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ROYAL GOVERNMENT OF BHUTAN
MINISTRY OF INFRASTRUCTURE AND TRANSPORT
THIMPHU: BHUTAN
ACCESS BHUTAN PROJECT



ACCELERATING TRANSPORT AND TRADE CONNECTIVITY IN EASTERN SOUTH ASIA –
BHUTAN PHASE 2 PROJECT

Terms of Reference for International Individual Bridge and Structural Specialist

1. Background

The deepening relationship among Bangladesh, Bhutan, India, and Nepal on regional trade and transport is reflected by the increasing number of regional and bilateral connectivity agreements. However, although trade between them has been increasing over the years, opportunities for growth through regional trade remain largely untapped.

Low regional trade reflects the high cost of connectivity. Several factors account for the high cost, including inadequate transport and trade infrastructure, cumbersome regulations, manual processes, and protective tariffs and non-tariff barriers. The Trade Restrictiveness Index, which captures the trade policy distortions that each country imposes on its import bundle, shows South Asia with the greatest protection compared to any other region.

However, despite the region's large road, rail, and waterway networks, the degree of multimodal freight movement is limited at the national level, and even less for cross-border freight traffic. Each of the modes of transport has largely evolved separately, with only nascent efforts to facilitate multimodal transport operations. An effort will, therefore, be required to strengthen the road, waterway, and railway networks and develop freight markets that allow more efficient coexistence and interfaces between the transport modes. This also entails providing last-mile connectivity by improving congested and less-developed road sections connecting to international borders and other trade gateways.

To overcome some of these impediments to regional trade and connectivity, the Royal Government of Bhutan (RGOB), with financial support from the World Bank, has conceived a multi-phase project: Accelerating Transport and Trade Connectivity in Eastern South Asia (ACCESS).

The objective of the proposed project is to increase the efficiency and resilience of trade and transport along selected corridors in Bhutan. The proposed project is expected to reduce trade and transport costs through (i) an increase in throughput at priority border points; (ii) a reduction in average travel time for vehicles along selected regional corridors; (iii) a reduction in annual fatalities on program corridors; and (iv) increase the number of people provided with improved climate resilient road access along regional corridors.

The main civil work intervention under the ACCESS Bhutan project is to design and construct a mostly greenfield road link between Gelephu to Tareythang (14 kilometers). This will add to the missing links of the Southern East West Highway through the southern Bhutan. The road link from Gelephu to Tareythang not only facilitates the airport, dry port and multimodal transport hub in Gelephu, but also is a part of the strategically important Samtse to Samdrup Jongkhar Highway running from west to east of the country. Gelephu and Tareythang are currently connected by a 45.4 km road with a carriageway width varying from 3.0 m to 5.5m and it takes about 2 hours to travel. The road traverses through mountainous terrain, often encountering steep inclines and declines, hair-pin bends and lacks proper sight distance at many curves. The first section (about 10 km) from Gelephu City to the junction with the secondary road to Tareythang (near the western end of the existing Mau River bridge) is part of the National Highway, PNH4 to Zhemgang/Trongsa.



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Being located on the floodplains, this will be a bridge-heavy road with over 3500m of bridge segments of different lengths, including about a 1005-meter-long bridge across Mau River and 780 meter-long Jengkhang and Taklai bridge. In addition to their usual functions, the bridges are expected to support the GMC development, be climate resilient, and also serve as underpasses for elephants and other wildlife.

Currently an international consultancy firm is conducting the design of Gelephu-Tareything road and the bridges. The design is expected to conclude later this year, works contractor appointment would take place right after, and then the construction of the project through ACCESS Bhutan project.

Given the scale, complexity, long design life, and exposure to climate and seismic risks of these bridges, using a portion of Project Preparation Advance from the World Bank, the Department of Surface Transport (DoST) intends to contract an appropriately qualified Individual Consultant interested in rendering consulting services for design review and construction phase technical backstopping for bridges and high retaining structures. Through these services of the individual, the department would like to ensure that the design of the bridges along the Gelephu-Tareything road is technically sound, resilient, constructible, and optimized over their life cycle, while strengthening the employer's design review and acceptance capacity. The services will be procured following the World Bank's Procurement Regulations for IPF Borrowers, July 2016, And Revised November 2020.

2. Objectives

The objective of the assignment is to support the Department of Surface Transport (DoST), as the Employer of the design and downstream construction of the project, by providing independent, senior-level bridge engineering expertise to enhance the quality, resilience, and life-cycle performance of major bridges and associated high retaining structures along the Gelephu-Tareything corridor under the ACCESS Bhutan Project.

Specifically, the assignment seeks to:

- Act as the Employer's independent technical expert to review, challenge (if necessary), and advise on complex bridge designs prepared by the Design Consultant, with particular emphasis on safety, structural integrity, constructability, durability, and long-term performance;
- Ensure that bridge and retaining structure designs adequately address Bhutan-specific risks and constraints, including seismicity, hydrology, flood and scour hazards, climate change impacts, geotechnical conditions, and environmental considerations, and are consistent with applicable national and international standards;
- Support informed and timely Employer decision-making on design acceptance, optimization, and risk mitigation, including through value engineering and life-cycle cost considerations; and
- Strengthen DoST's institutional capacity for bridge design review, acceptance, and construction-phase technical oversight through close engagement, knowledge transfer, and hands-on technical mentoring.
- The Consultant's inputs will directly inform the Employer's technical approvals, risk management decisions, and quality assurance processes for major bridge works implemented under the ACCESS Bhutan Project.
- The Individual Consultant shall certify the adequacy and safety of the bridge designs before construction.



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3. Scope of Services

The services are structured in two phases:

- Phase A: Design Phase Services (mandatory)
- Phase B: Construction Phase Services (conditional, subject to satisfactory performance in Phase A, and evolving needs)

3.1 Phase A – Design Phase Services

During the design phase, the Consultant shall provide independent technical review and advisory services, including but not limited to the following:

(a) Review of Design Basis and Parameters

- Review and confirm the adequacy of design criteria, codes, standards, and load assumptions adopted for bridge design, including Bhutanese standards, Indian standards, and relevant international best practices;
- Review key design parameters related to hydrology, hydraulics, geology, geotechnics, seismicity, traffic loading, and climate change projections;
- Assess whether the adopted parameters appropriately reflect extreme-event risks applicable to the site condition (e.g. floods, heating, storm, scour, debris impact, earthquakes etc.).

(b) Structural System and Layout Review

- Independently assess the suitability of proposed bridge locations, structural systems, span arrangements, deck widths, and foundation concepts;
- For major bridges (bridges longer than 500 m or with individual spans exceeding 80 m), carry out enhanced scrutiny of:
 - Structural system selection (e.g. box girder, continuity, redundancy);
 - Global structural behaviour and robustness;
 - Long-term performance and maintenance implications.

(c) Review of Analysis and Modelling

- Shall independently review and/or recreate analysis models by performing independent calculations for critical components such as superstructure, substructure, bearings & expansion joints.
- Review the appropriateness of structural analysis and design methodologies used by the Design Consultant.
- Assess the assumptions, boundary conditions, load combinations, and staged construction effects in analytical models;
- Independently interpret outputs from industry-standard bridge analysis (such as finite element models or other relevant models commonly used by the industry) used for long-span and prestressed concrete bridges.



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(d) Climate and Seismic Resilience Review

- Review seismic design philosophy, detailing, and ductility provisions;
- Review foundation design with respect to scour, erosion, liquefaction, and long-term river behaviour;
- Assess climate resilience measures incorporated into the design, including allowances for future hydrological and environmental conditions;
- Recommend additional resilience or adaptation measures where gaps or risks are identified.

(e) Value Engineering and Life-Cycle Optimization

- Review bridge designs from a value engineering and life-cycle cost perspective, focusing on durability, constructability, inspection access, and maintenance requirements;
- Proactively identify technically feasible alternatives or refinements that could reduce cost, risk, or long-term maintenance burden without compromising safety or resilience;
- Prepare concise value engineering notes summarizing options considered and recommendations.

(f) Review of Design Drawings, BOQs, Specifications, and Technical Documents

- Review Design Drawings, Bills of Quantities, and Technical Specifications to ensure completeness, consistency, and alignment with the approved design intent;
- Identify omissions, ambiguities, or constructability risks.

(g) Design Review Outputs

- For major bridges, prepare Design Review Memoranda summarizing key findings, risks, and recommendations;
- Maintain a register of design review comments and track their resolution by the Design Consultant.
- Upon completion of the design review and subsequent finalization of designs by the Design consultant, carry out final check and submit vet/proof check report and submit them to the Client.
- The Individual Consultant must have his/her signature on the approved final design drawings submitted by the Design Consultant.

(h) Capacity Building

- Provide on-the-job mentoring and technical guidance to DoST Bridge Division staff on bridge design review, resilience considerations, and interpretation of analysis results.

3.2 Phase B – Construction Phase Services (Conditional)

Subject to satisfactory performance during the design phase, at the discretion of the Employer (and availability of the Consultant), the Consultant may be engaged to provide limited construction-phase support, including:



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- Review of the Contractor's Quality Assurance and Quality Control (QA/QC) Plan, inspection and test plans, and material approval procedures for bridge and retaining structure works;
- Review of shop drawings, fabrication drawings, and method-specific design submissions for major bridge components to confirm consistency with the approved design intent;
- Review and advice on construction sequencing, phasing, and temporary works concepts, particularly for long-span bridges, foundations in riverine environments, and works affecting traffic or the environment;
- Review of contractor's method statements for critical bridge activities, including foundations, substructure works, superstructure erection, launching, and post-tensioning;
- Periodic site visits at critical stages of bridge construction (e.g. foundations, substructure completion, superstructure erection, post-tensioning);
- Review and technical advice on proposed design changes or value engineering proposals arising during construction;
- Advice on unforeseen ground, hydraulic, climatic, or constructability issues affecting bridge and retaining structure works;
- Technical advice to the Employer on bridge-related claims, variations, and dispute resolution, as required; and
- Preparation of site visit and technical advisory reports documenting observations, key risks, and recommendations.
- Provide on-the-job technical guidance to DoST Engineers on the critical stages of the construction works. This includes construction methodologies, quality control & assurance and contract management.
- Conduct periodic review of the construction schedule and progress, identify and analyze the risk that may cause possible delay of the project implementation along with appropriate recommendations.

4. Qualifications

(a) Education

- Graduate degree in Civil Engineering;
- Postgraduate qualification (Master's degree or equivalent) in Bridge Engineering, Structural Engineering, or a closely related field.

(b) Professional Experience

- Minimum 15 years of professional experience in bridge and structural engineering, with substantial involvement in the design of major bridge structures;
- Demonstrated hands-on experience in the design of major bridges of similar scale and complexity, including long-span bridges and bridges in challenging hydraulic, geotechnical, and environmental conditions;



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- Proven experience with long-span bridges, including individual bridges longer than 500 m or cumulative bridge experience exceeding 1,500 m, as a lead designer;
- Experience with prestressed concrete, box girder, balanced cantilever, or similar bridge systems;
- Experience in bridge projects located in seismic and/or monsoon-affected regions, including incorporation or review of seismic detailing, scour protection, and climate-resilience measures;
- Experience of long-span (over 1000 meters) bridge design and construction of similar hilly terrain comparable to Bhutan.
- Experience providing technical support during construction or construction supervision.
- Proven ability to review and interpret advanced structural analysis and design models prepared using industry-standard bridge and finite element analysis software;
- Proven ability to use structural analysis and design models, including finite-element models, prepared using industry-standard bridge and structural engineering software (such as MIDAS Civil, CSI Bridge, RM Bridge, SAP2000, STAAD Pro, ANSYS, or equivalent).
- Strong understanding of bridge life-cycle performance, durability, and maintenance considerations.

(c) Language

- Fluency in written and spoken English.

(d) Age

- Should not be more than 65 years at the time of proposal submission

5. Duration of Services

The consultant will be selected for 3 years on a retainer basis with the contract for intermittent input of 40-person days per year and to be renewed for each year based on the need of the Project and performance of the Consultant.

6. Supervisor and Reporting Requirements

The consultant shall report to the Project Manager, Gelephu – Tareythang Road studies Subcomponent Implement Team (SIT) during the Phase-A, and Project Manager, Gelephu – Tareythang Road construction SIT in the Phase -B. He/she shall prepare reports and slide presentations on the assigned tasks.

7. Remuneration and Compensation

The consultant shall be provided with the remuneration and benefits as per the contract.

The contract will mention a daily or hourly input per year, which shall include all his overhead, social charges and other associated costs and insurance premiums.



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The international and local travel as well as accommodation during visits to Bhutan and the logistics for the training rendered locally shall be reimbursed. Any income tax or other direct tax to be paid by the consultant in Bhutan shall also be reimbursed.

8. Facilities to be provided by the Employer

The consultant shall be provided with working space at PMU, DoST office with basic furniture, internet access, stationery and photocopying facility during his/her stay in Bhutan.

The Consultant is expected to bring his/her own laptop with the required software to render the expected services.

9. Selection Process

Selection of the consultant will be carried out in accordance with the approved selection methods for Individual Consultants as stated in the “World Bank’s Procurement Regulations for IPF Borrowers, September 2023.