

Government of the People's Republic of Bangladesh
Local Government Engineering Department
Program for Supporting Rural Bridges (SupRB)

Terms of Reference (ToR)
for
Bridge Management Specialist (International)

1. Background of the Program

Bangladesh is a densely populated country and more than 70% of the people live in the rural areas. To access to different social and economic centers and settlements, an extensive rural roads network has developed over the period. The total road network size of the country is roughly 375,000 km. This is equivalent to a road density of approximately 250 km per 100 sq. km. The total rural road network comprises just over 350,000 km (94% of the network). Upazila roads (UZRs) and union roads (UNRs) composed of respectively 11% and 12% of the rural road network. Over a quarter (30%) of the rural road network is paved, with 89% and 70% of the UZRs and UNRs, respectively, are paved. The current inventory envisages that a bridge is required for every 4.5km of UZRs and UNRs. Over four-fifths of these gaps now have structures, leaving a fifth of them to be bridged. But currently, the Government does not have any dedicated bridge construction and maintenance program. Nonetheless, none of the Development Partners are involved in rural bridge maintenance and rehabilitation activities.

At present, only 23.89% of all rural roads in the Bangladesh are of acceptable quality, while 26.19% are in fair condition and in need of resealing, 22.76% are in poor condition and in need of rehabilitation and 27.17% are in bad condition and in need of upgrading.

To address this situation, Local Government Engineering Department (LGED) has launched the premeditated initiative to improve the quality of the local road network across the country, by providing both financial investments for capital outlay, as well as strengthening the governance processes so that field officials of LGED are themselves able to effectively plan, design, implement and maintain their road networks. The Program addresses the underinvestment in local roads, and improvement of local roads connectivity to increase economic activity, and improve public access to facilities and services.

Efficient, resilient, and well-planned road networks ensure that no one is left behind in the drive for inclusive growth. This is why roads are considered as an important foundation for the Sustainable Development Goals, and a prerequisite for bringing communities together.

Due to a shortage of funds, significant backlog exists in the maintenance of bridges on rural roads. Although the rural road maintenance budget has been steadily increased in the last ten years, it was not sufficient to manage the entire maintenance needs including bridge maintenance. In this context, the Government of Bangladesh has received a loan from the World Bank (WB) toward the cost of the program titled "**Program for Supporting Rural Bridges (SupRB)**" and reduction of the maintenance backlog of rural bridges.

This program was launched September, 2018 and now under implementation stage by the Local Government Engineering Department (LGED) through the Project Director's Office and contract

administration of civil works will be carried out by LGED District/Upazila offices. The program is designed for 61(Sixty One) districts out of 64(Sixty Four) districts of the country, except 03(Three) hill districts of Bangladesh.

The program Components include (i) Major and minor maintenance of 85,000 meters of bridges, rehabilitation of 24,000 meters of bridges, Capacity Expansion (Widened) of 5000 meters of rural bridges, replacement or newly construction of 20,000 meters of bridges, technical, fiduciary, procurement, social and environmental capacity improvement of LGED including design and implementation of climate resilient bridges and establishment and operationalize of Grievance Redress System (GRS). This program provides continuous connectivity between agricultural production areas, growth centers and rural markets located in the program area and enhance earnings opportunities creating uninterrupted access to the commercial institution and basic services like health and education of the rural poor. The program is expected to lead to reduced poverty in the intervention area.

The Program has two parts. Part-A is Program for Results (PforR) and Part-B is Investment Program Financing (IPF). PforR is output based and is linked to the achievement of the Disbursement Linked Indicators (DLI). Program funds for Part-A (PforR) will be directly disbursed to the government treasury upon the achievement and subsequent verification of results by an independent party.

LGED intends to use some of the resources provided under the Credit to hire an **International Bridge Management Specialist** as an Individual Consultant. The Consultant is expected to support LGED in the Bridge Maintenance and Management activities of the SupRB and also will have to deliver knowledge products on bridge maintenance and management under SupRB/LGED. This will be a short-term engagement with possibility for extension depending on the outcome and future demand of the Program.

2. Objective of the Assignment

The overall objective of this consultancy is to support LGED in the preparation and monitoring of the implementation of long- and medium-term bridge maintenance plans and work programs.

The Consultant is expected to have good understanding of bridge deterioration, works effects and economic development. S/he is expected to work with computer systems or use paper systems with excel spreadsheet programs to forecast the deterioration of the bridges and determine the most opportune moment to carry out the most appropriate maintenance operation.

LGED is in the process of developing software systems for managing the bridge assets. The adoption of these software systems will enable LGED to centralize the production of the Rural Road and Bridge Management Master Plans and rolling work programs.

To achieve the foregoing, the engagement of a **Bridge Management Specialist** shall seek to achieve the following:

- (i) Addressing knowledge gaps on Bridge Asset Management among concerned engineers, working at HQ and field levels of LGED through training activities and workshops;

- (ii) Building capabilities and cascade learning through the development and distribution of knowledge products, such as (i) **Bridge Management and Maintenance Manuals** (ii) **Bridge Inspection and Condition Assessment Guidelines**; and (iii) **Bridge Asset Management Plan, training modules and tools**;
- (iii) Developing and formalize, Implementation guidelines for the planning, design and implementation of climate resilient rural bridges in collaboration with the other consultants and engineers in LGED and validate the aforesaid knowledge products through a required number of meeting and workshops;
- (iv) Developing capacities of implementers through other interventions necessary towards adoption by BMU (Bridge Maintenance Unit) of Bridge Asset Management principles and practices;
- (v) Preparation of the multi-year bridge maintenance and management rolling work program based on RuBIMS/RSDMS and a multi-criteria analysis for annual updates to this rolling work program.

3. Overall Scope of Services

The International Bridge Management Specialist will be responsible for contributing towards the capacity enhancement for Bridge Asset Management of LGED in Bangladesh by developing an understanding of the current capability of Bridge Asset Management, and then providing robust solutions primarily through effective training programs to resolve them effectively. The Bridge Management Specialist will also be responsible for devising a suitable but low-cost Bridge Asset Management System for use in the LGED. S/he will be responsible for integrating all bridge maintenance plans, work programs. S/he will set standards for implementation of a modern Bridge Asset Management System (IT and modern Software based) and in parallel with the prevailing system based until the software Rural Bridges Information Management System (RuBIMS) and Road & Structure Database Management System (RSDMS) is ready and fully functional.

A key function is the prioritization process among the needs from the various Upazilas at all planning stages and preparation of work programs. A key challenge is to ensure that the plans and work programs are financially sustainable and maximize the social and economic impact of the rural road network across the whole country.

The Bridge Management Specialist shall provide policy advice to the SupRB, Additional Chief Engineer (Maintenance), Project Director (SupRB). Her/his responsibilities will include, but not limited to, the followings:

3.1 Bridge Inventory and Asset Management:

- Review of LGED's current methodology for road and bridge inventory, Asset management, the methodologies and systems that are in use and conduct of SWOT analysis to identify strengths, weakness, opportunity and threat of the prevailing system and accordingly provide upgradation of the system;

- Assessment of the present actual load bearing capacity of the bridges, taking into consideration various load combinations, such as (i) a number of smaller loads (light goods vehicles); and (ii) one large load (a heavy goods vehicle), and assuming the existing defects and repairs to be carried out;

3.2 RuBIMS and RSDMS:

- Review of the usefulness, appropriateness of RuBIMS, and RSDMS, making more user friendly, setting standards for health inspection of bridges, implementation of a modern Rural Bridge Infrastructure Management System (IT and modern Software based) in addition of supporting the prevailing (paper and desktop based) Management System of LGED;
- Review of existing practices for Bridge data collection procedure with institutional setup and identify weakness of existing practices and recommend measure to address such weakness;
- Development of standards for measuring the performance of RuBIMS, RSDMS and development of a performance mechanism, including four types measures - Input, Output, Outcome and Efficiency – and both qualitatively and quantitatively (Inspection, Data Collection, Data storage, Data Management, Analyses and Reporting);

3.3 Prepare Manuals and Guidelines:

Development and validation of the aforesaid knowledge products through a number of meeting and workshops/Seminar which will be arranged after receiving request from the BME by LGED;

- (i) **Bridge Management and Maintenance Manual/Guidelines** including treatment options and describing acceptable construction method and also pilot test of the manual (preparation and pilot test should be completed within 6 to 8 months from the start of services);
- (ii) **Bridge Health Inspection and Condition Assessment Guidelines;**
- (iii) **Guidelines** for the planning, design and implementation of **climate resilient rural bridges** in collaboration with the other consultants and engineers in LGED;

3.4 Quality Control and Quality assurance system:

- Review existing Quality Assurance plan and update for all types of interventions (Minor/Major Maintenance/ Rehabilitation/ Capacity Expansion/ Replacement/ New Construction) under SupRB;

3.5 Disaster mitigation strategy

- Development of the **Disaster mitigation strategy** (essentially addressing the flooding risk) for LGED and the LGED's concerned officials in effective and timely response to emergency situations involving bridges (e.g., floods, cyclones, earthquakes and collapses) in close coordination with the Climate Change Adaptation consultants.

3.6 Bridge Management and Maintenance Plan:

- Proposal for improving efficiency of Bridge sector management of LGED including institutionalizing clear job description/responsibilities of LGED at central and field levels;
- Preparation of a multi-year rolling bridge management and maintenance Plan with prioritization, annual financing strategy and Plan. The strategy and Plan should be implementable and realistic, taking into account budget constraint and provide prioritization of the optimal resource allocation coordinating with all the bridge maintenance plans, work programs implemented under LGED. Also include the Proposal for improvements to the Bridge Maintenance Management System of LGED, especially regarding prioritizing maintenance needs considering budget constraint;

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3.7 Design, Technical Specification and Standard:

- **Review** of the existing design for Bridge Maintenance of LGED and development of a proposal of any modifications in design, engineering solution and bridge related items in the Rate Schedule and LGED Standard Technical Specifications;
- Checking and review of the designs of bridges obtained from the design consultants/design unit of LGED to ensure they meet all the standard requirements;
- Preparation of Technical Specification for Bridge Maintenance Standard with Climate Resilient Infrastructure;
- Prepare technical specifications for the items of activity in connection with the implementation of climate resilient bridge maintenance and new bridge construction so as to ensure quality control and further improvement strategy of the bridge maintenance works supported by environmental and social management framework of the World Bank and Bangladesh.

3.8 Structural Review, Evaluation and Recommendation:

- Development of a **Structural Review** methodology and also conducting of Structural Review of a few selected bridges for Replacement, Capacity Expansion, Rehabilitation type intervention in collaboration with the Bridge Maintenance and Management Coordination Team;
- Preparation of recommendations for any bridge replacement, major repairs, capacity expansion and provision of new bridges including commissioning reviews of environmental, ecological, hydrological and social impacts of the proposals with coordination of the other consultants of SupRB;
- Carrying out of an economic evaluation of the preferred engineering solution identified above to establish whether the proposed remedial works, or construction of an entirely new bridge, are economically justified.

3.09 Training and Workshop:

- Development of a proposal of relevant trainings and acting as a resource person to build capacities of LGED's central level engineers and other identified participants in Bridge Asset Management;
- Development of a proposal of relevant workshops and related activities to consolidate learning, suggestions on and proposed enhancements of the manual, modules and tools on Bridge Maintenance and Asset Management.
- The International Bridge Management Specialist shall prepare training documents based on his deliverables.

3.10 Technical Advice to LGED Senior Management on the Work Program of the the Bridge Management and Maintenance Coordination Team

The International Bridge Management Consultant will provide technical advice to the Additional Chief Engineer (Maintenance), Project Director(SupRB) and Superintending Engineer of Maintenance Unit of LGED in overseeing the work program of the Bridge Management and Maintenance Coordination Team, which consists of LGED's Bridge Maintenance Specialist, Jr Bridge Maintenance Specialist and Asset Management Specialist of Maintenance Consultancy Firm, Sr. Asset Management Specialist (Individual Consultant) at HQ level, Bridge Maintenance Engineer of Regional Level Consultancy firms of SupRB.

This Bridge Management and Maintenance Coordination Team will be embedded within the Road and Bridge Maintenance Unit and will work under the direct management of the Additional Chief Engineer (Maintenance). A Superintending Engineer of Maintenance Unit of LGED will manage the team on a day-to-day basis.

This Team will be responsible for the production of realistic strategic plan and guidelines for Bridge Management System of the country under LGED.

The Bridge Management and Maintenance and Coordination Team will be responsible for:

1. Provision of the feedback during the assessment of the usefulness, appropriateness of current Bridge Management System (BMS) of LGED, set standards for implementation of a modern Bridge Asset Management System (IT and modern Software based) and in parallel with the prevailing (paper and desktop based) system until the software Rural Bridge Information Management System(RuBIMS) and Road and Structure Database Management System(RSDMS) is ready and fully functional (Brief descriptions of RSDMS and RuBIMS are enclosed in the Annex of these TORs);
2. Contribution to the production of a multi-year forward minor & major maintenance, rehabilitation, replacement and capacity expansion work program;
3. Preparation of multi-year rolling Bridge Management and Maintenance Program (BMMPs) with annual updates; and ensure that bridge maintenance work programs of LGED comply with the approved BMMPs;
4. Contribution to the formulation of and implementation of strategies to increase funding envelopes for bridge maintenance;

5. Assistance to formulate Bridge and Road Maintenance related new and revise (Development Project Proposal) DPPs;
6. Coordination with donors (organize donor coordination meetings, prepare project proposals and so on);
7. Building capabilities and cascade learning through the development and distribution of knowledge products, such as the Bridge Maintenance and Management Manuals, Bridge Inspection Manual and Bridge Maintenance Guideline and Technical Specifications; and
8. Support in institutional capacity building of implementers through other interventions necessary towards adoption by BMU (Bridge Maintenance Unit).

4. Duration of the Assignment

Total duration of the assignment will be 24 months over the remaining implementation period of SupRB. The Consultant is expected to work in Bangladesh about 6 to 8 months each year.

The target start and completion dates shall depend on the actual date of hiring and may change depending on the finalization of LGED Bridge Maintenance Unit and other logistical considerations.

5. Required Qualification and Experience

(a) Educational Qualifications:

- Minimum Bachelor's Degree in Civil Engineering along with Masters in Structural Design/Highway Engineering/Transportation/ Construction Management or equivalent. Licensed or chartered engineer having relevant research, study, publication and field experience will be preferred.

(b) Experience:

- Minimum 15 (fifteen) years of overall experiences, out of which 10 (ten) years of relevant experience in bridge management, maintenance, inspection, inventory, M&E or similar assignment, at least 5 years of relevant international experience (Bridge Maintenance or Management Specialist) in developed countries, and at least 3 years of relevant experience (Bridge Maintenance or Management Specialist) in developing countries specially, relevant experience in South Asia will be an added advantage;
- Proven leadership and project management capability, personnel management and interpersonal skills, work skills in multi-disciplinary and multi-cultural team environments, excellent report preparation skills with computer literacy;
- Experience in developing Manuals, Guidelines, policy papers, training modules and/or other technical writing work;

- Demonstrated capacities in providing and facilitating capacity building interventions and technical assistance on Rural Bridge Maintenance and Management System;
- Excellent written and oral communication skills in English.

(C) Appropriateness:

- Computer skill (MS word, Excel, Power point, Bridge maintenance and asset management related application software, etc.),
- Recent Training Certificates and/or professional licenses in relevant areas,
- Bridge management software packages,
- Experience with setting up and managing of Rural Bridge Maintenance and Management System,
- Hands-on experience in preparing annual work program,
- Experience with developing training materials and providing training as well as conducting Training Needs Assessments, and
- Working experience in South Asia.

6. Institutional arrangements

The Individual Consultant will work directly with the Project Director of the “Program for Supporting the Rural Bridge program” and support the officials of LGED at PMU especially Bridge Maintenance Unit, LGED Headquarters, in order to achieve the objectives of the Program.

7. Logistics and Facilities provided by Client

The Consultant will work directly with LGED in Bangladesh. H/She will provide printer and necessary consumables under reimbursable items kept for the position. LGED will also provide office accommodation. Land transport from Residence to office and office to residence is to be arranged by her/himself and payment will be made from her/his reimbursable cost. LGED will provide transport for travelling to field whenever it becomes necessary.

8. Reporting Requirements

The Consultant will submit the following reports to LGED:

- 8.1 **Inception Report:** Inception Report within 30 days of mobilization. The report will include a work/activity plan and also provide details for procurement of reimbursable items under the current contract for the initial 12 months;
- 8.2 **Half Yearly Reports:** summarizing briefly the accomplishment over the previous months including details progress, capacity building and training, and consultant’s activities, any issues and resolution of these, and a work plan for the following three months;

- 8.3 Annual Reports: Annual reports covering all details of the Mid-term Reports summarizing all activities to date, any issues and methods for resolution of these, and planning to achieve future targets, annual bridge maintenance work program;
- 8.4 Draft Task Completion Report: The Consultant will submit the Draft Task Completion Report (DTCR) soon after completion of his/her services at least two months ahead of his/her contract ending; and
- 8.5 Final Task Completion Report: After approval of the Draft Task Completion Report (DTCR), the Consultant will submit the Final Task Completion Report (FTCR) within the contract period.

9. Expected Deliverables

- 9.1 Inception Report which includes relevant policies, guidelines and practices along with his/her activity schedule;
- 9.2 Bridge Management and Maintenance Manual;
- 9.3 Bridge Health Inspection and Condition Assessment Guidelines;
- 9.4 Review of the current methodology in place for the preparation of Multi-year Rolling Bridge Management and Maintenance Program, Annual Financing Strategy and Annual Implementation Plan, and development of the improved methodology with the production of the Guidelines for the preparation of Multi-year Rolling Bridge Management and Maintenance Program, annual financing strategy and Annual Implementation Plan
- 9.5. Development of the Multi-year Rolling Bridge Management and Maintenance Program based on the multi-criteria analysis and prioritization, Annual Financing Strategy and Annual Implementation Plan
- 9.6. Review RuBIMS and/or RSDMS and submit written proposal for further upgradation;
- 9.7. Disaster Mitigation Strategy for rural road and road structures;
- 9.8. Quality Assurance Strategy and Plan for all types of interventions under SupRB;
- 9.9. Climate Resilient Bridge design, construction and maintenance standards.
- 9.10. Update of the Multi-year Rolling Bridge Management and Maintenance Program based on the multi-criteria analysis and prioritization, annual financing strategy and Annual Implementation Plan during the second year of this assignment

Deliverable Timeline and Submission Requirements

Sl. No.	Report	Frequ ency	Due Period	No. of Copies	No. of CDs
9.1	Inception Report	One time	Within 30 days after commencement of service	4	2
9.2	Bridge Health Inspection and Condition Assessment Manual/Guidelines	One Time	Within 3 months after commencement of service	4	2

Sl. No.	Report	Frequency	Due Period	No. of Copies	No. of CDs
9.3	Bridge Management and Maintenance Manuals	One Time	Within 6 months after commencement of service	4	2
9.4	Review and Improvement of the Guidelines (based on review of the current methodology and lessons learnt from the preparation and implementation of the Multi-year rolling bridge management and maintenance Program with prioritization, annual financing strategy and Plan	One Time	1 st September 2021	4	2
9.5	Review reports, and Draft Strategy proposal of RuBIMS and RSDMS to ensure the effective performance of both systems.	One Time	Soon after the RuBIMS and web based RSDMS finalized	4	2
9.6	Disaster Mitigation Strategy	One Time	Within 12 months after commencement of service	4	2
9.7	Review and update of Quality Assurance Strategy and Plan for all types of Project interventions under SupRB	One Time	1 st June, 2021	4	2
9.8	Climate Resilient Bridge design, Construction and Maintenance Standard	One Time	Within 12 months after commencement of service	4	2
9.9	Update of the annual financing and implementation plan of the multi-year rolling bridge management and maintenance Plan	One Time	1 st June, 2022	4	2

Annex

Road & Structure Database Management System (RSDMS)

LGED and LGIs have under their jurisdiction around 353,000 km of roads, of which 237,000 km (64%) are earthen. There is approximately 2,015,000 m of bridges and culverts are needed on this network, of which 646,000 m remain to be developed (32%).

A comprehensive and reliable road inventory database is a basic requirement to establish an effective and efficient road maintenance management system. It should contain detailed information about the physical features of the roads along with identification number, geometric features, condition of road and bridge/culvert, International Roughness Index (IRI), traffic count, chronological history of construction and maintenance, location of bridges/ culverts, growth centres, rural market, union council complex, other social infrastructures (school, college, madrasa, community clinic, health centre, cyclone shelter, etc.) on the road in detail.

Against this backdrop, LGED has developed a computer based software named as - Road and Structure Database Management System (RSDMS), which contains above all information and act as backbone of the maintenance management system of LGED. This database application is being used in planning as well as management of LGED's road network. Based on road and bridge/culvert condition data, assessment of annual maintenance need can be done by this software, while it helps to draw up comprehensive maintenance program including rational allocation of fund based on road category, surface type, traffic volume and social importance of the road. Various reports generated from RSDMS act as management information system while this application takes part in decision-making support to the management in order to planning, and formulation of annual maintenance program.

Key Features of RSDMS:

- General and geometric information of road and road structures;
- Road surface segments includes shoulder and slope;
- Traffic survey data;
- Roughness survey data;
- Visual inspection data;
- Construction and maintenance history;
- Connectivity with growth centers and rural markets;
- Connectivity with socio economic infrastructure (e.g. schools, college, health facility, industry)
- Deflection test data;
- Structure (bridges/culverts) condition data;
- Assessment of annual maintenance need;
- Prioritization and optimization of annual maintenance program based on multi-criteria analysis;
- MIS and decision support related reports.

Rural Bridge Information Management System (RuBIMS)

RSDMS has been designed to capture comprehensive data of road network including basic and condition data for associated bridge/culverts. However, it seems that format so far considered to collect condition of bridge/culverts is not adequate to quantify appropriate health of the structure. During its service life, a structure/bridge has to meet certain quality standards based on technical and performance criteria to meet the safety and performance functions. Due to non-homogenous components of bridge, sometimes it is not easy to set up these standards and even more difficult to decide on what extent a structure/bridge should be repaired or rehabilitated.

Hence, LGED feels necessity for development of a comprehensive bridge management system, which will consist of a series of algorithms to analyze large databases on bridge/structure components and will act as a decision-support tool to identify the right and effective maintenance action. Accordingly, LGED is in the process of developing a comprehensive bridge management system (RuBIMS).