3. Qualification and Experience of Experts	9
6. Non-key experts and support staff & backstopping	10
7. Duty Station	10
8. Reporting Mechanism	10
9. Duration of this Assignment and Payment schedule	11
10. Selection Procedure	11

1. Introduction

Sector Context

The Civil Service Reform Act 2022 established the Government Technology Agency in December 2022 as an autonomous agency with a mandate to lead/centralize policy and its implementation for digital infrastructure, platforms, and services across the government. The Bhutan Information Communication and Media Authority (BICMA) under the Ministry of Industry, Commerce, and Employment remains responsible for regulatory matters related to the telecom, information and the media sector.

Internet reliability, affordability, and resilience are key challenges for Bhutan. This is impacted by constraints in the international segment of the broadband value chain, largely due to Bhutan's constrained connectivity through India to access undersea cables for international connectivity.¹ Access to high-speed fixed broadband remains below 1 percent of total households and unaffordable for smaller businesses, inhibiting their access to digital trade markets. In addition, Bhutan's two international gateways in Phuentsholing and Gelephu, are both connected through India's narrow Siliguri corridor. Therefore, any natural disaster there impacts Internet services in Bhutan.² An additional link in Gelephu has been confirmed via Bangladesh (through India) but more competition and technical options are needed to improve international connectivity, affordability, and reach.

Over 90 percent of the population now has access to 4G mobile broadband offered by the two operators – B-mobile (Bhutan Telecom) and Tashi Cell, The GovTech Agency (formerly the Department of Information Technology and Telecom, Ministry of Information and Communications) has implemented the National Broadband Master Plan Implementation Project (NBMP) in collaboration with Bhutan Power Corporation (BPC) to establish a fiber-optic backbone network throughout the country. National Backbone Network connects the entire country with fiber optics cables (piggybacking on the BPC's transmission and distribution network) down to the block level. In addition, the Government Network (GovNet) and the Druk Research and Education Network (DrukREN) connect government institutions, higher education institutes, and hospitals to the Internet. All government agencies are connected through GovNet which in total subscribes to 10 Gbps for 1,200 agencies. In addition, all research institutes including RUB colleges, higher secondary schools, and hospitals are connected via the DrukREN network which subscribes to 7 Gbps for 260 agencies. Total individual users on both networks add up to around 32,000 users. Major trade and logistics centers (Phuentsholing Thromde, Samdrupjongkhar Thromde, Gelephu Thromde, Samtse Dzongkhag and Paro International Airport) are also connected to the Government Network. However, still many (mostly remote) rural government trade, logistics, and agricultural centers remain without connectivity to either of these networks.

Currently, Bhutan has three Internet Service Providers with International Internet gateways, Bhutan Telecom Ltd. (BTL), Tashi Infocomm Ltd. (TICL) and NANO. The current combined total international bandwidth is around 71Gbps coming through three fiber-optic cable connections – two in Phuentsholing and one in Gelephu, all going through the Siliguri corridor in India. As mentioned before, this poses a risk for connectivity connections for Bhutan being affected by a single incident at Siliguri since these fiber cables connect Bhutan further to the rest of the world. If a major disaster should happen in Siliguri, Bhutan's communications will be cut off from the rest of the world. A possible route for the third

¹ In 2021, Bhutan's International bandwidth price was around \$7 per Mbps per month, higher than neighboring countries such as Nepal (\$4), Bangladesh (\$3.25), India (\$4) and Pakistan (\$2).

² In May 2020, Bhutan's internet was largely affected due to the cyclone Amphan.

International Internet Gateway (IIG) for Bhutan is as follows: Gelephu – Agartala, India – Comilla, Bangladesh – Kuakata, Bangladesh – Singapore.

Accelerating Trade and Transport Connectivity in Eastern South Asia (ACCESS) Project.

The World Bank’s Accelerating Trade and Transport Connectivity in Eastern South Asia (ACCESS) Multi-Phase Programmatic Approach (MPA) consists of a series of linked transport and trade facilitation projects in eastern South Asia designed to increase the efficiency and resilience of trade and transport along selected regional corridors. The ACCESS Program was approved on June 28, 2022, with Phase 1 covering Bangladesh and Nepal, and Bhutan has requested to join Phase 2 for which preparatory activities have initiated. The proposed project development objective is to enhance the resilience and efficiency of trade and transport along selected corridors in Bhutan (“Project”).

The ACCESS program framework consists of 3 main pillars: (a) Digital Systems for Trade: provision of digital solutions and automation, designed to eliminate manual and paper-based processes, resulting in faster border crossing times; (b) Green and Resilient Infrastructure: enhancing regional corridors, infrastructure, and trade gateways; and (c) Institutional and Policy Strengthening for Transport and Trade: technical assistance and capacity building for trade and customs modernization.

Proposed priority interventions under ACCESS have been identified, including but not limited to targeted investments to improve road connectivity, a national single window (NSW) for digital trade, and improvements in digital connectivity, data infrastructure, and other enablers that are aligned with ACCESS objectives. As part of its efforts to improve digital connectivity, the Government Technology Agency (GovTech) aims to carry out the following activities: (i) long-term competitive procurement of international internet bandwidth for the Government Network (GovNet, DrukREN, and new trade, logistics and agriculture centers) under an indefeasible right of use (IRU) contract to improve competition, reliability, and affordability of international connectivity, and connect trade and logistics centers to reliable high-speed Internet; and (ii) improve last mile connectivity to select rural and remote businesses, agricultural trade, and logistics center that remain unconnected to high-speed Internet, but are expected to be key beneficiaries/users of the NSW and other digital trade systems in the future.

In October 2023, the Royal Government of Bhutan received a Project Preparation Advance (PPA) in support for the preparation of the proposed ACCESS project. As part of the PPA, the Government Technology Agency (GovTech) will be carrying out a technical feasibility study to advance readiness of the proposed digital connectivity interventions under ACCESS.

This document is prepared to invite consulting firms with the right professionals and expertise to conduct nation-wide assessments to identify the current situation of government bandwidth requirements, local market conditions for the provision of such bandwidth to government agencies and the need to expand last-mile connectivity. As the existing international links are cited as one of the bottlenecks in delivering quality digital services, this project also gives emphasis to evaluating different routing and procurement options for international capacity options. Moreover, other issues that need attention such as policy on and regulation of ICT infrastructure development and management shall also be addressed by this project.

The main contracting party for this assignment is the GovTech Agency of Bhutan. The consulting firm must visit Bhutan at least twice during the assignment.

2. Objective of the Assignment

The objectives of this assignment are to: (i) assess existing international connectivity status, market conditions, and bandwidth utilization practices of public institutions and to design a competitive procurement structure based on an IRU approach for additional, resilient international bandwidth for the Government Network (GovNet and DrukREN, the Research & Education Network); (ii) assess demand for expanding last mile connectivity to currently unconnected trade, logistics, and agricultural centers in Bhutan which are expected to be key beneficiaries/users of the NSW and other digital trade systems in the future; and (iii) prepare two bidding documents – (a) IRU procurement of international bandwidth; and (b) last mile connectivity for unconnected trade and logistics centers.

3. Scope of Work

The assignment is organized in such a way that the overall scope is divided into 3 main deliverables. The activities that lead to the deliverables are closely interrelated and involve assessment of overlapping areas. The consultants should work out a methodology, explaining in detail how the different tasks and activities are best organized.

The detailed scope of each deliverable is given below.

Deliverable 1: Inception Report and Work Plan

The inception report serves as assignment mobilization and should include a comprehensive methodology, work plan, work schedule, and provide comments on the overall assignment.

Deliverable 2: Report on assessment of Broadband Market Structure and Connectivity Needs

The main output of the deliverable 2 is an assessment report analyzing the following key areas:

- (1) International and National Broadband Market Structure and Government Connectivity Needs
- (2) Last-Mile Connectivity Needs for rural trade, logistics and agricultural centers
- (3) Review of Policies and Regulations related to International and National Broadband Bandwidth Services including Last-Mile connectivity services

(1) International and National Broadband Market Structure and Government Connectivity Needs

This section shall include an assessment of the current international and national broadband market structure and the Government of Bhutan's connectivity needs, *as relevant to improving the readiness of the ACCESS project*. This includes the following:

- Assessment of the local broadband market structure in Bhutan
 - a. High-level assessment of current and future bandwidth requirements for the public and private sectors in Bhutan, taking into account ambitious plans to accelerate digital transformation and integration into digital trade markets; this includes an assessment of bandwidth requirements for all fixed and mobile users on domestic and international levels

- b. Review of current connectivity status and infrastructure utilization patterns of GovNet and DrukREN across the country; this includes studying redundancy and reliability requirements, and exploring possibilities of infrastructure sharing among local telcos and ISPs.
- c. Role of local telcos and ISPs using the national fiber backbone network to bring connectivity from the border gateways to the Government Networks and across the country; this includes assessment of possible options that can be adopted for handover of the international bandwidth to the local telcos and ISPs at the border gateway.
- Assessment of the international bandwidth market bringing broadband services to Bhutan
 - a. Analysis of current and potential new entrants/providers of international bandwidth services
 - b. Review of international best practices in bandwidth procurement including high-level projection of expected pricing trends for Bhutan and comparator countries
- Procurement design options for additional international bandwidth
 - a. High-level review of current international bandwidth cost levels, including comparison with select regional and global benchmarks
 - b. Analysis of benefits of IRU approach to bandwidth procurement for Government based on international best-practice examples including a projection of expected bandwidth price reductions through an IRU. The firm's analysis should build on a review of targeted case studies that were carried out with support from the World Bank team.
 - c. Review of potential procurement design options for IRU procurement of international bandwidth, including how local operators could be factored into the tender process either as part of the IRU or under a separate procurement.
 - d. High-level review of legal and regulatory gaps that could impact the procurement of international bandwidth services by the Government and for bringing the bandwidth to the government networks
- Implications for IRU bidding process and documents
 - a. Summary of key implications for IRU design and process to provide guidance to the bidding document development (Deliverable 3)

(2) Last-Mile Connectivity Needs for rural trade, logistics and agricultural centers

GovNet developed an initial plan with an estimated budget for connecting rural trade, logistics and agricultural centers. This section shall include a verification and assessment of last mile connectivity gaps, and estimated costs for facilitating digital trade at unconnected rural trade, logistics, and agricultural centers that could be addressed through national operators and/or ISPs using a range of fixed broadband (wired and wireless) technologies.

This includes the following:

- Verification with the GovTech team on the current status of government and research networks (GovNet and DrukREN)
 - a. High-level assessment of current and future bandwidth requirements on both networks
 - b. Analysis of main providers for these networks (including the role of local telcos and ISPs)
 - c. Mapping of existing sites currently connected to the government and research networks including their bandwidth requirements
- Assessment of unserved (and underserved) trade, logistics, and agricultural centers
 - d. Mapping of currently unconnected (and/or underserved) centers
 - e. Design of a mix of access technologies to most efficiently connect these currently unconnected agencies – this technology assessment should primarily rely as much as possible on existing infrastructure (wired and wireless)
 - f. Perform a gap analysis for how many centers can be connected through existing infrastructure and how many will require connections via new infrastructure development (including recommendation on optimum technology choice)
 - g. High-level budget estimate for (a) connecting centers through currently existing infrastructure and (b) connecting centers, which will require new infrastructure development
- Procurement options for last-mile connectivity services
 - h. Review of current procurement process for similar services in Bhutan
 - i. High-level market screening of potential providers (e.g. wired, wireless, satellite) for Last-Mile connectivity in remote areas of Bhutan
 - j. Analysis of different procurement options for Government
 - k. High-level review of legal and regulatory requirements for the procurement of Last-Mile connectivity services by the Government of Bhutan
- Implications for bidding process and documents
 - l. Summary of key implications for bidding process design to provide guidance to the bidding document development (Deliverable 4)

For the two activities as mentioned above (1) IRU for Procurement of International Bandwidth and (2) Last-Mile Connectivity Needs for rural trade, logistics and agricultural centers, provide the following:

- a. Conduct comparative study for procurement modalities in terms of pros and cons, industry practices, capacity of GovTech in managing such contracts. Suggest the most suitable procurement modalities such as packaging, selection method (e.g., RFB/ RFP) market approach options (e.g., National/ International; Open/ Limited; Pre-qualification/ Initial Selection; Single Stage/ Two Stage; One Envelope/ Two Envelop, any other). Also suggest

possibility of using features like sustainable procurement, value engineering, KPIs for contract management.

- b. Provide detailed market information for the selected procurement modality (as stated in paragraph a. above). Market information will include, among others, probable national/international suppliers, notable similar experience, technical and financial capacity. If needed, carry out a market sounding workshop to get the information. This will facilitate the preparation of the relevant procurement documents.

(3) Review of Policies and Regulations related to International and National Broadband Bandwidth Services including Last-Mile connectivity services

This section shall include an assessment of existing laws, decrees, policies and regulations relevant to the two envisaged competitive procurement process for the IRU and last mile connectivity, with an aim to facilitate competition, private investments, and to open doors for new entrants.

- a. Review existing process of the Government of Bhutan and identify any issues, which may need to be addressed to support a competitive procurement of international bandwidth through an IRU process and last-mile connectivity solutions
- b. Develop a set of recommendations and implications for the two planned procurement activities.

A legal gap analysis of the Information, Communication, Media Act 2018 (ICM Act) has already been completed including a review on the telecommunications sector, and this shall be made available by the client.

Deliverable 3: IRU Bidding Documents for Procurement of International Bandwidth

Based on the analysis of the previous deliverables, this assignment should prepare a set of bidding documents, that adhere to World Bank Procurement Regulations and procedures and align with national policies, for an IRU process to competitively procure international bandwidth at Bhutan's border gateway, for use by the Government Networks.

In this context, the assignment should carry out the following activities, among others:

- Detailed specification of most appropriate IRU procurement process for Bhutan, that adheres to World Bank Procurement Regulations and procedures and aligns with national policies, including but not limited to designing a one- or two-stage process, requirement for pre-qualification/ Initial Selection (as detailed above), the role of local telcos for bringing bandwidth from the border to the GovNet, evaluation and selection criteria, contract award procedure, etc.
- Detailed definition of IRU contractual conditions, including but not limited to contract duration, inclusion of O&M charges during initial years, amount of O&M charges in further years, penalty clauses, etc.
- Detailed specification of technical parameters and processes, including but not limited to bandwidth requirements, implementation schedule, testing and performance procedures, quality of service requirements, etc.

- High-level market screening of potential international (and, if applicable, national) providers for bringing international bandwidth to Bhutan (as verification of initial assessment under Deliverable 2)
- Drafting of all necessary Bidding Documents, including annexes, draft contract templates, etc.
- Organize meetings to consult stakeholders and validate findings/recommendations.

Deliverable 4: Bidding Documents for Last Mile Connectivity for Digital Trade

Based on the analysis of the previous deliverables and based on initial planning and estimated budgeting already performed by GovTech, this assignment should prepare a set of bidding documents, that adhere to World Bank Procurement Regulations and procedures and national policies, for Last Mile connectivity to procure bandwidth services for Bhutan’s currently unconnected trade, logistics, and agricultural centers that will become important hubs for digital trade. For the purpose of this particular assignment, procurement shall only utilize existing infrastructure, and will not entail new roll-out of fiber optic networks or other network infrastructures.

In this context, the assignment should carry out the following activities, among others:

- Detailed specification of most appropriate procurement process for Bhutan, that adheres to World Bank Procurement Regulations and procedures, including but not limited to designing a one- or two-stage process, requirement for pre-qualification/ Initial Selection (as detailed above), evaluation and selection criteria, contract award procedure, etc.
- Detailed definition of contractual conditions, including but not limited to contract duration, upfront versus ongoing charges, penalty clauses, etc.
- Detailed specification of technical parameters and processes, including but not limited to bandwidth requirements, choice of technology (wired versus wireless), implementation schedule, testing and performance procedures, quality of service requirements, etc.
- High-level market screening of potential providers for Last-Mile connectivity in remote areas of Bhutan (as verification of initial assessment under Deliverable 2)
- Drafting of all necessary Bidding Documents, including annexes, draft contract templates, etc.
- Organize meetings to consult stakeholders and validate findings/recommendations.

The deliverables as stated above are interrelated. It is the responsibility of the consulting firm to merge common activities (e.g., assessments) together while conducting others independently.

4. Methodology

The consulting firm shall develop a proven methodology to achieve the desired results. The methodology chosen and approaches to be followed shall be indicated in the proposal in detail. The consultancy must clearly indicate, among others:

- How the firm plans to collect and analyze primary and secondary data from government institutions and other national and international stakeholders, as well as available documents.
- How the firm plans to determine the gaps between the current situation and anticipated needs for international bandwidth and last mile connectivity. For example, to verify spare capacity for co-location at border gateways, would a limited physical survey of network sites become necessary?
- How the firm plans to ensure that the proposed designs, strategies, and documents are aligned with national and international best practices and standards.
- How the firm ensures proposed technologies and architectures are the most optimal solutions to improve Bhutan's connectivity, including cost and energy efficiency, sustainability, and forward looking options to facilitate private investments.
- How the firm makes sure that international best practices are captured in all their recommendations.

5. Administrative Arrangements, and Responsibilities

The client is the Government Technology Agency of Bhutan. The assignment should be carried out in close consultation with stakeholders such as Bhutan InfoComm and Media Authority (BiCMA), Bhutan Power Corporation (BPC), private sector operators, ISPs, and the World Bank team, among others.

5.1. The Consulting Firm's Responsibilities

The consultancy firm shall have the following responsibilities. The consulting firm:

- Shall submit weekly status reports and any required deliverables in line with the project plan.
- Shall build and maintain positive and professional working relationship with professionals assigned from GovTech
- Shall work on bases of knowledge transfer and experience sharing with professionals assigned from GovTech
- Must not be engaged in other activities that affect this assignment during the consultancy period
- The consultant should work closely with GovTech staff on a knowledge transfer and experience sharing basis to develop the deliverables
- Organize workshops, as needed, to collect further inputs to the findings

5.2. The Client's (GovTech) Responsibilities

The Client shall have the following responsibilities.

- Provide spaces for small meetings and discussions
- Communicate to relevant stakeholders, as needed, to facilitate the requirements of the consulting firm to carry out its tasks
- Provide relevant available data and documents needed for the assignment
- Assign a team of professionals and a contact person to facilitate communication between the consultancy and stakeholders
- Assign professionals to work with the consulting firm on knowledge transfer

- Make all concerned individuals available whenever needed by the consulting firm

5.3. Qualification and Experience of Experts

The Consultant shall be a firm/ consortium of firms consisting of qualified professionals. The Consultant's team should be comprised of the following key experts.

SN	Title	Academic Qualification	Experience
1.	Project Manager / Senior Telecom Policy and Regulatory Expert	MSc in telecommunications, computer science, public policy, law, business administration, or related disciplines.	15 years of relevant experience managing high (international) level consultancy or broadband infrastructure development projects; experience in at least 2 similar projects as Project Manager of similar position. The expert will have experience in similar assignments in at least one country other than his/her country of nationality.
2.	Senior Telecommunications Network Expert	MSc in telecommunications, computer science, network engineering or related disciplines.	10 years of relevant experience designing large scale networks that with focus on fiber-based network designs (evidence of at least 2 network infrastructure projects shall be attached). The expert will have experience in similar assignments in at least one country other than his/her country of nationality.
3.	Senior Procurement Expert	Masters in Procurement, Economics, Business Administration, Law, Commerce or related disciplines.	10 years of relevant experience in designing procurement and bidding documents, with demonstrated experience supporting telecom procurement design, including IRU procurement of internet bandwidth (evidence of at least 2 similar projects shall be attached). Should have familiarity and experience with the WB or other development partners' Procurement Procedure. The expert will have experience in similar assignments in at least one country other than his/her country of nationality.
4.	Local Counterpart (Telecommunications expert)	Bachelors in telecommunications, computer science,	10 years of working experience in the telecommunications sector with focus on fiber-based network designs (evidence of at

SN	Title	Academic Qualification	Experience
		network engineering or related disciplines.	least 2 network infrastructure projects shall be attached).

6. Non-key experts and support staff & backstopping

The Consultant may propose any other experts as non-key expert. It will include in its proposal the full costs for such non-key experts and support staff (secretaries, translators, drivers, etc.), and activities necessary for the professional operation of the project team. Costs shall include administrative and technical support from the Consultant's head office and field trips, including travels to Bhutan and consultative sessions.

7. Duty Station

The consultancy is expected to execute the assignments partly remotely, partly stationed at facilities in Thimphu, Bhutan with at least two field trips to Bhutan.

8. Reporting Mechanism

GovTech will form a team that will be working closely with the consulting firm. The consulting firm shall send a written progress report to this team every week on the status of the assignments. Every two weeks the consultancy is expected to give in-person presentations to the team. However, if the need arises to discuss on the status of the project out of this stated time, the consultancy may request GovTech in advance to arrange an extraordinary reporting meeting. The consultancy is expected to explain its reporting plan in the proposal.

9. Duration of this Assignment and Payment schedule

The consulting company is expected to complete all deliverables within 20 weeks from the date of contract signing. The payment schedule is as follows.

	Deliverables	Payment Schedule ³	Expected Delivery
0.	Contract signing	10%	0 weeks from contract signing
1.	Submission and acceptance of Deliverable 1 (Inception Report and Work Plan)	10%	2 weeks from contract signing

³ As a percentage of total contract amount under the guidance of the World Bank team

2.	Submission and acceptance of Deliverable 2 (Report on assessment of Broadband Market Structure and Connectivity Needs)	20%	12 weeks from contract signing
3.	Submission and acceptance of Deliverable 3 (IRU Bidding Documents for Procurement of International Bandwidth)	20%	16 weeks from contract signing
4.	Submission and acceptance of Deliverable 4 (Bidding Documents for Last Mile Connectivity for Digital Trade)	40%	20 weeks from contract signing

10. Selection Procedure

The consultant will be selected following Fixed Budget-Based Selection (FBS) as set forth in the World Bank Procurement Regulations for IPF Borrowers, Fifth Edition, September 2023.