


**DRAFT**

Terms of Reference

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Detailed Project Report for the  
[CITY] Bus Rapid Transit System

Government of 

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# 1. Introduction

The Government of [REDACTED] (GO [REDACTED]) intends to implement a high quality bus rapid transit (BRT) system as a key component of a comprehensive effort to expand the use of sustainable transport. GO [REDACTED] hereby seeks proposals from interested consultants to carry out detailed service planning and infrastructure design for the [CITY] BRT system. The final deliverable from the study is a detailed project report that GO [REDACTED] will use to seek funding from domestic and/or international sources.

## 1.1. Background

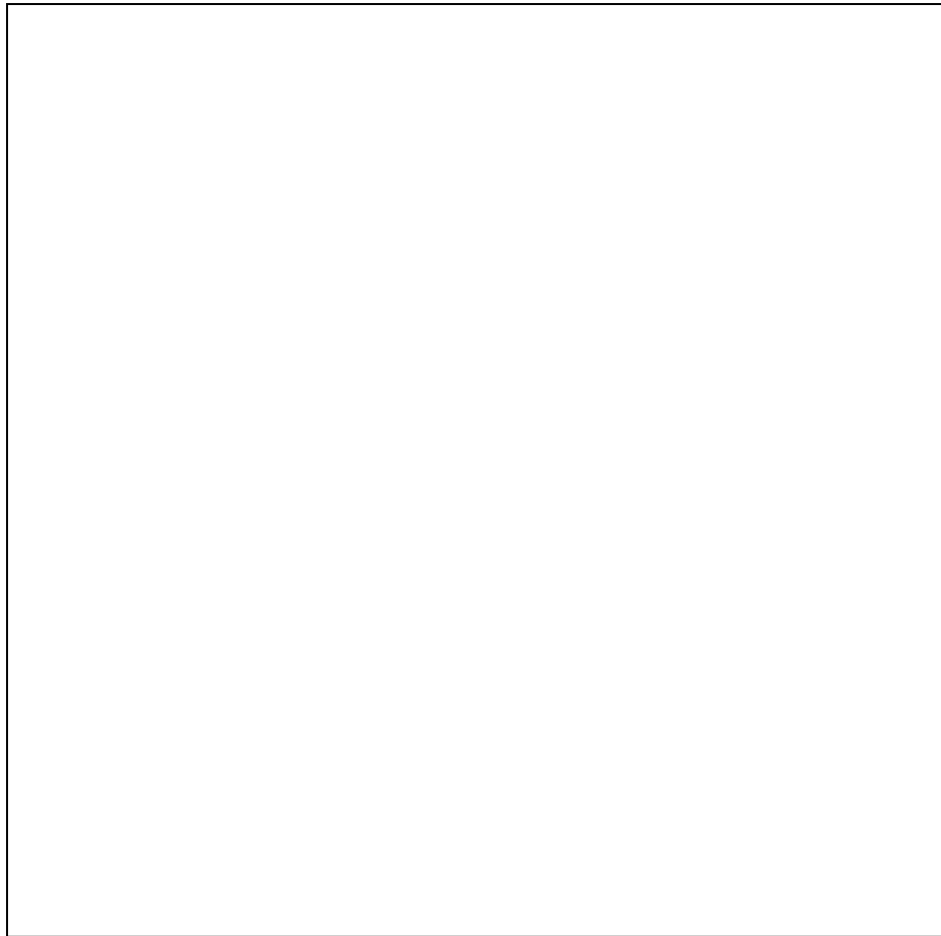
The Transport Department, [REDACTED], commissioned a feasibility study for the [CITY] BRT system by the [REDACTED]. This study found that BRT is feasible and urgently required in [CITY]. The [CITY] Comprehensive Transportation Study set an ambitious goal of increasing the mode share of public transport from XX per cent to XX per cent of all motorised trips by 20XX. Simple improvement of bus service may not be a viable option to expand public transport use in [CITY], as measures to control the use of private vehicles are extremely limited. Improvements in bus service should be paired with other elements, such as dedicated right-of-way for buses that is segregated from general traffic. The appropriate solution for [CITY] is a full-featured BRT system that can complement other high capacity rapid transit modes in the city.

The proposed three-phase BRT network covers XX km and serves a large portion of the [CITY] Metropolitan Area ([REDACTED]). This network is integrated with the metro rail lines, currently under construction, as well as proposed monorail corridors. BRT corridors were selected based upon a detailed study of [CITY]'s existing transport assets and planned development.

An 80 km network has been identified for phase 1, including two major networks ():

- South network comprising of [REDACTED], [REDACTED], [REDACTED] and [REDACTED] integrated with [REDACTED], [REDACTED] and suburban rail stations at the [REDACTED], [REDACTED], and [REDACTED].
- North network that connects the [REDACTED] hub to [REDACTED], [REDACTED] and [REDACTED] integrated with Metro and suburban rail stations.

Figure 1. Proposed Phase 1 BRT Corridor



## 1.2. [CITY] BRT system features

The [CITY] BRT system will follow international best practices in BRT design. The following design characteristics should be assumed for all planning activities:

- **Median busway alignment.** The busway will be located where conflicts with other traffic are minimised. Median alignment reduces conflicts with turning vehicles at intersections and property access points. The central verge is largely free of obstructions such as delivery vehicles or autorickshaws that require access to the kerb.
- **Dedicated right-of-way.** All BRT trunk corridors must have a dedicated right-of-way with physical segregation to ensure that buses can move quickly and are unimpeded by congestion.
- **Off-board fare collection.** To reduce travel times, improve customer experiences, and prevent revenue leakage, the system will employ off-board fare collection at all BRT stations. On-board fare collection should only be used on direct service extensions.
- **Platform-level boarding.** In order to reduce boarding and alighting times, the bus-station platform must be at the same level as the bus floor. This is particularly helpful for the elderly, disabled, or people with suitcases or strollers.

- **Central stations.** Centrally positioned stations will serve both busway directions. Central stations allow for easier integration between busway routes, particularly when two routes cross on perpendicular streets. Central stations also reduce construction and operational costs.
- **Excellent NMT access.** High quality pedestrian and cycle facilities along the corridor help ensure that passengers can reach BRT stations safely.

These fundamental elements of BRT will form basis of the Preliminary Assessment Report, which will serve as a starting point for more detailed analysis in the Service and Infrastructure Plans. The consultant is encouraged to make use of the BRT Standard, a technical tool that describes the components that make up high quality BRT systems.<sup>1</sup> The BRT Standard establishes gold, silver and bronze rankings, which are determined by the project's compliance with key elements. GO [REDACTED]'s aim is to achieve at least a gold or a silver standard BRT, incorporating international best practises to ensure that the system to contributes to the city's goal of expanding the use of sustainable transport.

## 2. Detailed scope of tasks

The consultant will build on the work already undertaken by the GO [REDACTED] in corridor identification and prepare a detailed plan for the rollout of the [CITY] BRT system. The focus of consultant activities will be on accumulating data, conducting analysis, and completing planning and design work for an efficient rapid transit system. The BRT Detailed Project Report (DPR) will be prepared in two stages. The first stage will include a demand assessment, concept plan, service plan, and impact analysis, enabling a preliminary appraisal of the system. In the next stage, the consultant will prepare detailed infrastructure plans including physical designs and construction cost estimates. The end product will be a viable proposal to enable successful implementation of all elements of the BRT.

Submissions will include:

- Stage 1:
  - **Inception Report.** This report will review existing secondary data and outline all data collection activities proposed by the consultant.
  - **Corridor Demand Analysis:** This report will form basis for the DPR. It will include detailed surveys, analysis, and modelling to establish the need for a BRT system.
  - **Concept Plan.** This report will establish the service typologies on proposed corridors along with street sections, alignments, and intersection designs.
  - **Service Plan:** This is a viable service plan for the successful implementation of the BRT. It will detail on the types of trunk, complementary, and feeder services; the fare collection system; IT systems; institutional structure, and other elements of BRT operations.
  - **Financial, social, and environmental analysis.** This report will include analysis of capital costs, operating costs and revenues, social impacts, and environmental impacts. It will also include an overall cost-benefit analysis.
- Stage 2:

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<sup>1</sup> The BRT Standard is available at <<http://www.brtstandard.org>>.

- **Infrastructure Plan.** Based on the findings of the Service Plan, the consultant will develop detailed infrastructure designs. This plan will cover corridor design, station design, bus design, the station-bus interface, terminals, and depots. It will include plan drawings for all corridors, along with a detailed bill of quantities and cost estimates.

Each DPR component is detailed below.

## **2.1. Inception report**

At the commencement of the project the Consultant will collect and review all relevant reports, with particular attention to the [REDACTED], City Development Plan (CDP), Master Plan, Comprehensive Mobility Plans, Comprehensive Traffic and Transport Studies, City Corporate plans, transport-related DPRs, and other plans. Relevant state and corporation authorities, such as the [REDACTED] State Transport Corporation ([REDACTED]), the [REDACTED], and Regional Transport Office (RTO), can assist with secondary data collection. Data on socio-economic characteristics, vehicle ownership, and transport policies shall be collected. Based on this information, the Consultant will prepare a brief profile of the planning area including population and demographic data, land area, regional linkages, and socio-economic information. The Consultant will indicate the spatial distribution of economic activities, important generators of travel demand (e.g. large hospitals, government offices, schools, universities, shopping areas, and recreational spaces).

The Consultant will also compile information on existing private operators of city buses and share autos, including the current institutional and permitting relationship between the operators and the relevant oversight agencies. The Consultant will identify relevant agencies and institutions with a role in public transport and traffic management.

The Consultant will compile spatial information on plans for other related projects such as existing, planned, and proposed cycling networks, pedestrian networks, and pedestrian zones to understand how they would complement the BRT. In addition, information on underground utility networks as per information available with the Client and urban local bodies also should be compiled. This information should be mapped using a GIS platform.

Finally, the Consultant should prepare a plan for all surveys to be conducted in the subsequent planning phases, including survey forms and locations.

## **2.2. Corridor demand analysis**

The Consultant will prepare a Corridor Demand Analysis report for the [CITY] BRT system including the results of primary surveys and documentation of the travel demand model for the [CITY] public transport system.

### **2.2.1. Surveys**

The Consultant will conduct travel demand and traffic surveys to inform the service plan, corridor designs, and other elements of the Pre-Feasibility Study:

- **Documentation of public transport network.** The Consultant will compile a complete database of public transport services in [CITY], including stop names and locations, route definitions, headway, running time, dwell time and fare structures. All data should be collected for city buses (both publicly and privately operated) and share autos.

- **Frequency-occupancy survey.** The Consultant will survey frequencies and passenger loads along major public transport corridors. The survey should be conducted in at least 30 locations along the proposed BRT corridors and on other important public transport demand corridors. The selected cordon points should be selected such that 95 per cent of bus and share auto routes pass through at least one cordon.
- **Household survey.** The Consultant will conduct a sampling of household and work place surveys along each of the proposed BRT corridors. These surveys will cover travel characteristics such as origins and destinations, mode of travel, travel time, and vehicle ownership.
- **Boarding-alighting surveys.** The Consultant should determine the number of boardings and alightings at each stop along bus and share auto routes that coincide with the proposed BRT corridors.
- **Transfer surveys.** The Consultant will conduct transfer surveys at key stops and terminals to determine gaps in the existing bus route network. This analysis will facilitate the planning of BRT routes that provide continuous service between major origin-destination pairs and reduce the need for transfers.
- **Traffic counts.** The Consultant will conduct 16-hour classified turning movement counts at key junctions along the planned BRT corridors, using specific vehicle classification to clearly distinguish buses, 2-wheelers, 4-wheelers, share-auto etc., for off-peak and peak periods. The purpose of this task is to optimise the layout and dimensions of the junctions and to permit the development of timing plans for the traffic signals at these junctions.

### 2.2.2. Modelling

For a comprehensive analysis, the Consultant is required to construct and calibrate a transport model using a modelling software or spreadsheet analysis. The key modelling tasks are:

- Code the public transport network, including public transport stops, routes, fares, and speeds.
- Model peak-hour passenger demand for each route. Use the data from frequency-occupancy and traffic counts to calibrate the model to ensure that the model accurately reflects existing bus and paratransit operations and demand in the base year. (The Consultant should present calibration results, including corridor volumes on public transport, boardings and alightings per stop, and boardings per route.)
- Forecast origins and destinations for trips by public transport users and other road users at the time of opening of the BRT system and 5, 10, 15, and 20 years after implementation. Estimate the shift of passengers from other modes, such as private vehicles, autos, to the new BRT system. The demand estimation should clearly indicate the relative contribution of various factors, such as population growth, land use patterns, income distribution, road network development, fare affordability, BRT journey times, and parking policy, to the estimated BRT demand. Prepare forecasts for peak-hour and off-peak demand for BRT services, feeder services and non-BRT services.
- Prepare detailed estimates of BRT demand, including directional boardings and alightings at each proposed BRT station during each time period. The demand estimates will inform the service planning process and the dimensioning of physical infrastructure.

The output from these tasks will be used as inputs for the concept plan, service plan and infrastructure design, including stations, terminals, and corridors.

### **2.3. *Concept plan***

Based on the Corridor Demand Analysis, the Consultant will prepare a concept plan for the BRT system, including the following:

- Service typology. The Consultant will include an initial network plan for trunk, complementary, feeder, and non-BRT services. The Consultant will develop the network plan through an iterative process with the demand and financial modelling results. The network should be displayed in a GIS-based map.
- Infrastructure typology. The Consultant will discuss the rolling stock; station and terminal typologies; and station-bus interface.
- Fare collection. The Consultant will present a concept plan for fare collection on BRT services.
- Street sections. Conceptual street cross sections showing the alignment of BRT lanes, mixed traffic lanes, NMT facilities, and other street elements. Sections should be prepared for the major ROWs that are found along the corridors.
- Intersections. The Consultant will also prepare a corridor analysis to show the road capacity and its functionality during peak hours. The Consultant will prepare concept designs for major intersections. The concept designs should be consistent with the intersection design guidance in section 2.6.1 (see below).

### **2.4. *Service Plan***

The purpose of a Service Plan is for the Consultant to develop an operating strategy for the BRT services, including trunk, feeder, and complementary services, as well as required adjustments to regular city bus services in the corridors where BRT is introduced. The Service Plan will detail additional BRT service components, including fare collection, ITS, and institutional structure. The Consultant will prepare a detailed Service Plan including (but not limited to) the following components:

- BRT services.
- Bus fleet requirements.
- Fare system.
- ITS.
- Management information system.
- Institutional model.
- Service contracts.



### 2.4.1. BRT services

The Consultant is required to develop a detailed service plan for multiple route options on a single corridor, frequency of buses and provision of limited/express bus service based on peak-hour and off-peak demand. The Consultant will complete the following tasks toward development of a detailed service plan:

- Analyse the existing bus routes by categorizing them as: (1) fully affected by BRT introduction; (2) partially affected by BRT; (3) not affected by BRT. This analysis will help identify how existing routes should be modified to compliment BRT services.
- Propose an efficient network of BRT services, including trunk, complementary, and feeder services. The route plan should include multiple routes along each corridor, with service itineraries optimised to minimise travel times and the need to transfer. Transfers, if required, should be planned in locations with decent waiting areas and minimal walking distances (e.g. formal BRT terminals) and so as to ensure that at least one leg of the journey has high frequency service.
- Where room for passing lanes is available, develop proposals for limited/express services based on preliminary OD surveys and corridor demand analysis conducted by the Consultant. This step must be carried out together with the infrastructure plan—the Consultant must determine how the corridors can accommodate passing lanes at stations.
- Present a detailed database of planned regular non-BRT services showing how these routes are to be modified, curtailed, or eliminated to reduce conflicts with the BRT system. The non-BRT route plan must minimise parallel service in mixed traffic lanes on BRT corridors.
- Determine the total BRT and non-BRT fleet requirement, classified by type of vehicle, in the initial year of operations and after 5 and 10 years.
- Based on the proposed service plan, estimate passenger demand and bus frequencies at all stations and terminals in the BRT network, peak-hour and off-peak demand, in the initial year of operations and after 5 and 10 years. This information will inform the design and sizing of these facilities.
- Produce a preliminary timetable for all BRT and non-BRT services, including frequency of service and actual journey times (with any variation by time of day), hours of operation, and number of runs operated per day particularly for those sections of the route that are common with the proposed BRT route. The timetable should indicate the number of buses required for each route.
- Taking into account the changes in the public transport services proposed, the Consultant must develop a detailed signalisation plan for intersections along the BRT corridor. The purpose of this task is to ensure the layout and dimensions of the grade junctions are optimised for expected peak-hour traffic flows. The Consultant will carry out micro-simulation for traffic light optimisation at key junctions and transfer stations. Signal design must be completed through an iterative process together with the geometric design of intersections in the Infrastructure Plan.
- Forecast the demand levels for feeder modes such as walking, cycling, bus and rickshaw to determine the need for interface locations and cycle parking stations.

### **2.4.2. Fare system**

The Consultant is required to develop functional requirements for a BRT fare system this is compatible with the existing fare levels and other public transport fare systems, and the technical specifications for the procurement of the design, implementation and operation of the system, including the activities necessary for collection and disbursement of fare revenue. Thus, the consultant needs to:

- Review existing fare levels and tables used in [CITY], including overall government public transport fare policy, and the policy for discount (concession) fares, levels of subsidy (if any) on all transport modes;
- Develop a fare concept (distance-based, passenger-based, or mixed, or other) for the system and the technological implications of such a fare structure;
- Assess the level of fare affordability and the need for discounted (concession) fares for social reasons for various passengers (such as students and low-income users). Evaluate the costs and benefits of the different options, in particular with respect to affordability, likelihood of attracting passengers from other modes and level of government (or business community) subsidy (if any) required, and government payments for fares discounted for social reasons, and recommendations on a preferred option;
- Propose mechanisms for integration of fares between the BRT trunk, complementary, and feeder services and make recommendations on the preferred options;
- Develop technical specifications with regards to standards for fare system, payment media, the fare regime, software and hardware, and integration requirements. Assess possible modalities for integration of the BRT ticketing system with that of the [CITY] Metro Rail and other modes of transport in [CITY], including technical feasibility, cost, and institutional considerations.
- Define functional requirements for the fare system including arrangements for sale of fare cards, and collection and disbursement of revenue;
- Describe the central information sub-system for fare collection (functional requirements, technical requirements, reporting requirements, operational requirements, data storage and back-up requirements, ITS interface)
- Prepare a procurement plan for operation and maintenance of fare equipment.

### **2.4.3. ITS concept**

The BRT service will be facilitated by the use of a number of intelligent transport system (ITS) applications and equipment. The consultant will prepare a concept plan describing the broad functional requirements of the following ITS components:

- Passenger Information System (PIS) on vehicles and at stations to provide real-time information to passengers on their schedule time of arrival of buses;
- Automatic Vehicle Location (AVL) for real-time tracking of the position of the BRT vehicles along the routes;

- Automatic Fare Collection (AFC) using contactless smart cards and/or near-field communication-enabled phones;
- Access control system for the terminals and depots;
- Security systems for buses, stations, and terminals.
- Traffic signal control at BRT corridor junctions, including mechanisms for bus priority;
- BRT Control Centre (CC) to monitor PIS, AVL and AFC and to use real-time data to manage passenger flow at stations and terminals, monitor signals, and manage the traffic movements along the BRT corridor.
- Customer Service information centre.
- Management information system (MIS).

Detailed specifications for ITS components will be prepared as part of the Infrastructure Plan.

#### **2.4.4. Institutional model**

The Consultant will develop a structure for management of the BRT system through a dedicated special purpose vehicle (SPV). The SPV will function as a dedicated management unit with highly qualified staff and operational independence that oversees operating contracts for the BRT system. These operating contracts will include bus operations; fare collection and ITS; station and corridor maintenance; and traffic management. The Consultant will prepare detailed staffing and financial plans for the SPV. The Consultant also will describe the division of responsibilities between the SPV, other government departments, and private sector participants in operations and ownership of BRT infrastructure. The plan should include a timeline for setup of the SPV.

#### **2.4.5. Industry transition**

The consultant should develop an industry transition plan that outlining a process for outreach to existing transport system operators, including share auto and private bus operators. The plan should describe how existing operators may be encouraged to participate in the tendering process for the BRT system. The plan should also describe means integrating current staff from paratransit and other city bus services into the new BRT system.

#### **2.4.6. Stakeholder consultation on concept designs**

After approval of all submissions that comprise Stage 1, the Consultant will organise a stakeholder consultation to gather public input on the proposed BRT plan.

The consultation should incorporate the following:

- The consultation will be conducted in                      or English, depending on the preferences of the workshop participants.
- The Consultant will make all necessary arrangements (venue, projector, other materials) for the consultation.
- The Consultant will publish notice in at least three daily newspapers (2                      1                     ) in the format given by the client.

- The Consultant will present the BRT plan in slide show format. The presentation will provide an overview of the transport system in [CITY], introduce the key features of BRT, and discuss the proposed [CITY] BRT network.
- The Consultant will provide conceptual street sections, plans, and 3D renderings on A1 size sheets for reference.
- The Consultant will make necessary arrangements for recording written and oral comments.

The Consultant will prepare a summary of points raised in written or oral form at the stakeholder consultation and the suggested response to each comment received (i.e. whether or not to amend the conceptual designs as per comments). The Client will indicate whether each suggestion is to be incorporated or dropped. The Consultant will revise the conceptual plans accordingly.

## **2.5. Financial, Social, and Environmental Analysis**

### **2.5.1. Capital cost**

The Consultant will need to provide a preliminary costing of infrastructure components including:

- Planning and design of BRT corridors.
- Corridor construction, including utility relocation, property acquisition (if necessary), and resettlement (if necessary).
- Stations, terminals, depots, and control centre.

Techniques used to estimate the cost will be documented and must be consistent with the current construction costs and the locally applicable current schedule of rates. In addition, unexpected cost increases must be planned for in contingency analysis. The cost estimates will be updated once the detailed infrastructure designs have been completed.

### **2.5.2. Operating costs and revenues**

Costs for the BRT service and corridor operation and maintenance will be estimated depending on various fare models. The operating costs analysis will detail out financial impacts on the government, city bus operators, paratransit industry and other stakeholders. In addition, the operating cost analysis will include but is not limited to, the following:

- Bus operations contract (purchase, operations, and maintenance of buses)
- Fare collection and IT contract(s) (purchase and operations of hardware/software)
- Station service contract (security, cleaning, landscaping, maintenance, etc.)
- Infrastructure maintenance cost (busways, depots, stations)
- Costs associated with institutional management of the system by the SPV

The Consultant is required to model the estimated revenue from the system. Revenue components will be projected include, but are not limited to:

- Fare income from all trunk, direct and feeder services

- Advertising income from station and vehicle advertising contracts
- Land value capture of property development.

The Consultant will need to extract relevant data from the model by taking into account the new system and the existing system continuing to operate. The Consultant will require the following scenarios, which will be jointly agreed by GO [redacted]:

- Run at least 50 different Phase 1 scenarios through the financial model
- Run at least 2 different scenarios for Phase 2, Phase 3, and then full network
- Calculate the full operational costs and revenues for each model run
- The Consultant will need to identify any subsidies under current public transport that will be forgone with the transformation of existing services into the new system

### 2.5.3. Cost-benefit analysis

The Consultant will conduct a cost-benefit comparing the expected cost of system to the total expected benefits, which are expected to include the following:

- Decrease in travel time for public transport passengers due to dedicated bus lanes and potentially for private vehicle users due to improved efficiency of intersection management.
- Decrease in travel costs for the BRT users.
- Decrease in energy consumption from paratransit, old bus, and private vehicle trips that are avoided due to from a modal shift to BRT.
- Increase in local employment.
- Reduction injuries, loss of life, and economic productivity due to improved road safety along the BRT corridors
- Impact of system on environmental quality and quantifiable public health benefits.
- Evaluate the costs and benefits of the different options, in particular with respect to affordability, likelihood of attracting passengers from other modes and level of government (or business community) subsidy (if any) required, and government payments for fares discounted for social reasons, and recommendations on a preferred option.

### 2.5.4. Social impacts

The Social Assessment Report will include a screening for social impacts, especially those that will benefit vulnerable populations, including women and low-income users. This analysis should highlight impacts such as changes in travel time, expenditures, safety, and access to services and employment.

In the case of properties that will be affected by the construction of the project, the assessment will identify type and nature of impacts and required mitigations measures as per the ESF entitlement matrix of the [redacted]. It will outline a process for public consultation with the identified projected affected persons, public disclosure, implementation arrangements, and mechanisms for land acquisition, resettlement, and rehabilitation. The Consultant will prepare a Resettlement Action Plan

(RAP), if applicable, that should take into account of policy provisions and entitlements available in the National Rehabilitation and Resettlement Policy of 2007. The Consultant should explore design options to minimize negative social impacts.

### **2.5.5. Environmental impacts**

The Environmental Assessment Report will identify impacts of the BRT project on local air pollution and greenhouse gas emissions. The Report will also examine additional environmental impacts during construction and operations.

## **2.6. Infrastructure Plan**

The Consultant will prepare a detailed Infrastructure Plan including the following components:

- Corridor designs.
- Stations.
- Terminals.
- Depots.
- Bus fleet.
- Control centre.
- Bill of quantities.
- Service contracts.

Given the complexity of corridor planning, the designs will be presented to the Client in two phases: conceptual designs and final working drawings.

### **2.6.1. Corridor design**

The selected BRT corridors (Figure 1 plus additional corridors identified in the Preliminary Assessment Report) will make up the Study Area. The Study Area will also include the following:

- Major streets (i.e., streets with a right-of-way of 18 m and above) perpendicular to the BRT corridor, up to a length of 500 m from the BRT corridor.
- Minor streets (i.e., streets with a right-of-way below 18 m) perpendicular to the BRT corridor, up to a length of 100 m from the BRT corridor.

All streets in the Study Area, along with their legal ROWs should be mapped using GIS. The Consultant shall conduct total station surveys to prepare base plans for critical sections and junctions along the corridors. The surveys must cover all streets in the Study Area. Specific elements that must be surveyed (including documentation of geocoded X, Y, and Z coordinates in a GIS platform) include:

- Main roads, sub roads, and service lanes, as applicable
- Signals /road marks
- Intersection elements

- Roundabouts
- Medians / bollards /permanent barricades
- Compound walls and each access point/gate
- All utility (electricity, telephone etc.) poles/boxes
- Overhead high tension lines
- Trees: to be indicated in 2 categories, above and below 30 cm of main trunk circumference
- Front facade of existing buildings/structures
- Footpaths/pathways including all kerbs and level differences
- Kerbs
- Pavements
- Manholes
- Sign boards/markings
- Service lines/cable ducts
- Difference in levels wherever it occurs
- Establishing true/magnetic north point with respect to each location
- Establishing reduced/relative level for each item

Each map should be georeferenced with latitude, longitude, and height coordinates so that it can be combined with other maps on a GIS platform; and each element should be in a separate layer.

Once the topographic surveys are ready, the Consultant can begin preparing detailed BRT corridor designs. The design shall be prepared following the relevant guidelines and standards, including the BRT Planning Guide,<sup>2</sup> the BRT Standard 2013, Better Streets, Better Cities: A Guide to Street Design in Urban India,<sup>3</sup> and relevant Indian Roads Congress standards, especially IRC103:2012.

BRT Corridor design should include but not limited to:

- BRT lanes located in the central verge of the road and with dedicated right-of-way.
- Centrally located bus stations.
- Paratransit and feeder stops.
- Dedicated pedestrian footpaths.
- Dedicated cycle tracks (if the corridor falls on the cycle priority network).

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<sup>2</sup> <https://go.itdp.org/display/live/Bus+Rapid+Transit+Planning+Guide>

<sup>3</sup> <http://www.itdp.org/betterstreets>

- Dedicated spaces for cycle sharing stations. (The proposed BRT corridors fall outside the planned phase 1 coverage area of the [CITY] cycle sharing system, but cycle sharing may be expanded to the areas covered by the BRT system in subsequent phases.)
- Integration of other NMT facilities planned by **IMPLEMENTING AGENCY** that intersect with the BRT corridor.
- Pedestrian crossings, including formal speed table crossings as well as median breaks that serve as informal crossing locations.
- Trees to provide shade for pedestrians and cyclists as well as decorative landscaping, including compensatory afforestation for the trees removed as part of the project.
- Spaces for street vending.
- Medians.
- Traffic calming elements, where needed to reduce vehicle speeds.
- Physically demarcated on-street parking areas.
- Street furniture, including benches, stools, tables, and other seating arrangements.
- Signage locations.
- Pedestrian refuge islands.
- Carriageways, ensuring that the width remains uniform between intersections.
- Street lighting.
- Storm water drains.
- Utility access points.

The Consultant will prepare a detailed analysis of potential peak-hour capacity issues at major junctions, covering both the BRT and mixed traffic lanes. The consultant will estimate traffic volumes in the opening year and 5 and 10 years after opening. The traffic volume estimates for future years will take into account expected changes in travel patterns (i.e. the  envisions a reduction in the private vehicle mode share from **XX** to **XX** per cent of motorised trips by 20**XX**, helping to reduce pressure on the traffic system).

The consultant will provide location-specific solutions to address capacity issues, focusing on at-grade solutions, including geometric design and signal timing, that ensure optimum operations within the available right-of-way. Key solutions include:

- The use of the network to replace right turns across the BRT lanes with a series of right turns and/or U-turns.
- Squareabouts to manage right turning traffic at large intersections.

The Consultant may explore grade separation provided that such solutions prioritise BRT.



All intersection designs should promote safety for pedestrians and cyclists. The design should incorporate adequate turning radii, pedestrian refuge islands, and continuity for cycle tracks. Solutions involving grade separation, if recommended, must prioritize BRT and maintain convenient access for cyclists and pedestrians.

The Consultant will submit the Preliminary Corridor Designs for evaluation by the Review Committee before preparing the final working drawings. The Review Committee will review the Preliminary Corridor Designs. The Consultant will prepare Revised Preliminary Corridor Designs based on the feedback received from the Review Committee. The Revised Preliminary Corridor Designs must be submitted to the Client for approval.

Following approval by the Client of the conceptual designs, the Consultant will prepare detailed construction drawings (Draft Working Drawings) for the study area. The designs should include geometric and vertical profiles. The designs should include the following components:

- Typical sections along various segments.
- Horizontal control plan.
- List of existing street elements to be demolished.
- Utility relocation plans (wherever necessary).
- Storm water plans.
- Material specifications. Special attention should be paid to the pavement material requirements for the bus lanes, noting cost, durability, and maintenance aspects of each option. Among the options to be examined are existing pavements, concrete panels, continuously reinforced concrete (CRC), modified asphalt, and concrete only at stations.
- Construction details for each element.

The Draft Working Drawings must be submitted to the Client for approval. The Consultant will prepare Final Working Drawings based on the feedback received from the Client. The Final Working Drawings must be submitted to the Client for approval. The Consultant will submit all conceptual designs and final working drawings to the Client in hard copy and electronic format.

### **2.6.2. Stations**

BRT stations form an important interface between the passengers and the BRT system. Thus, it is essential for the station facilities to be convenient, comfortable, safe, and easily accessible for all age groups. The design must consider providing for required infrastructure, adequate circulation and waiting areas, and protection from the weather. Platform height options will be evaluated and recommendations made in conjunction with determination of bus equipment specification and cost considerations. Station design must also ensure physical integration with other transport modes in [CITY], including [CITY] Metro Rail, suburban rail, MRTS, and monorail. To meet with these requirements, the Consultant must provide detailed station design to include:

- Distinct functional areas for fare payment, circulation, and waiting. A functional diagram should be prepared along with the architectural drawings.

- Appropriate station sizing (including number of bays) based on passenger demand at the respective location. The width and length of the station must allow enough space for queuing. Provision for phased modification of rolling stock (e.g. from 12 m to articulated to bi-articulated buses, as appropriate given estimated corridor demand).
- Provision of multiple sub-stops at the highest-demand stations and where passing lanes are possible. The Consultants must design options to show how the sub-stops that can be connected to one another.
- For stations located near Metro Rail, suburban, MRTS, or monorail stations, an integrated common mezzanine level for both stations.
- Tactile surfacing, floor markings (directional arrows)
- Provision of ticket counters, automatic ticket vending machines, and barrier control for entry.
- Provision of litterbins, drinking fountains, toilets, etc.
- Static signage as well as real-time information displays.
- Space for IT and mechanical equipment, including station computer, turnstiles, and automatic screen doors.
- Placement of security cameras and kiosks.
- Visibility of destination display boards on approaching buses.
- Safe, convenient pedestrian access that minimises grade differences.
- Totem and external signage to facilitate identification of the station and its name.
- Space for internal and external advertising
- Fire and emergency equipment, emergency exit

In addition to the above aspects, the Consultant will develop options for environmental concepts such as energy efficiency and water conservation at the stations. The Consultant will show designs for NMT facilities integration at the stations such as cycle sharing stations.

The Consultant will need to develop at least ten different architectural concepts with 3D renderings for the overall aesthetic design of the stations including the above-mentioned features.

### **2.6.3. Terminals**

The Consultant will design bus terminals for route endpoints and major intermodal transfer locations. In order to design for terminal requirements, the Consultant must:

- Determine the number of bus bays required for BRT and non-BRT services. The number of bays should inform the size of the terminal.
- Show how the BRT feeder and trunk services will be integrated for ease and safety of passenger transfers.

- Indicate how BRT services will be integrated with other modes (e.g. railway stations, intercity bus services, drop-off points for auto-rickshaws, cycle parking, etc.). These interchanges will include integrated terminals at the [CITY] Mofussil Bus Terminus and the Airport.
- Determine facilities and amenities to be provided at terminals for an enhanced passenger experience.
- Identify potential for joint development of commercial or residential space at terminals to generate revenue for BRT operations.
- Identify opportunities for co-location of terminal and depot locations to reduce implementation costs and dead kilometres.

#### **2.6.4. Depots**

Create detailed designs for depots, including the following:

- The number and size of depots required for the BRT and non-BRT buses.
- The internal layout, which should indicate:
  - Location of bus entry and exit points
  - Adequate internal circulation
  - Adequate parking spaces
  - Storage areas
  - Space for administration and staff utilities area.
  - Areas for routine maintenance of buses including refuelling, washing, cleaning etc.
- Potential depot locations, preferably on land already owned by the government.

The Consultant will develop at least three architectural design options for the depot facilities; the design options should replicate aspects of the chosen station architectural design.

#### **2.6.5. Bus fleet**

The Consultant will plan for the procurement of a high quality fleet of buses to meet expected demand in the initial year of operations and in subsequent years. Both the functional requirements and technical specifications of the buses should be identified. As part of this exercise, the Consultant should:

- Develop detailed trunk and feeder vehicle specifications including:
  - Number of new buses and vehicle type,
  - Weight and dimensions
  - Body and interiors of the bus
  - Mechanical and electrical
  - Intelligent Transportation Systems (ITS)

- Additional specifications:
  - Driver training programme
  - Maintenance training programme
  - Warranty provision
  - List of spare parts (initial year of spare parts)
  - List of required tools, software, and diagnostic equipment
  - Supply of vehicle manuals and instructions
  - Vehicle approval process and vehicle homologation / licensing
- Draft set of design guidelines for the buses with detailed technical specifications, including provisions related to interior design, engine, and pollution standards and a procurement timeline that is calibrated to estimated demand.
- Develop a BRT employment plan to integrate current staff from paratransit and other city bus services into the new BRT system, as part of the set-up process.
- Develop a plan for vehicle acquisition and approval process which should include the following elements:
  - Sign-off on conceptual vehicle design with manufacturer.
  - Sign-off on the detailed vehicle design with manufacturer.
  - Site visits to manufacturing plant.
  - Authority given for full production of units.
  - SPV inspection of initially produced units.
  - SPV sign-off of vehicle delivery.
  - Identify and negotiate contract for vehicle tendering and procurement process.
  - Identify bus fleet requirement for future demand growth
- Conduct a market analysis for bus procurement, including an assessment of procuring hybrid buses. The assessment must include, but is not limited to, identification of existing domestic and international suppliers of hybrid buses, including the feasibility, capital cost, operating cost, and environmental impact of using hybrid buses.

The bus specifications should ensure the following:

- Passenger comfort and ease of use, ease of entry and exit, suitability for elderly passengers and passengers with young children, temperature and protection from the rain and noise;
- Specific requirements for persons with disabilities, including visual, hearing, intellectual as well as those with mobility impairments. The vehicles and stations should be fully accessible

to all persons with disabilities, as well as other passengers, with special needs including parents with prams, small children, and the elderly;

- Operational efficiency, including boarding and alighting speeds, dwell time at stops, commercial speeds, acceleration/deceleration rates, fuel consumption, ease of driving;
- Ease and efficiency of maintenance;
- Minimal emission levels, both local pollution and greenhouse gases; and
- Safety and security.

#### **2.6.6. ITS specifications**

The Consultant needs to propose an integrated ITS system to detail the following:

- Identify on-board equipment for the information of passengers on board such as arrival time at the next station, weather conditions, educational information and advertising. Provide specifications for procurement of on-board computer system equipped with GPS to transmit real-time vehicle locations to the OCC. The system must allow for monitoring of speed, stops, travelling times, route deviations, and unauthorised manoeuvres.
- Identify equipment to be installed in trunk and feeder stations, depots and terminals, including audio and visual display systems to provide information for users relating to operational status; security systems such as closed circuit cameras; and automatic platform screen doors.
- Identify equipment required in stations and buses for an integrated AFC system. The consultant must provide details on automatic ticket vending machines, staffed ticket kiosk equipment, barrier control at stations and terminals, and mechanisms for fare collection on complementary routes. The Consultant has to identify specifications and locations for installation of the respective equipment.
- Prepare equipment specifications and management plan for the control centre. The control centre should integrate respective interfaces and functions of the AFC system and integrate data on the BRT operations with traffic and arrival data.
- Prepare specifications for procurement of an integrated package of traffic signals, signal control applications, closed circuit cameras, and traffic management functions at the control centre to support efficient operation of BRT system. Using data from the traffic surveys and forecasts, prepare the traffic signal phasing plan for the BRT and other traffic.
- The Consultant will develop functional specifications for a MIS that can generate reports for various levels of BRT system managers, including staff and duty schedule reports, bus operation reports, and financial reports. The software will have the capability to provide daily, monthly, and yearly summaries.

#### **2.6.7. Control centre**

A control centre is essential for a range of management functions, including bus operations monitoring, financial management, and staff training. The control centre system should also be able to generate periodic information reports to be used in the future to optimise the BRT system. To facilitate interdepartmental interaction, the control centre may be co-located at an existing operational

centre, such as the CMRL headquarters in Koyembedu. The Consultant will prepare the detailed standards and design of the control centre, which should have the following capabilities:

- Real-time monitoring of bus speeds and location using GPS technology, with staff terminals and auditorium-style displays.
- Secure areas for initialisation of fare media and processing and reconciliation of financial data.
- Sound proof cabins and general staff cabins.
- Security management to prevent unauthorised entry.
- Alternative off-site office as a backup for system operations to enable system recovery.

#### **2.6.8. Representation of infrastructure elements**

The Consultant will need to develop a high-quality simulation video of at least 2 minutes demonstrating the operation of the BRT system. In addition, the Consultant shall provide 3D renderings of each major infrastructure design component:

- Busways (at least 20 perspectives)
- Intersections (at least 10 perspectives)
- Integration facilities (at least 15 perspectives)
- Landscaping (at least 15 perspectives)
- Trunk stations (at least 20 perspectives)
- Feeder stations (at least 10 perspectives)
- Depots (at least 10 perspectives)

#### **2.6.9. Stakeholder consultation(s) on detailed designs**

After preparation of the Preliminary Corridor Designs as well as initial designs for the stations, terminals, and depots, the Consultant will organise up to four stakeholder consultation(s) to gather public input on the proposed BRT detailed designs.

The consultation should incorporate the following:

- The consultation will be conducted in [REDACTED] or English, depending on the preferences of the workshop participants.
- The Consultant will make all necessary arrangements (venue, projector, other materials) for the consultation.
- The Consultant will publish notice in at least three daily newspapers (2 [REDACTED], 1 English) in the format given by the client.
- The Consultant will present the BRT plan in slide show format. The presentation will provide an overview of the transport system in [CITY], introduce the key features of BRT, and

discuss the proposed [CITY] BRT network, focusing on BRT detail design elements relevant to the respective stakeholder group.

- The Consultant will provide street sections, plans, and 3D renderings on A1 size sheets for reference.
- The Consultant will make necessary arrangements for recording written and oral comments.

The Consultant will prepare a summary of points raised in written or oral form at the stakeholder consultation and the suggested response to each comment received (i.e. whether or not to amend the conceptual designs as per comments). The Client will indicate whether each suggestion is to be incorporated or dropped. The Consultant will revise the detailed designs accordingly.

#### **2.6.10. Bill of quantities and revised capital cost**

The Consultant will prepare a bill of quantities (BoQ) for all proposed civil works (i.e. corridors, stations, terminals, depots, and control centre) based on engineering drawings and inputs the Client on rates to be quoted. The consultant will also prepare photomontages and renders showing key typologies along the corridors. The Consultant will revise the capital cost estimates for infrastructure components based on the detailed designs.

### **2.7. Tender documents**

#### **2.7.1. Infrastructure construction**

The consultant will prepare tendering documents for the corridors, stations, depots, terminals, and all other infrastructure components. The consultant will also prepare contracting documents, including mechanisms to facilitate long-term maintenance through construction warranties.

#### **2.7.2. Service contracts**

The consultant will prepare draft requests for proposals and operating contracts to facilitate the procurement of the following services:

- Bus operations.
- Station and terminal maintenance.
- ITS operations, including AFC and AVL services.
- Traffic management.
- Corridor and landscaping maintenance.

## **3. Review Committee**

Consultant deliverables will be evaluated by a Review Committee consisting of following:

- Representative, Transport Department
- Representative, Highways Department
- Representative, Department of Municipal Administration and Water Supply
- Representative,

- Representative, [CITY] Corporation
- Representative, Police (Traffic)
- Representative, ██████████ Metropolitan Development Authority
- Representative, ██████████

## 4. Timeline

Consultant output	Description	Calendar days after approval of previous submission
<i>Stage 1</i>		
Inception Report	To be presented to Review Committee	25
Draft Corridor Demand Analysis and Concept Plan	To be presented to Review Committee	45
Final Corridor Demand Analysis and Concept Plan	Revisions incorporating feedback from the Client and Review Committee	15
Draft Service Plan	To be presented to Review Committee	30
Revised Service Plan	Revisions incorporating feedback from the Client and Review Committee	15
Draft Financial Analysis and Environmental and Social Impact Assessment Reports	To be presented to Review Committee	30
Final Financial Analysis and Environmental and Social Impact Assessment Reports	Revisions incorporating feedback from the Client and Review Committee	15
Stakeholder consultation on conceptual designs	Date TBD	10
<i>Stage 2</i>		
Draft conceptual drawings	To be presented to Review Committee	60
Revised conceptual drawings	Revisions incorporating feedback from the Client and Review Committee	15
Stakeholder consultation(s) on detailed designs	Date(s) TBD	15
Updated financial analysis	To be presented to Review Committee	15
Draft Infrastructure Plan, including draft detailed working drawings	To be presented to Review Committee	45
Final Infrastructure Plan, including draft detailed working drawings	Detailed design and engineering drawings, bill of quantities, and tender documents	15
Draft tender documents	To be presented to Review Committee	30
Final tender documents	Revisions incorporating feedback from the Client and Review Committee	15



## 5. Selection Process

### 5.1. Eligibility Criteria

The applicant shall meet the following criteria:

- Successful completion of similar BRT planning and design services including service planning, infrastructure design, and financial analysis for at least one full BRT system that is currently in operation.<sup>4</sup> A certificate from the appropriate authority shall be enclosed to substantiate the fact. Only works performed by the applicant directly for the respective clients shall be considered.
- Consortiums are eligible to apply.

### 5.2. Skill requirements

The following key professionals are to be engaged by the Consultant along with required support staff. The CVs of the following professionals will be reviewed as part of the technical evaluation.

	Specialization	Requirement
1	Project Lead	At least ten (10) years of experience in major infrastructure initiatives transport planning, project management, or transport engineering. Experience in BRT corridor design, street design, and BRT system planning required.
2	Senior BRT Planner	At least eight (8) years of experience in management and implementation of a BRT system.
3	Urban Transport Planner	At least eight (8) years of experience in public transport service and infrastructure planning.
4	Fare system specialist	At least eight (8) years of experience in fare system management. Preference will be given to experience in BRT fare system.
5	Transport Modeller	At least five (5) years of experience in travel demand modelling and transport surveys. Specific experience in BRT service planning preferred.
6	Business strategist	At least five (5) years of experience in major planning and implementation of major business initiatives. Preference will be given to experience in a public transport environment and especially in a BRT or other technologically advanced transport environment.
7	Financial Modelling Specialist	At least five years (5) years of experience in finance modelling of major public transport projects.
8	Civil Engineer	At least five (5) years of experience in engineering for road and intersection design. Experience in BRT engineering preferred.

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<sup>4</sup> A full BRT system is defined as a system achieving a Gold or Silver ranking per the BRT Standard. At present, the following cities have qualifying full BRT systems: Ahmedabad, Barranquilla, Bogotá, Brisbane, Cali, Cape Town, Cleveland, Curitiba, Goiania, Guadalajara, Guangzhou, Guatemala City, Jakarta, Johannesburg, Lanzhou, León, Medellín, Mexico City, Pereira, Quito, Quito, Rio de Janeiro (Transoeste), Rouen, Sao Paulo (Expresso Tiradentes), State of Mexico.

9	ITS Expert	At least five (5) years of experience in ITS for BRT system.
10	Demand Survey Specialist	At least five (5) years of experience in conducting traffic counts, sampling of household surveys and travel behaviour.
11	Urban designer	Master's degree in urban design (M Arch or equivalent) from a reputed university. S/he shall have at least five (5) years of experience in street design. Experience in the design of BRT, walking, and cycling facilities preferred.
12	Architect	Master's degree in architecture (M Arch or equivalent) from a reputed university. S/he shall have at least five (5) years of experience in architectural design. Experience in the design of public transport facilities preferred.
13	Intermodal designer	At least five (5) years of experience in the design of intermodal transport facilities.
14	NMT specialist	At least five (5) years of experience in NMT design.
15	Landscape Architect	At least three (3) years of experience landscape designing. Experience in landscaping of transport projects preferred.
16	Project Manager	At least three (3) years of experience in project management for surveying, design, and construction projects.
17	Social impact specialist	At least three (3) years of experience in conducting social impact analysis of major transport system.
18	Environmental Specialist	At least three (3) years of experience in strategic environmental assessment of major transport systems.

The above team should be supported by adequate support staffs and other experts / specialists with adequate experience to ensure that the objectives of the project are achieved within the time lines.

### 5.3. Evaluation criteria for technical bid

Table 1 indicates the criteria for the technical scoring of applicants.

**Table 1. Scoring criteria**

6.	Possible score
<i>Methodology and experience</i>	
Approach and methodology of work for the [CITY] BRT project	10
Number of BRT service plans of similar scale completed to date	20
Number of BRT infrastructure plans of similar scale completed to date	20
<i>Team composition and experience</i>	
Project Lead	10
Urban Transport Planner	8
Transport Modeller	7

Business strategist	6
Urban designer	6
Architect	5
Intermodal designer	4
Project Manager	4
Total technical score	100

### 6.1. *Submission of proposal*

The submission envelope must be clearly marked with the following text: “Consulting Services for BRT Planning and Design for the IMPLEMENTING AGENCY.” The Consultant should include two separate envelopes in the main submission envelope: one containing the Technical Bid and another with the Financial Bid. The sub-envelopes must be marked with the project name and the type of bid. The Technical Bid envelope should contain the following information:

- Name, address, and contact details of the Project Lead.
- Company profile.
- List of technical staff employed full time with the applicant (part time staff shall not be considered).
- Detailed CVs of the technical staff.
- Proof of professional affiliations of staff.
- List of facilities (office space, computers, software, printers/scanners etc.) available with the firm for performing the activities of the TOR, including an indication of which facilities are available in cities in                      state.
- Description of approach and methodology for the current TOR.
- Portfolio of previous works.

Applicants may be requested to make presentation to the Client indicating the following:

- Experience with similar BRT/public transport design projects
- Proposed approach and methodology for the current project

The Financial Bid envelope should include the Consultant’s monetary bid for the project.

Applicants shall submit all materials before date mentioned in the notice.

### 6.2. *Financial proposal*

Financial Bids of applicants with a total Technical Bid score of 75 and above shall only be opened. For Consultants who do not qualify per the Technical Bid, the Financial Bids shall be returned unopened.

The score for each Financial Proposal, *F*, will be computed as follows:

$$F = 100 \times F_m / F_c$$

where  $F_m$  is the total price of the lowest Financial Proposal and  $F_c$  is the total price of the Financial Proposal under consideration. The lowest Financial Proposal will receive the maximum score of 100 marks.

### **6.3. Combined evaluation of technical and financial bids**

The Client reserves the right to reject, at its sole discretion, any or all evaluated Financial Proposals and if necessary, call for submission of new Financial Proposals. In order to allow comparison on a common basis, each proposal will be carefully scrutinised in accordance with the procedure outlined above and technically eligible proposals will be scored on the basis of following formula:

$$\text{Score} = 0.75 T + 0.25 F$$

Where  $T$  is technical score and  $F$  is financial score. The Bidder with the highest Score will be selected.