

Terms of Reference (ToR)

for

Feasibility study for Construction of Bridges over the river Meghna on Shariatpur-Chandpur road & Gazaria-Munshigonj road and preparation of Master Plan for Bangladesh Bridge Authority.

1. Background

1.1 Introduction of the organization

Bangladesh Bridge Authority (BBA) is a statutory body under Bridges Division of the Ministry of Road Transport & Bridges. It is the mandate of BBA to undertake technical research, feasibility study, development planning, detailed design, activities associated with the project implementation (including Public Private Partnership projects), monitoring, evaluation, operation and maintenance of 1500 m and over Bridges, Tunnels, Elevated Expressways and related Flyovers, cause way & ring road.

Since its establishment in 1985, the BBA has successfully constructed the Bangabandhu Bridge in 1998 and Mukterpur Bridge in 2008, which are now operated and maintained by the same organization. The other major projects under implementation by the BBA includes: Padma Multipurpose Bridge Project at Mawa-Janjira, Dhaka Elevated Expressway PPP Project, Karnaphuli Tunnel Project (Bangabandhu Sheikh Mujibur Rahman Tunnel), Dhaka-Ashulia Elevated Expressway, Dhaka Bus Rapid Transport Corridor (BRT) Project (Elevated Portion), SASEC Road Connectivity Project (Elenga-Htikamrul part). All these Projects are being implemented through different procurement modes. In addition, feasibility studies for construction of subway in Dhaka city and Five new Bridges at different locations (Paira Bridge, Karkhana Bridge, Meghna Bridge, Bhola Bridge and Biskhali Bridge) are progressing. Some other mega projects in the pipeline are Dhaka East-West Elevated Expressway and feasibility study for Tunnel under the river Jamuna.

Bangladesh is a riverine country and the whole country is divided into 3 (Three) parts like East, North and South by the river Jamuna, Padma & Meghna. By constructing Bangabandhu Bridge across the Jamuna river, communication network between Northern part with Dhaka and Chottagram has become easier. In addition, Harding Bridge (rail bridge) and Lalon Shah Bridge (road bridge) across the Padma river has made the communication easier between the northern and southern part of the Bangladesh. Padma Bridge at Mawa will establish a direct link between south-west part and Dhaka. The Padma and The Meghna divide Bangladesh into two distinct zones – namely the south-western zone and the remaining. This separation has resulted in significant socio-cultural differences among the people which are also precursor to lower economic growth in the southern regions. A direct road / rail connectivity between Shariatpur and Chandpur will provide a cheaper alternative means of transportation which will reduce traffic pressure on Dhaka by diverting the traffic.

1.2 Government's visions toward development

Bangladesh is a developing country. It is being developed gradually. For its gradual development, the Government has fixed some visions. The Government's first vision, "Vision 2021" was initiated in the year 2008 targeting the 50 years of the independence. Vision 2021 focused on participatory democracy, efficient and honest governance, which, drawing upon a vibrant private sector, will transform Bangladesh into a major commercial hub through the creation of a competitive economic environment, sustained by a well-trained skilled workforce. The tasks for achieving the goals of

Vision 2021 were articulated by the Government through the two five-year plans namely the Sixth Five Year Plan (2011-2015) and the Seventh Five Year Plan (2016-2020). While the Seventh Five Year Plan continues to be implemented with tremendous successes in the economic and social sectors, the Government revealed their Vision 2041, a long-term perspective plan to make Bangladesh a peaceful, prosperous, happy and developed nation comparable with the developed world.

Vision 2041 seeks to eliminate extreme poverty and reach upper middle-income country status by 2030 and high-income country status around 2041 with zero poverty. In order to transform Bangladesh into a high-income country as per Vision 2041, the Government has clearly identified the responsibilities of the ministries and agencies in line with the global commitment of achieving the Sustainable Development Goals (SDGs). SDGs, that included 17 Goals and 169 Targets, will have a relationship with the Vision 2041. Achieving the SDGs by 2030 will ease the successful realization of Vision 2041.

1.3 Development of BBA's Master Plan

Given the importance of transport in economic and social development in general, and in supporting productive activities in particular, the Government places transport at the core of its development strategies, with the formulation of sector policies underpinned by substantial investments in infrastructure and services. Till now, the projects taken by the BBA were assigned through the Government's initiatives included in the development plans. Nevertheless, the BBA has no Master Plan. In order to make the "Vision 2041" successful, as well as to cope up with the future demand in the transport sector beyond 2041 considering a developed country scenario, the BBA would like to develop its own Master Plan for the next 30 years (2020-2050).

2. Objectives of the Study

BBA seeks to engage a consulting firm (the Consultant) to undertake a Master Plan Study to develop a Master Plan for BBA in the transport sector for the years 2020-2050. The Master Plan will be formulated based on a comprehensive analysis of the future transport demand, considering the scenario of a High-Income Country by 2041, as well as focusing on the mandates of the BBA (as mentioned in the first paragraph of the Introduction). The study will emphasize on not only the several sustainable transport modes inside the major cities but also identify the missing links for the improvement of the national transport network to meet the future demand. The primary objectives of the Master Plan Study are as follows:

- i. Guide the future development of the transport network in the country through coordinated planning and operation of projects and programs;
- ii. Promote sub-regional economic cooperation/agglomeration and utilization of existing transport system for more efficient connectivity between the industrial/production areas, major cities, and rural areas;
- iii. Identifying a time bound priority-based list of projects with estimated present and future cost, including assessment of potential source of funding.
- iv. Pre-feasibility study of the high priority projects that must be undertaken by the next 10 years.
- v. Identifying the scope for the development of a Specification for Bridges and Highways in Bangladesh.
- vi. Enhance the capacity of BBA to use various transport planning tools and techniques, especially those employing new technology, through training workshops;
- vii. Establish a sound policy framework to ensure the sustainability of the current and future investments of BBA in the sector.

- viii. Carry out Feasibility Study on the highest priority projects such as bridge across the Lower Meghna along Shariatpur- Chandpur corridor.

3. Scope of Works

3.1 Developing BBA's Master Plan

The scope of works for the Consultant includes but not limited to the followings:

- 1) Reviewing the national and local level transportation sector related strategic plan, such as Vision-2041, Five year plan, SDG and related policies and regulations, feasibility/pre-feasibility study reports, master plans of different relevant organizations and other pertinent documents necessary for the development of the Master Plan. The consultant shall collect and review all existing data relevant to the project, including, but not limited to, the following:
 - Available social data (distribution and disaggregation of population employment levels and distribution, etc)
 - Available economic data (GDP, income levels, etc)
 - Available trade data (type, volume and value of imports/exports, etc)
 - Available Development/Master Plans
 - Available safety-related statistics (annual number of road traffic accidents, injuries and fatalities, etc)
 - Available traffic counts, data and statistics (automatic and classified traffic counts, truck weighing stations, truck and taxi licensing, etc)
 - Available data and information about transport infrastructure (networks, statistics, costs etc.)
 - Available studies and plans for individual transport modes.
 - Legislation and decrees dealing with transport, including legislation relevant to private sector investments and other related matters.
 - Existing transport regulations (licensing procedures for intercity and international freight and passengers transport etc).
 - Any other data of relevance to this project.

BBA shall facilitate contact between the Consultant and concerned agencies those having available information.

- 2) Conducting an inventory of the existing transport network for not only the major cities but also for whole Bangladesh. The inventory includes but not limited to spatial distribution, physical infrastructures with their existing condition, traffic demand (passenger and freight) served operation and maintenance (O&M) condition.
- 3) Collecting new data, review of the existing data, statistics, plans and studies, the Consultant shall identify gaps and/or deficiencies in terms of the quality and quantity of available information. Field surveys will be undertaken in one neutral season/representative period for a 2-month period. The field surveys and roadside interviews will be conducted for different category of vehicles in different potential sites. All categories of light vehicles shall be interviewed. In parallel, at the same sites, 24 hrs traffic counts should be conducted; while the Consultant shall ensure that the collected sample will be analysed in a weekly basis. The results of the field surveys will be required for updating data, building a database, improving reliability and ensuring data consistency. The final number of survey locations will be selected during the Inception Phase.
- 4) Preparation of a National Road Transport Model as a tool for the enhancement of transport policy-making capacity. The model should be applicable to light and heavy traffic and shall be

developed using the traditional 4-stage type. The Transport Model shall be initially developed to represent a Base Year of 2020 along with five years forecasting. The transport model shall be used as the basis for problem analysis, for appraisal of the overall Transport Plan, and for testing of individual project proposals as deemed appropriate. The transport model shall be prepared and forecast years for 2020, 2030 and 2050. The modelling output shall be AADT or similar, with expansion factors included to outline how the modelled period can be expanded to generate annual volumes.

- 5) Identifying critical bottlenecks in transport infrastructure development in terms of, among others, quality, adequacy, efficiency, accessibility, safety, and environmental and social aspects, as well as emerging issues and challenges brought about by rapid urbanization, population growth, etc. The Consultant shall undertake the estimation of future traffic demands and patterns based on the different parameters for each type of traffic (passengers and freight). In particular, the Consultant shall forecast of passenger traffic on the well-established principles and methods pertaining to demographic and socio-economic parameters such as population, workforce, changes in travel trends, land use, car ownership, physical and operational characteristics of the transport infrastructure (including the potential impacts of new technologies), GDP, trade exports/imports etc. In all cases, the Consultant shall consider different growth scenarios for each type of traffic (passengers and freight) to enable the determination of a range of possible future outcomes.
- 6) Identifying probable alignments/routes of the potential projects for the years 2020-2050 that will fall under the jurisdiction of the BBA after analyzing the forecasted passenger and freight movements, i.e., through origin-destination survey, etc., and formulate relevant baseline indicators, e.g., transport cost/shipping cost, travel time, environmental impact, etc. The alignments/routes of the potential projects should be submitted on Geographic Information Systems (GIS) based maps overlaying the proposed projects on the existing transport network. The Consultant shall identify and describe an adequate number of significantly different transport scenarios and recommend, in sufficient detail, practical transport solutions/alternatives, and combinations thereof, for the development of the national transport system in the short, medium and long terms. Such solutions and alternatives shall take into consideration of the following aspects and appropriate combinations thereof:
 - Transport related objectives, targets and international commitments (e.g. road traffic accidents, emissions and energy reduction etc.) set out by the Government of Bangladesh.
 - Transport Infrastructure Investments (e.g. to achieve maximum integration of transportation modes and networks, to meet future travel demand).
 - Transport Policy Decisions (e.g. regulatory alternatives for managing and controlling travel demand (private car demand in particular), institutional reforms etc.). This could vary from do-nothing to introducing higher fuel taxes to introducing road user charges to establishing transport authority alliances;
 - Operational Interventions (e.g. managing traffic on intercity roads through traffic management tools versus implementation of Intelligent Traffic System)
 - In any case, the proposed transport solutions/alternatives shall be presented to the BBA for initial approval prior to detailed evaluation.
- 7) Analyze, plan, and assess the implementation priority of identified projects. A time bound priority-based list of projects should be prepared with estimated present and future cost including assessment of potential source of funding. The priorities should be categorized for short, medium- and long-term planning. Assessing the projects impact on national GDP growth is also essential.

- 8) Identifying the issues for synchronization with the Revised Strategic Transport Plan (STP) of Dhaka city as well as synchronization with other projects (already undertaken or under planning by different Government agencies) in different locations of Bangladesh.
- 9) In line with the vision of “Digital Bangladesh”, identifying how the information technology can be used for the smooth operation and maintenance of the existing as well as future projects. For example, introducing vision and sensor based Artificial Intelligence (AI) to detect damages in the bridges/viaducts, vibration and vision based health monitoring system, AI based vehicle tracking and weighing system, vision based verification of toll collection system etc.
- 10) Identifying the scope for the preparation of “Specification for Bridges and Highways in Bangladesh” and “Bridge Operation and Maintenance Manual”.
- 11) Assess the critical path for successful implementation of all of the projects, taking into consideration technical, fiscal, socioeconomic, environmental, regulatory and legal aspects, and institutional and right-of-way (ROW) matters.
- 12) Conduct Value Engineering/Value Analysis (VE/VA) on the different connectivity modes.
- 13) Conduct preliminary assessment of the impact of implementing the Master Plan in terms of, among others, the transport sector indicators identified, e.g., transport cost/shipping cost, travel time, environmental impact, etc, as well as financial and economic viability.
The Consultant shall define an evaluation framework/grid for a comprehensive, consistent and transparent evaluation of the identified solutions/alternatives. The framework shall be based on criteria such as the following with appropriate weight being assigned to each criterion:
 - Social impacts (improvements to mobility and accessibility)
 - Economic impacts (Cost-Benefit Analysis, Net Present Value, reduction of travel time and travel cost to travelers and cargo, etc)
 - Financial impacts (life-cycle cost of the scenario, including construction, operation and maintenance costs, Internal Rate of Return IRR etc)
 - Safety impacts (reduction of road traffic accidents etc)
 - Environmental impacts (reductions of vehicle emissions and energy consumption etc)
 - Public Private Partnerships (potential opportunities for private sector participation in the transport infrastructure and services)
 - Any other relevant and sufficiently significant important criteria
- 14) Undertake intensive consultation with relevant stakeholders throughout the Study.
- 15) After identifying the high priority transport infrastructure projects for the next 30 years with corresponding timing and resource requirements, conducting the studies on the identified high priority projects which includes but not limited to the followings:
 - i) Carry out traffic counts for the project location as well as Origin-Destination (OD) surveys (one station per project) to obtain information on the current pattern and volume of vehicle and commodity movements. Axle-load surveys (one station per project road) will also be carried out to determine the magnitude of vehicle overloading on the road sections where the project located, and for the purpose of pavement design.
 - ii) Assess the possibility of traffic diversion between transport modes and from other road routes, taking into account transport costs and other relevant factors.

- iii) Establish traffic growth models for each representative vehicle type on the basis of population changes and economic activities in the project influenced areas, and estimate expected new traffic to be generated by the proposed road improvements.
- iv) Carry out geotechnical surveys, topographical surveys, hydro-morphological surveys, drainage surveys and archeological surveys along the possible alignments.
- v) Provide preliminary assessment for the requirement of land and structures acquisition.
- vi) Estimate overall construction costs as well as maintenance costs (routine and periodic maintenance separately) of the project by means of international standard ratios.
- vii) Carry out preliminary economic evaluation (30-year benefit stream period) of the project by calculating the net present value (NPV) and the economic internal rate of return (EIRR) based on expected benefits and costs. The choice between mutually exclusive improvement options will be based on the NPV method at a discount rate of 12 percent.
- viii) Undertake initial environmental impact examination and preparing the scope of the environmental impact assessment required as part of subsequent project preparation. The examination will be carried out in accordance with the Government's procedures and guidelines.
- ix) Undertake an initial social impact analysis, in accordance with the Government's procedures and guidelines, including preparation of an outline of resettlement action plan.
- x) Taking into account the preliminary economic evaluation, social benefits, and environmental impact, ranking the suitable improvement options for each project. Present the results in a format showing project name and location, length (in km), ranking of improvement options, present daily motorized traffic, cost of civil works, NPV, and EIRR.
- xi) The consultants will, in cooperation with the district authorities, conduct public meetings and dialogue with the communities in the project areas to obtain feedback on the proposed project components, and the social and environmental mitigation measures envisaged. Summarize the results of the dialogue and the action plans in the report.
- xii) Integrating all project components, formulate an investment project presenting details in the format acceptable to the development partners, and prepare the logical framework.

16) Developing Database

The Consultant shall develop a GIS based integrated database and maps for all of the identified projects where all the data for traffic, geotechnical, topographical, hydro-morphological, drainage, archeological, environmental, social impacts etc. will be available. Besides, the database should be prepared in editable Microsoft Excel format also. Furthermore, the database in either format shall be developed in such a manner that enables BBA to update the database periodically in future.

17) Training/Workshop

The Consultant shall conduct a training/workshop every quarterly in order to train/enable BBA Personnel and its counterparts (at least 20 personnel) on the various planning tools, techniques and skill sets employed in the conduct of the Study, including database management. The Consultant, after discussion with BBA, shall identify some developed countries, their emergence and insight about the process of their development. A study tour/learning visit (comprising of 10 BBA personnel) in those countries shall be conducted to expose the countries development, transport projects taken by those countries to boost up their economy, as well as training on maintenance of the total transportation system of those countries.

3.2 Feasibility study for Construction of Bridges over the river Meghna on Shariatpur-Chandpur road and Gajaria-Munshiganj road

There is no direct road or rail connectivity between the south-west part (Khulna, Barisal, Madaripur, Shariatpur) and the south-east part (Noakhali, Cumilla, Chattogram) of Bangladesh. Road communications between these two parts are continuing through Dhaka which imposes extra traffic load on Dhaka city and contributes to traffic congestion in Dhaka metropolitan area. In addition, the south-west part is deprived of economic development due to the lack of direct connectivity with the main sea port-city Chattogram.

3.2.2 The government has initiated many development activities in these two areas of Bangladesh such as the Sonadia deep sea port, Rampal power plant, a cantonment at Patuakhali, Karnaphuli Tunnel, deep sea port at Matarbari, Cox's Bazar etc. A direct road and/or rail connectivity between these two developing zones of Bangladesh will further enhance the social-economic progress of these areas as well as of overall of Bangladesh. A rapid socio-economic growth can be expected in the south-west part of the country if development connectivity is established between the above mentioned regions.

3.2.3 A direct transportation link of south-west part with the main sea port Chattogram will provide a scope for developing economic zones in the Shariatpur, Madaripur and nearby areas. The vision of uniform economic growth throughout the country cannot be realized without such connectivity. After completion of the construction of Padma Bridge, it will be the only the link remained to connect the south-west region with eastern, north-eastern and the Chattogram region of Bangladesh. For sustainable development an alternate direct link between these zones is essential. Connectivity of Shariatpur and Chandpur was one the considered locations during the feasibility of Padma Bridge.

3.2.4 Feasibility Study to be conducted for bridges across the Meghna River along (i) Shariatpur-Chandpur and (ii) Munshiganj-Gajaria corridors. The Feasibility Study will be conducted to find technical, economic, social and financial viability of the bridges. The study will emphasise on not only the bridges but also identify other options for the improvement of the national transport network to meet the future demand. The primary objectives of the Feasibility Study are as follows:

- i. Find the suitable locations of the bridges;
- ii. Identify the types of bridge or tunnel suitable for the crossings;
- iii. Assess socio-economic status of the area;
- vi. Evaluate technical, social, economic and financial viability of the projects;
- v. Recommend the mode of procurement;
- vi. Carry out preliminary design of the bridges and associated facilities.
- vii. Estimate Cost

3.2.5 The scope of work for the feasibility study includes but not limited to the followings:

(i) Review available traffic count data and other studies, if any, and carry out supplementary traffic counts of the bridges and roads under study, as well as supplementary Origin-Destination (OD) surveys (one station per project bridge) to obtain information on the current pattern and volume of vehicle and commodity movements. Axle-load surveys (one station per project road) will also be carried out to determine the magnitude of vehicle overloading on the road sections where the project bridge located, and for the purpose of pavement design.

(ii) Assess the possibility of traffic diversion between transport modes and from other road routes, taking into account transport costs and other relevant factors.

(iii) Establish traffic growth models for each representative vehicle type on the basis of population changes and economic activities in the project influence areas, and estimate expected new traffic to be generated by the proposed road improvements.

(iv) Review (a) the structure of the road transport industry covering both the passenger and freight subsectors; (b) the extent of competition within each subsector; (c) the structure of ownership within each subsector; (d) the extent of controls on entry into each subsector; and (e) the extent of regulation of tariffs and fares. Traffic forecasting according to the vehicle classification through necessary surveys and models.

(v) Review the available data and information and carry out detailed geotechnical investigation to identify the appropriate pile depth, topographical surveys, archeological surveys, morphological study, including alignment plans, longitudinal sections, cross-sections, and drainage surveys; and establish horizontal control points, benchmarks and reference as required. Assess and cost any right-of-way requirements for the project road sections. Investigate the seismic characteristics of the area to assess the potential earthquake hazards to the infrastructure.

(vi) To undertake investigations of the existing pavement structure, if necessary, including roughness assessments; and identify the most economical way of improving it.

(vii) Study the availability of bridge construction materials, in particular stone aggregates, taking into account the demand from ongoing projects and projects planned for implementation in the same time frame as the proposed project, and propose how to address any shortfall of supply.

(viii) Study existing bridge and roadside and cross-section drainage facilities, and following an analysis of rainfall and flood records supplemented by detailed field investigations, establish the adequacy of embankment heights and pavement levels, as well as side and run-off ditches.

(ix) Investigate all bridges and culverts of the study area to determine their condition, adequacy of waterway openings, load capacity and widths, anticipated future serviceability, and general extent of repairs and strengthening needed. In case of replacement or new construction of bridges, carry out subsoil investigations considering long-term flooding cycles.

(xi) Estimate maintenance costs (routine and periodic maintenance separately) on new bridges for economic evaluation. Also focusing on the maintenance and improvement of the existing bridges and their economic evaluation.

(xi) Based on the results of the engineering investigations establish the design criteria, prepare preliminary designs, construction quantities, and overall construction costs for each bridge portion. The costs should be broken down into foreign exchange, local currency, and tax components. Indicate direct and indirect foreign exchange separately. Also, prepare typical cross-section and bridge drawings, and location plans in 1:50,000 scale.

(xii) Calculate economic vehicle operating costs for each homogeneous road section (including and excluding passenger time savings) with and without the proposed improvements, based on estimated changes in road surface roughness and gradients. Quantify the benefits for each road section and for each improvement option, divided into savings in vehicle operating costs, changes in road and ferry maintenance and operating expenditures, and other quantifiable benefits.

(xiii) Carry out an economic evaluation (30-year benefit stream period) of the alternative improvement options for each road section and project road by calculating the net present value

(NPV) and the economic internal rate of return (EIRR) based on benefits and costs, including those for civil works, rights-of-way, detailed engineering, and construction supervision. Carry out sensitivity analysis of the different parameters identified. The choice between mutually exclusive improvement options will be based on the NPV method at a discount rate of 12 percent. Financial evaluation will also be carried out.

(xiv) Undertake an initial environmental examinations (IEE) for mitigating environmental impacts of the selected options, and for preparing the scope of the environmental impact assessment required as part of subsequent project preparation; the examination will be carried out in accordance with the Government's procedures and guidelines, in sufficient detail for the cost of environmental mitigation measures to be included in the economic and financial analysis. EIA to be carried out as per ToR approved by the Department of Environment.

(xv) Undertake an initial social impact analysis, in accordance with the Government's procedures and guidelines, including preparation of an outline resettlement action plan that will identify people who might be affected by the medium-term project, and who thus might need to be resettled. Estimate land, resettlement, and other social impact costs in sufficient detail for the economic and financial analysis.

(xvi) Estimate the expected distribution of the project net benefits, based on the project economic analysis, for (i) users of freight transport, (ii) users of passenger transport, (iii) vehicle owners, (iv) labor, (v) the government, (vi) the economy in general, and where appropriate (vii) lenders. Estimate the number of poor people, and the number of extremely poor people, who will benefit from the project by estimating (i) the number and proportion of poor and extremely poor who make up the population of the project area; (ii) the percentage of poor and extremely poor who use road transportation services; and (iii) the proportion of poor and extremely poor who make up each category of beneficiaries.

(xvii) Taking into account the economic evaluation, social benefits, and environmental impact, recommend the most suitable improvement option for each project road section. Present the results in a format showing road section name, length (in km), improvement level, present daily motorized traffic, cost of civil works, NPV, and EIRR.

(xviii) Undertake sensitivity tests for the recommended improvements by appropriately varying benefits, project costs, maintenance costs (and their implications for roughness in the with and without project situations related to EIRR), and the implementation period. Describe the major risks that the Project will be exposed to and the measures proposed to mitigate these risks.

(xix) The consultants will, in cooperation with the district authorities, conduct public meetings and dialogue with the communities in the project areas to obtain feedback on the proposed project components, and the social and environmental mitigation measures envisaged. Summarize the results of the dialogue and the action plans in the report.

(XX) Determination of appropriate construction method, configuration and technology. To formulate proper procurement strategy that will result in early construction of the bridge. Also to prepare implementation and O&M plan.

(xxi) Integrating all project components, formulate an investment project presenting details in the format acceptable to all and prepare the logical framework.

4. Duration of the Study and Deliverables

The duration of the study will be 24 months. The consultants will prepare the following reports and documents in the form and number indicated therein for the Bangladesh Bridge Authority (BBA). All reports will be in English.

- (i) **Inception Report:** The Inception Report will (a) incorporate detail action plan and methodology/approach to be adopted in the Study, (b) summarize initial findings, and (c) highlight problems encountered or anticipated, and recommend solutions to them. The report should be submitted within 1.5 months after the commencement of the services, in the form of electronic document (Microsoft Word/Latex and PDF format) and ten hard copies. The Consultant will submit to the BBA a detailed Transport Survey Plan including methodological approach for surveys execution.
- (ii) **Monthly Progress Reports:** Brief reports, will be based on the inception report implementation. The reports will identify matters requiring the attention of BBA. To be submitted monthly i.e. from 1st month up to 23rd month, in the form of electronic document (Microsoft Word/Latex and PDF format) and three hard copies.
- (iii) **Draft Study Report for Master Plan:** Identifies the high priority projects in short-term planning (for years 2020-2030). Provides substantial progress under the scope of the studies for each of the identified high priority projects. Report to be submitted within 6 months after the commencement of the services, in the form of electronic document (Microsoft Word/Latex and PDF format) and five hard copies. A multimedia presentation on the Draft Pre-Feasibility Report is essential.
- (iv) **Details Study Report for Master Plan:** Provides complete pre-feasibility study reports for each of the identified high priority projects. To be submitted within 12 months after the commencement of the services, in the form of electronic document (Microsoft Word/Latex and PDF format) and ten hard copies.
- (v) **Interim Report:** Identifies the priority-based projects to be taken as mid and long-term planning (for years 2031-2050). Provides the probable alignments/routes of the projects in the GIS map. To be submitted within 18 months after the commencement of the services, in the form of electronic document (Microsoft Word/Latex and PDF format) and five hard copies.
- (vi) **Draft Final Report:** Provides complete study reports of the mid and long-term projects addressing all the aspects stated in the scope of work. To be submitted within 20 months after the commencement of the services, in the form of electronic document (Microsoft Word/Latex and PDF format) and five hard copies. The Final Report shall contain Master plan and Feasibility Report for 02 Bridges over river Meghna. The feasibility report should be self-content complete.
- (vii) **Final Report:** This report should be submitted after addressing all the issues with concerned stake holders as well recommendations from BBA. This report will be a complete document for BBA Master Plan summarizing all the previous information provided in different reports for short, medium, and long-term priority projects. An executive summary (maximum 5 pages) with this report is essential. To be submitted within 24 months after the commencement of the services, in the form of electronic document (Microsoft Word/Latex and PDF format) and ten hard copies.

Milestone/Month	4	8	12	16	20	24
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<i>Inception Report</i>	■					
<i>Interim</i>	■					
<i>Draft Final Report</i>	■					
<i>Final Report:</i>	■					

5. Required Experts and their eligibility

The following Tables presents the required experts, their input in person-months and their eligibility (need to update with estimate).

International/Expatriate Key Person		Local/National Key Person	
<i>Name of Positions</i>	<i>Man-month</i>	<i>Name of Positions</i>	<i>Man-month</i>
Team Leader	20	Deputy Team Leader	24
Transport Modeller	20	Structural Engineer (2 nos)	25
Transport Planner	20	Geo-Technical Engineer (2nos)	27
Structural Engineer	16	Transport Economist (2nos)	27
Geo-technical Engineer	18	Traffic Engineer (3nos)	35
Transport Economist	22	Transport Planner (2nos)	30
Hydrologist and Morphologist	23	Highway Engineer (2nos)	35
Highway Engineer	20	Electrical Engineer	15
Electrical Engineer	05	Survey Expert (2nos)	27
Survey Expert	21	Hydrologist and Morphologist Specialist (2nos)	32
Safeguard Expert	18	Environmental Expert (2nos)	33
Environmental Expert	20	Resettlement Specialist (2nos)	33
Risk Management Experts	15	Risk Management	24
		Contract Expert	22
Transport Demand Modeller	10	Construction Expert	16
Transport Expert (2 nos)	40	Financial Specialist	22
Road and Bridge Engineer (2 nos)	20	Statistician / Data Analyst (2 nos)	30
Contract/Procurement Expert	13	Land Acquisition planner (2 nos)	27
Construction Expert	10	Architect	16
Financial Specialist	16	Cost Estimator (2 nos)	24
Statistician / Data Analyst	16	GIS Expert (2 nos)	24
Civil Structural Engineer	12	Urban Planner (2 nos)	24
GIS expert	5		
Geotechnical Engineer	12		
Cost Estimator	18		
Urban Planner	7		
Total	323		572

6. Consultant Eligibility Criteria

The consultant's eligibility criteria are summarized in the following table:

Sl. No.	Key personnel	Education (minimum)	Professional experience (min. years)	Key/ Non-Key	Key Tasks and Specific Experience
	International				

1	Team Leader/Transport Specialist	Bachelor/Masters in Transportation Engineering or Equivalent	20 years	Key	Preferably 10 years international experience in Design/Construction Supervision/Management as Team Leader/Project Manager in planning, design and construction of Bridge or any transport infrastructure. He/She should have been responsible for planning, project preparation, and design of projects Lead the team, review the quality of deliverables, and lead the commercial and PPP transaction structuring.
2	Transport Planners (2)	Bachelor/Masters in Transportation or Equivalent	15 years	Key	Preferably 5 years international experience in transport planning in feasibility/design of Bridge or any transport infrastructure. Besides, Experience in organizing traffic surveys and prepare traffic demand forecasts, prepare sub-project cost estimates under the direction of traffic engineering resources, and prepare economic and financial data for each of the proposed sub-projects.
3	Transport Demand Modeller	Bachelor/Masters in Transportation Engineering	15 years	Key	Preferably 5 years Experience as transport modeller in development of multimodal freight and passengers transport models. Experience with preparation of national level transport multimodal master plan for passengers and freight.
4	Structural Engineer	BSc in Civil Post-Graduate in Structural engineering	15 years		<ul style="list-style-type: none"> • Preferably 5 years international experience as Bridge/other Transport infrastructure design engineer in planning, design and construction. The major Task & responsibility of Structural Engineer will be: • Key support to Team Leader with project QA management. • Design of all structural components of the project including initial costing. • Preparation/review of technical specification for structural design. • Apply knowledge of construction methods. • Project reporting and

					presentations.
5	Geotechnical Engineer	Graduate in Civil Engineering with Masters Geotechnical Engineering	15 years		<ul style="list-style-type: none"> • Preferably 10 years international experience as Geotechnical engineering. The major Task & responsibility of Geotechnical Engineer will be: • Ground Investigation-procurement, supervision. • Scheme design of bridge & large structure foundations incl. initial costing. • Detailed design of bridge and large structure foundation. • Preparation/review of technical specification. • Foundation construction methods. • Foundation design-including piling and foundations in soft soils and seismic zones. • Ship impact protection devices and measures.
6	Hydrologist	Bachelor /Masters in Hydrology or Equivalent	15 years		<p>Preferably 10 years experience as Geotechnical engineering Experience in bridge hydrological data analysis of long major bridges. The major Task & responsibility of Geotechnical Engineer will be:</p> <ul style="list-style-type: none"> • Ground Investigation-procurement, supervision. • Scheme design of bridge & large structure foundations incl. initial costing. • Detailed design of bridge and large structure foundation. • Preparation/review of technical specification for the Bridge or other infrastructure. • Foundation construction methods. • Foundation design-including piling and foundations in soft soils and seismic zones.
7	Highway Engineer	Bachelor/Masters in civil engineering	15 years		Preferably 10 years experience as Highway Engineer in Road design and preparing drawings etc

8	Electrical Engineer	Bachelor/Masters in Electrical Engineering	15 years		<p>Preferably 5 years international experience as Electrical engineer in planning, design and construction of Bridge or transport infrastructure. The major Task & responsibility of Electrical Engineer will be:</p> <ul style="list-style-type: none"> • Key support to Team Leader with project QA management. • Design of Electrical components Project including initial costing. • Define power connections to local network and substation requirements. • Liaise and co-ordinate with other local authorities.
9	Survey Expert	Bachelor/Masters in civil Engineering or equivalent	8 years		<p>Preferably 5 years international experience as Experience in organizing traffic surveys, traffic modelling and prepare traffic demand forecasts</p>
10	Transport Economist	Bachelor/Masters in Transport Economies or Equivalent	10 years	Key	<p>Preferably 5 years international experience as transport economist in feasibility/design of transport infrastructure. Experience in projects for preparation of large-scale transport infrastructure projects including feasibility studies and cost benefit analysis and prepare economic and financial data for each of the proposed sub-projects.</p>
11	Environmental Engineer	Bachelor/Masters in Civil/Environmental Engineering or its equivalent	15 Years	Key	<p>Preferably 5 years international experience as Environmental expert in major infrastructure projects. The major Task & responsibility of Environmental Engineer will be:</p> <ul style="list-style-type: none"> • Identification of activities generating environmental impacts. • Develop EIA ToR. • Undertake project EIA to GoB requirement. • Develop EMP including implementation plan and budget.

12	Resettlement/Social Expert	Bachelor/Masters in social science	15 years		Preferably 5 years experience international experience preparation of Resettlement Action Plan.
13	Costing Engineer	Bachelor/Masters in Civil Engineering	15 Years	Key	Preferably 5 years international experience as Costing Engineering in Bridge or other transport infrastructure. The major Task & responsibility of Costing Engineer will be: <ul style="list-style-type: none"> • Prepare BOQ for each work section and each. • Prepare comprehensive quantities schedule and cost estimates • Develop and prepare unit rates and costs. • Cost sensitivity analyses. • Project expenditure profiles.
14	Architect	Graduate in Architecture	15 Years	Key	Preferably 5 years international experience as preparing the architecture and physical plan of Bridge or transport infrastructure considering the traffic flow, existing utility services and land availability of the site to make it aesthetically pleasant.
15	Urban Planner	Bachelor/Masters in Urban Planning	15 years	Key	Preferably 5 years experience in Urban Planner in Major Bridge/Road/other transport infrastructure project.
16	Financial Expert	Post-Graduate/ MBA /CA	15 years	Key	Preferably 5 years international experience as Financial Expert in major Infrastructure Projects. The major Task & responsibility of Financial Expert will be: <ul style="list-style-type: none"> • Financial Modelling for the project (FIRR)
17	Statistician / Data Analyst	Bachelor in Statistics or any relevant degree	10 years		Preferably 5 years international experience as data analyst in transport infrastructure project.
18	Construction Expert	Bachelor/Masters in civil engineering	15 years	Key	Preferably 5 years experience as preparing construction method in Major Bridge/Road/other transport infrastructure project.

	National				
1	Deputy Team Leader	Bachelor in Civil Engineering or Equivalent	15 years	Key	<p>Preferably 10 years experience as Deputy Team Leader or Project in Charge in Major Bridge/road project, which will include in feasibility study, planning, designing and construction supervision project.</p> <ul style="list-style-type: none"> • Assist Team Leader for overall management, Control Administration, Technical and Financial Management. • Organize and mobilize the local teams for topographical survey, Geotechnical Investigation, detailed environmental impact assessment resettlement action plan, land acquisition plan and bridge design preparation of cost estimate. • Co-ordination and liaison with field teams. • Taking part in preparation of Inception Report, Monthly Progress Report and Draft & Final Feasibility Report. • Review all reports and take part in optimization of length, location and alignment of the bridges.
2	Transport Planner	Bachelor in Transportation Engineering	10 years		Preferably 5 years experience in data/market analysis, demand model development and preparation of public transport plans, etc.
3	Transport Economist	Bachelor /Masters in Transport Economies or Equivalent	10 years	Key	Preferably 5 years experience as transport economist in feasibility/design of major transport infrastructure project.
4	Traffic Engineer	Bachelor in Transportation Engineering	10 years	Key	Preferably 5 years experience in traffic engineering, traffic survey and data analysis experience, etc.
5	Bridge Engineer	Bachelor in Civil Engineering or higher degree	10 years	Key	Having experience in bridge and viaduct design and planning, road planning, etc.
6	Cost Estimate Engineer	Bachelor in Civil Engineering	10 years	Key	Preferably 5 years experience in cost estimation of major bridge, expressway projects.

7	Civil Engineer	Bachelor in Civil Engineering	10 years	Key	Preferably 5 years experience in major bridge or expressway projects.
8	Geotechnical Engineer	Bachelor in Civil Engineering	10 years	Key	Preferably 5 years experience as Geotechnical Engineer in Major Bridge/Road Project: <ul style="list-style-type: none"> • Scheme design of bridge & large structure foundations incl. initial costing. • Detailed design of bridge and large structure foundation. • Foundation construction methods, including marine construction. • Foundation design-including piling and foundations in soft soils and seismic zones. • Ship impact protection devices and measures.
9	Social/Resettlement/ Safeguard Expert	Bachelor in Social Science	10 years	Key	Preferably 5 years experience in carrying out consultations with affected persons, ensuring compensation, rehabilitation, and income restoration measures are done prior to construction, during RAP implementation, reports produced by the RPI's NGO and to provide guidance to the NGOs on specific activities, as required. During construction stage.
10	Environmental Expert	Bachelor in Environmental Engineering	10 years	Key	Preferably 10 years experience in Environmental Engineering. The major Task & responsibility of Environmental Expert will be: <ul style="list-style-type: none"> • Identification of activities generating environmental impacts. • Develop EIA ToR. • Undertake project EIA to GoB requirement. • Develop EMP including implementation plan and budget.
11	Land Acquisition Planner	BSc. in Social Studies or Equivalent	10 years	Key	Preferably 5 years experience as preparing Land Acquisition Plan in major transport infrastructure project. The major Task & responsibility of Land Acquisition Planner will be Prepare Comprehensive LAP
12	Architect	Graduate in Architecture	10 years	Key	Preferably 5 years experience as Architect in major transport infrastructure project. The major

					Task & responsibility of Architect Engineer will be: To prepare the architecture and physical plan of Bridge or transport infrastructure considering the traffic flow, existing utility services and land availability of the site to make it aesthetically pleasant.
13	Electrical Engineer	BSc in Civil Engineering or transport Engineering	15 years	Key	Preferably 5 years experience as Electrical Engineer in bridge/other transport infrastructure project, which will include in feasibility study, planning, designing project.
14	Urban Planner	Bachelor in Urban Planning or its equivalent	10 years	Key	Preferably 5 years experience as Urban Designer in Major Bridge/Road project.
15	Hydrologist and Morphologist Specialist	Bachelor in Civil Engineering or its equivalent	10 years	Key	Preferably 05 years experience as Hydrologist and Morphologist Specialist of Major Bridge/Road project: <ul style="list-style-type: none"> • To carry out all Hydrological and Morphological Surveys and Analyses to facilitate the fixation of alignment and preparation of design. • To identify catchment areas which administrate the supply and drainage of water in and around the Tunnel construction area; • To identify hydrological and morphological characteristics of the rivers and canals in and around the construction sites.
16	GIS Expert	Bachelor in Civil Engineer or any relevant field	10 years	Key	Preferably 05 years experience as GIS Specialist in Major Bridge/Road/other major transport infrastructure project.
	Support Staff				
1	Junior Engineer-Topo	Diploma in Civil Engineering or its equivalent	10 years		Minimum 05 years experience in survey works used by Total Station of Major Bridge/Road project
2	Junior Engineer-Geotech	Diploma in Civil Engineering or its equivalent	10 years		Minimum 05 years experience as geo-technical engineer of Major Bridge/Road project
3	Junior Engineer-Traffic	Diploma in Civil Engineering or its	10 years		Minimum 05 years experience in Traffic survey of Major

		equivalent			Bridge/Road project
4	CAD Operator	HSC Pass	10 years		Preferably 02 years experience as CAD Operator of Major Bridge/Road project