

**TERMS OF REFERENCE
for**

**Package SD-16: “Feasibility study for the implementation of Water Supply and Sanitation
Schemes under Proposed Municipal Water Supply and Sanitation Project”**

1. Background

The government of Bangladesh through the Department of Public Health Engineering had been implementing a provision of safe and sustainable water supply and sanitation services in 30 municipalities under the Bangladesh Municipal Water Supply and Sanitation Project (BMWSSP) funded by the World Bank - International Development Association (IDA) and Asian Infrastructure Investment Bank (AIIB). The project Implementation is funded on the fundamental principle of engaging private operators for smooth operation and maintenance of the said services in a sustainable manner.

In continuation of this, the World Bank (IDA) and AIIB have expressed their intention to support GoB to scale-up its water supply and sanitation (WSS) service provisioning to another 30 municipalities. Hence, DPHE wishes to prepare the investment project for water supply and sanitation services for 30 municipalities through conducting feasibility study, detailed engineering design and bidding documents under BMWSSP so that implementation can be started immediately on completion of BMWSSP.

In this context it is proposed to hire a competent, qualified, and experienced consultancy agency to assist DPHE in conducting a feasibility study, detailed engineering design with cost estimate and bidding document for implementation of water supply and sanitation services in the selected 30 municipalities.

2. Objectives

The objectives of this assignment are, (i) to update the existing set of selection criteria for preparing a ranking list and finalize 30 small towns out of 40 pre-selected (by DPH E) small towns; (ii) to conduct the feasibility study for water supply and sanitation services including required technical, financial and legal due diligence to assess the feasibility of outsourcing O&M of WSS; (iii) to prepare Detailed Project Report including detailed engineering design, detail estimates and bidding document in the selected towns. (iv) to undertake stakeholder consultation for obtaining community buy-in for the WSS services, pay for services and outsourcing of O& M of WSS.

3. Phasing of study

It is envisaged that the study would be undertaken in three distinct stages (a) Selection stage, (b) Feasibility stage (c) Detailed Project Report stage

4. Scope of Services

In all stages of consultancy activities, the consultant must communicate with concerned division of DPHE head office and local DPHE officials as and when required. Data gathered from field activities must be acknowledged by concerned officials.

4.1. Selection Stage

DPHE will prepare a short list of about 40 Pourashavas based on some preliminary criteria such as population, population density, present water supply (source – surface and ground water; availability, quality and distance from town (surface water) and depth (groundwater) and sanitation (household / public toilets, containment (pit / septic tank; condition), emptying (frequency, manual / mechanical and disposal), scenario, climate change vulnerability (cyclone, storm surges, tidal floods, bank erosions etc.) with emphasis on coastal areas, geographical distribution among all administrative divisions etc. This list is to be attached in Annex-A (This Annex-A will be attached in the final ToR). The consultants will update the existing set of selection criteria (emphasis on confirmation of availability of required land with clear title for different components of WSS services, source sustainability and climate vulnerability) to finalize the list of about 30 Pourashava for the investment project. They will share the criteria with the World Bank (IDA), AIIB and DPHE and hold a meeting to review the criteria and solicit feedback. Once the criteria are agreed upon, the consultants will undertake exclusive visits to each Pourashava.

The consultant will hold discussion with Pourashava authority on the object of the scheme with its infrastructure intervention and their roles and responsibility (what is needed from Pourashava i.e. land, tentative charge for services, time line etc.) After getting positive feedback the consultant will conduct sample survey of households to collect relevant data as per agreed criteria. The sample size must be based on any suitable statistical formula. Minimum 40 to 50 households (4 to 6 from each ward representing all classes of the community) from each Pourashava to be surveyed. After the analysis of the collected data, the consultant will prepare the ranking list of Pourashavas for implementing the water supply and sanitation services.

Again, the consultants will hold a meeting with the World Bank (IDA) & AIIB, and DPHE to present the findings of their quick review of the 40 Pourashavas and recommendation for selecting thirty potential Pourashavas.

Upon acceptance from the World Bank (IDA) & AIIB and DPHE, the consultant shall undertake the next phase of activities.

Deliverable A: Report on the Screening process and final recommendation of thirty Pourashavas with detailed justification for selection.

4.2. Feasibility Stage (feasibility study for short listed 30 Pourashavas in regard to Water Supply)

Consultants shall carry out detailed feasibility studies to assess the viability of investments in terms of technical, financial, environmental, and social aspects. The feasibility study shall include a socio-economic survey of the households (Domestic, institutional, commercial and industrial), a topographical engineering survey, hydrological and hydro-geological investigations for identifying the

location and type of source, geotechnical investigations, cost estimations, detailed financial and economic analyses, and all due diligence necessary for compliance with the World Bank (IDA) & AIIB and government environmental, resettlement and other guidelines.

The key activities to be undertaken in this phase shall include but not limited to the following:

4.2.1 Existing Situation Analysis:

Based on existing studies and available information and through research from other sources, preferably similar type project in Bangladesh and conducting field visit including field survey (***random survey following standard and suitable statistical sampling process***) the Consultant shall undertake the following activities:

Socio Economic Profile;

- Population status
- Housing pattern
- Literacy and Educational status
- Occupation and Income – Expenditure status
- Poverty and Vulnerability
- Land use
- Road network with types (RCC, CC, bitumen, HBB, BFS, earthen etc.) and owner of roads (such as Pourashava, RHD, Bangladesh Bridge Authority etc.)
- Cultural and Archeological status
- Organization (Public, private, institutional, commercial and industrial)
- Gender status

Existing Water Facilities:

- Available Water Sources (Surface and Groundwater)
- Sources of safe water for drinking, cooking, and other domestic purposes
- Number of households having own running water systems (domestic, institutions and organizations)
- Water quality problem based on water quality testing report.
- Water Consumption for drinking, cooking, and other domestic purposes
- Time for fetching water/distance of safe water source from HH
- Willingness to pay for water (tentative amount as per their livelihood)

Environmental Situation

- Sanitation status (types of latrines such as single pit, twin pit, septic tank)
- HHs having no latrine, having sanitary latrine, insanitary latrine, depending on shared / community latrine, public toilet with number of seat for men/women etc.
- Drainage status (existing drains, water logging, probable outfall points etc.)

- Solid Waste Management and Disposal (Existing arrangement for collection, treatment and disposal)
- Fecal Sludge Management (emptying practices – frequency, manual, mechanical, treatment and disposal; availability of trucks, etc)
- Health and Hygiene situation and coverage

Institutional Capacity Review

- Current institutional arrangement to provide existing (if) water supply and sanitation services (detail roles and responsibilities and capacity (technical and availability of personnel to deliver the services) and suggested institutional arrangement for delivery of services

Financial Review

The total financial strength of the Pourashava should be assessed including:

- current financial flow details for water and sanitation services like, capital expenditure for installing new tube wells and/or pumping equipment,
- operating expenditure for maintenance of tube wells and pumps if any, maintenance cost in provision of sanitation services especially fecal sludge and solid waste management if any,
- salaries for staff deployed in operations and maintenance (separately for water and sanitation services), outsourced contracting costs if any

4.2.2. Population and Water Demand Projection:

- Population Projection for Planning Perspective
- Design Population and Design Period
- Water Demand Projection for Planning Perspective over a standard project design life of 25 years
- Design Water Demand including domestic, commercial/industrial, institutional and other users on the basis of present and future consumption patterns and other known parameters

4.2.3. Identification of Water Sources:

Carry out full-fledged hydrological and hydro-geological surveys and investigations in the scheme areas for selected Pourashavas.

For groundwater - the consultant is allowed to conduct minimum 3 numbers of 4 inchx2 inch test boring at suitable locations to assess the potential yield of the aquifer, flow and water level measurement at different seasons, water quality testing including all parameters required for safe water assessment and identification of sustainable water source. The costs for test boring and pumping test will be reimbursed (from the Provisional Sum) upon submission of necessary documents. The consultants will submit its program for installation of test wells, necessary

assessments, and water quality testing including name of laboratories and sampling procedures to the PMU and obtain necessary approval before initiating the work.

- i. For surface water - the consultant needs to collect data for at least one-year (lean, high tide and low tide period)

from concerned authorities and cross-check the relevant data with primary data collected by consultants. The consultants will submit its program for the collection of water samples, sampling procedures and the name of the laboratory prior to initiating the work before the PMU for approval.

The following activities but not limited to be carried out to explore the sources are:

Groundwater Sources

- a. At least 10 existing tube wells for each Pourashava (multiple-layer representative) in and around the Pourashava to be surveyed for collection of:
 - i. Latitude and Longitude
 - ii. Depth to Water Table/Piezometric Level
 - iii. Well Depth
 - iv. Water Quality (arsenic, iron, manganese, alkalinity, total hardness, chloride, EC, TDS, pH, nitrates) using field kits and 20% lab test for cross checking (cost for kits and lab will be borne from provisional sum)
 - v. Current and Long-term Water Level
 - vi. Flood Level
 - vii. Data Analysis of the existing tube wells (graphs, illustration, maps, etc.) surveyed and identifying productive and safer aquifers and locations for test tube wells installation with the intention of production well installation.
 - viii. The consultants will submit its program for installation of test wells, necessary assessments, and water quality testing including name of laboratories and sampling (following standard sampling protocol of DPHE) procedures to the PMU for approval prior to initiating the work.
- b. Data Acquisition from Test Tube Wells at least 3 nos. of 4 inch by 2-inch diameter TTWs for each Pourashava
 - i. Latitude and Longitude
 - ii. Litho-stratigraphy to be prepared following the standard bore log format of DPHE and to be shared with ground water circle of DPHE (hard and soft copy)
 - iii. Hydro-stratigraphy
 - iv. Aquifer properties (by conducting step-drawdown test, 24-hour pumping test, and recovery test)
 - v. Grainsize Analysis
 - vi. Depth to Water Table/Piezometric Level

- vii. Water quality (arsenic, iron, manganese, alkalinity, total hardness, chloride, EC, TDS, pH, nitrates) testing by using field kits and at nearby laboratory of DPHE.

c. Designing of Production Well

Surface Water Source Investigation

- b. Availability of water (for all nearby water bodies)
 - i. Water flow, water level and water quality at least for one year (lean, high tide and low tide period) to be measured as part of primary investigation
 - ii. Siltation (sedimentation that is deposited at the bed of river /lake)
 - iii. Mapping of In-flow and out-flow through tributaries and distributaries
 - iv. Aquatic (fauna) habitat and livelihood
 - v. Existing water demand for irrigation and industry (if any) from this source
 - vi. Impact on irrigation and industrialization while water to be withdrawn from this source for domestic demand
 - vii. Dependable flow analysis
- c. Development of flow duration curves for the mean, as well as minimum and maximum
- d. Quantification and mapping of upstream contaminant or pollutant source identification (if any)
- e. Water quality analysis (parameters such as DO, BOD, COD, NH₃, NH₄, NO₃, PO₄, Pb, Cr, Cd, Cl, TDS, salinity, SO₄, Hg, Total Coliform, Alkalinity, total organic carbon, turbidity, pH, temperature etc. Depending on the geographical location, and hydrological and environmental considerations, the consultants will submit its program for the water quality analysis. The program shall include names of parameters to be tested, the sampling procedure, and the name of the laboratory. Consultant will collect the water sample and make arrangement for testing in the nearby DPHE laboratory

Recommendation of Water Source

4.2.4. Selection and Finalization of Infrastructure (components) for Water Supply System:

Based on the available water quality and quantity, the consultants shall select the optimum components for the water supply system including suitable options for treatment (if required) considering its appropriateness in terms of local operating environment, operational requirements and, limitations if any.

4.2.5. Detail Hydraulic Design

The consultants will undertake a detailed hydraulic design of all infrastructure components for the water supply system. The key tasks essentially include but not limited to the following:

Design Criteria.

The consultant will establish specific design criteria for each component of the proposed water

supply system considering the following issues:

- Water Quality and Quantity Requirements. Establish the specific water quality and quantity requirements for the project compliant with official regulations.
- By-products Processing and Disposal. Identify potential by-products and address processing and disposal thereof compliant with official regulations.
- Safeguards Requirements. Establish environmental and social safeguards requirements.
- Design Standards Adopted. Establish the design standards to be adopted that meet the requirements of the users/clients.

Key Performance Indicators. Establish a set of KPIs for an efficient, energy saving and sustainable water supply system.

Design Analysis.

- Water Resources: Establish the quantity and quality of water supply sources (groundwater or surface water) including diurnal, seasonal, or long-term variations depending on project type.
- Treatment Process and Evaluation of Options. Establish options for efficient and effective treatment processes appropriate for the project type; technologies shall be matched with logistical realities (space, power and availability of skilled personnel) in the study area and existing quality of the water.
- Treatment and Disposal of By-products. Identify and establish quantity and quality of by-products and recommend appropriate treatment and disposal alternatives
- Assessment of Network Alignment considering both Horizontal Directional Drilling (HDD) and open trench cut.
- Assessment of the suitability of using District Metered Area (DMA) concept.
- Power Requirements. Determine energy requirements of the project during construction and operation. The whole system should be designed as an energy-efficient system. Solar panel and power backup system need to be considered.

Hydraulic Design

The consultant will undertake the hydraulic design of all selected components such as source,

pumping plant, transmission pipeline, treatment plant (with process design) , storage reservoirs, feeder and distribution networks, etc.

Preliminary Design Drawings:

Establish adequate preliminary design drawings that realize the project plan. Preliminary design drawings should include, but not limited to, location plans, general system layout/arrangement, flow diagram for major components of the water supply system with the tentative capacity of each, network plan, and elevation including schematic drawings for all components.

Finalize the location of different components of proposed Water Supply System such as water sources (site for proposed Production Wells in case of Ground Water and intake in case of Surface Water), functional building, treatment plant (if required) and other infrastructure relevant to Water Supply System. Legal documents of all the sites from the Pourashava must be collected during the feasibility stage without which further development cannot be started.

Physical Feature Map

Prepare a map showing all existing physical features including:

- Road network and type including waterways within the proposed pipe alignment
- Locations of all public buildings, school-college, religious places, rail lines, and other notable features.
- Location of different components of the water supply system
- Electric power lines (connected national grid) indicating information such as type of phase and voltage

4.2.6 Environmental and Social Safeguards Assessment:

- The consulting firm will carry out Environmental and Social (E&S) Risk Assessment of the proposed project activities as per the requirements of the World Bank's Environmental and Social Framework (ESF, <https://www.worldbank.org/en/projects-operations/environmental-and-social-framework>) and also meeting the regulatory guidelines and requirements set forth by the Bangladesh Department of Environment (DOE). The consultant will conduct detail ESIA following ESF with 10 standards for the activities that would be known during this assignment. The consultant will also prepare other Environmental and Social (E&S) instruments (e.g., Resettlement Action Plan (RAP), Stakeholders Engagement Plan (SEP), Labor Management Procedures (LMP), Gender and SEA/SH Action Plan, etc.) that would be needed to fulfill the ESF requirements. The consultant will prepare an ES Management Framework (ESMF) for the components/sub-components/activities of which locations and detail design will not be ready during this study. The consultant will also prepare the ToR for carrying out specific ESIA for such activities at later stage following ESMF. To carryout ESMF, the consultant will prepare the ESIA

report.

- Review and update the existing Environmental Management framework and Social Development Framework already prepared for similar typed project of DPHE
- Prepare the Environmental and Social Management Plan in line with the Environmental Management Framework and Social Development Framework developed under the project
- Impacts and Mitigation. Evaluate all possible environmental and social impacts of the scheme and ways to mitigate them.

4.2.7 Stakeholder consultation

- Organize stakeholder consultation **(1 for each Pourashava)** through focused group discussions (FGDs) with the public representatives, Pourashava's representatives, community leaders, NGOs, CBOs, etc. and present the proposed WSS service delivery option with the corresponding tariff/revenue requirements
- Obtain feedback from the FGDs and clarify any apprehensions on the planned service delivery option, quality of service required, user charges and other issues and obstacles, if any.

Deliverable B: Feasibility Report focusing on technically, environmentally, socially and economically viable of the water supply project.

4.3. Detailed Project Report Stage (Water Supply)

Upon approval from DPHE on the feasibility report, the consultant shall undertake full-fledged engineering design and costing of each of the scheme. The key tasks essentially include but not limited to following.

4.3.1. Engineering Surveys

- a) Carry out soil investigation at the proposed locations for installing the water supply infrastructure, such as, water reservoirs, water treatment plant, pumping stations etc. In this connection at around 3 to 7 nos. borings per each Pourashava to be done for soil investigation **(number may be varied as need for the design purposes)**. The cost of soil investigation will be reimbursed upon submission of necessary documents from the Provisional Sum.
- b) Carryout detailed topographic surveys using Total Station Equipment to establish the alignment, elevations with Geo-reference along the with the routes of proposed transmission and distribution mains and access roads including block leveling of the identified land proposed for construction of water reservoirs, intake structures, pumping stations and water treatment plants

4.3.2. Detailed Engineering Design

The Consultant shall prepare detailed engineering design of each facility that will cover details of on-site preparatory tasks, layout facilities, landscape, architectural and detailed structural design of source, pumping plant, treatment plant, storage reservoirs, mechanical works including piping works and installation of pumps and other equipment, and electrical works including instrumentation and control system. Consultant shall have to submit the hydraulic and structural calculation of final engineering design of above mentioned infrastructure in the

form of soft and hard copy.

4.3.3. Network Design:

The transmission and distribution network is composed of links and nodes. The links represent the pipes to be installed; nodes represent public faucets (demands), road intersections, tanks or reservoirs and water sources. The recommended methods on how to prepare the schematic network diagram are the following:

- All pipes in the system should be shown with corresponding distinct number and length based on the output of the topographic survey
- Each node should be given distinct number and elevation based on the topographic survey
- Public faucets of water demands should be assigned to nodes indicating the number of households served
- Tanks and reservoir should be placed in a node that represents the location in the service area

Based on actual network (as per site specific demand) diagram, hydraulic analysis is to be done using EPANET/Water Gem or similar programs to check the residual pressure at each end node especially furthest node from supply source. The designed network should be tested for reliability/sensitivity. If any major pipe breaks or water supply is stopped in a certain area for maintenance purpose, the rest of the network should be able to supply a considerable amount of water to the consumers.

Considering longevity, durability and less repairing and maintenance issue, HDPE pipe is technically suitable. So, HDPE pipe should be used for pipe line network

4.3.4. Detail Engineering Drawing:

The detail engineering drawings shall be based on the final selected alternative or final configuration of the proposed water supply system. Detailed engineering drawings should include at least the following:

- Cover page
- Topographic map
- Table of contents and vicinity map and location map
- Legends and symbols
- Key plan of delineated area
- Plan of water supply facilities
- Profile of transmission and distribution pipelines
- Pipe trench details and public faucet or service connection details
- Pipe bridge, culvert and river crossing details when applicable
- Civil and electro-mechanical drawings for intake facility/production well, treatment plant, tank or reservoir, pump house, office buildings, pumping plant, networks for transmission & distribution pipe lines, piping gallery etc.

4.3.5. Detail Cost Estimate:

Capital Cost: The cost estimate to be prepared based on approved detail engineering drawings with relevant technical specification of the water supply system. The cost estimates include the costs of materials, labor, equipment and other specialty services to complete the water supply facility. The cost estimate need to be prepared based on latest rate schedule of

DPHE/PWD/LGED. Rate analysis to be needed with respect to market price of the particular item of work which is not available in latest DPHE/PWD/LGED schedule. The derivation of unit costs should consider the availability of construction materials and labor in the project area. Other costs of water supply items could be based on the latest “in-place cost” prepared by DPHE or recently completed nearby potable water supply projects.

Operation and Maintenance Cost: Develop a detailed O&M plan which shall comprise of operating & maintenance strategy, water safety plan, the requirement of operating staff, requirement of energy, chemicals, and other consumables, repairs and maintenance and depreciation and assess the resultant operating cost.

4.2.6 Financial Analysis:

Conduct financial analysis using the tentative costing for O&M to calculate the water tariff considering depreciation cost for short lived asset for future replacement and regular repair, operation and maintenance issues. The consultant may review the existing tariff calculation sheets and update as per requirement of this project.

4.3.7 Operating Requirements.

Establish the operating requirements of the facility or network towards establishing performance-based specifications meeting the needs of the users/clients and compliant with official regulations.

4.3.8. Detail Implementation Plan:

Detailed implementation plan for construction management, quality control and commissioning of each subproject using the scientific method, such as Critical Path Method (CPM) to be prepared

4.3.9. Service Delivery Option

Prepare appropriate service delivery options considering WS & S services deliver either by Pourashava or by a private operator. The service delivery option should cover the planned service delivery mechanism, institutional set-up, and implementation arrangement with the respective roles and responsibilities of each proposed stakeholder. The consultant should compare the options, identify the pros & cons for each option and recommend the appropriate service delivery option for water supply and sanitation (on-site) separately with wherever possible services through private operator with proper justification.

4.3.10. Engagement of Private Operator:

The consultant shall:

- review and customize the existing Term of Reference for hiring private operator to carry out operation and maintenance of the water supply system
 - prepare bidding document to engage Private Operator
- Assess the availability and strength of private operators in the country

4.3.11. Detailed Engineering Design Submissions:

The detailed engineering design should be submitted containing the following basic documents:

- Design Report
- Design Plans and Specifications
- Hydraulic Analysis with detailed calculation
- Structural/Electro-Mechanical Design and Calculations
- Program of Work (Cost Estimates)
- Detailed Drawings
- Construction/Implementation Schedule

4.3.12. Detailed Project Report (DPR):

Detail Project Report should include detailed design report along with water distribution network modelling, Detail Estimates, Economic and financial analysis etc.

Deliverable C: Detail Project Report

4.3.13. Procurement

- Based on approved Detailed Engineering Design, the consultant shall prepare the bid documents for different packages (as per prior consent of PMU) using the standard procurement procedures and considering the World Bank procurement guidelines
- Bid documents for each contract package should include respective BoQ, detailed technical specifications for materials, equipment, instruments, methods of construction of civil works and methods of installation and fabrication for mechanical and electrical works, among others.

Deliverable D: Bid documents for thirty schemes

(i) to implement the water supply system and

(ii) to engage Private Operator to O&M the water supply system

4.4. Feasibility of Sanitation Facilities

Objective and scope of the assignment

- The scope of activities will include but not be restricted to, the following:
 - i) *Household sanitation improvements*
 - Carry out quantitative data collection through household survey following standard sampling method acceptable to the client. Incorporate the survey data in a database.
 - Collect qualitative data on household sanitation through discussions with pourashava/ key informants and field visits to capture all types of arrangements in the pourshava
 - Identify numbers household having no latrine
 - Identify number of households resorting to open defecation, dependent on shared /community and unimproved sanitation in each Pourashava.
 - Identify poor households with insanitary toilets / shared toilets and estimate the subsidy that is needed for sanitation improvements.

- Assist Pourashavas to identify other (non-poor) households for providing them with sanitation options.
- Assess the current emptying practice (frequency of emptying pits and septic tank; who provides service (Pourashava or private (formal / informal); charges for services) and disposal practices
- Estimate number and capacity of trucks to evacuate the fecal sludge considering accessibility to household and containment structures.
- Suggest a suitable treatment option (trenching or FSTP) which is technically and financially viable for that specific Pourashava
- Collect data on solid waste generation, collection, transportation, disposal
- Collect information on who provides service; available equipment, manpower
- Suggest a suitable solid waste management plant that is technically and financially viable for that specific Pourashava

Deliverable E: Report on Sanitation Facilities which includes

(i) Paurashava Wide Sanitation Assessment Report

(ii) Paurashava Wide Sanitation Improvement Plan

4.5. Feasibility Studies on Storm Water Drainage Development Works

Objective and Scope of the assignment

The objective of the feasibility studies on storm water drainage system is to:

- Assess the present drainage situation,
- Identify the future requirements
- Suggest improvement of the drainage network

This will require:

- Collect all the topographical features of the existing drains
- Locate (with type) the water logging and drainage issues in different areas,
- Locate the probable outfall points,
- Water level (maximum & minimum) in the outfall rivers / canals
- locate the suitable alignments of the main drains (primary or Secondary) and the nearest effective outfall points to drain out the maximum drainage discharge from the water logging areas.
- Prepare maps with existing drainage situation and the proposed drainage plan for future development.

Deliverable F: Report on Drainage Facilities which includes

(i) Assess the present drainage situation

(ii) Identify the future requirements

(III) Suggestion for improvement of the drainage network

5. Timelines and Deliverables

The following time lines and the deliverables govern the contract:

After the commencement of contract	Deliverable
1.0 month	Inception Report comprising of details of team mobilization, Gantt chart showing detailed activity plan on each phase of scope of services
4.0 months	Deliverable A: Report on Screening process and final recommendation of thirty towns with detailed justification for selection.
6 -18 months (12 months) Report on 10 Paurashavas after each 4 months	Deliverable B: Feasibility Report focusing on socio-economic survey of all the households, topographical engineering survey, hydrological and hydro-geological investigations for identifying the location and type of source, geotechnical investigations, cost estimations, detailed financial and economic analysis for thirty scheme. Resettlement Action Plan (RAP), Stakeholder Engagement Plan (SEP), Gender and SEA/SH Action Plan, and Labour Management Procedures (LMP)
12-24 months (12 months) Report on 10 Paurashavas after each 4 months	Deliverable C: Detail Project Report including detailed design report along with water distribution network modelling, Detail Estimates, Economic and financial analysis etc. for 30 schemes First draft ESIA
9-23 months (15 months) Report on 10 Paurashavas after each 5 months	<i>Deliverable D: Bid documents for thirty schemes</i> <i>(i) to implement WSS options/services and</i> <i>(ii) to engage Private Partner to O&M the water supply and sanitation services under Management Contract.</i> Final versions of ESIA, Resettlement Action Plan (RAP), Stakeholder Engagement Plan (SEP), Gender and SEA/SH Action Plan, and Labour Management Procedures (LMP)
5-23 months (15 months) Report on 10 Paurashavas after each 5 months	Report of sanitation facility includes: i) results of field surveys, ii) city sanitation improvement plans,
5-23 months (15 months) Report on 10 Paurashavas after each 5 months	Report of drainage facility includes: i) Assessment of the present drainage situation, ii) Identification of the future requirements , iii) Suggestion for improvement of the drainage network
24 month	Draft final report
25 months	Final Completion Report

Table-A:																											
Activities/ Deliverables	Months																										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		
Inception report																											
Report on Screening process and final recommendation of thirty towns with detailed justification for selection																											
Situation analysis for 30 Paurashavas																											
Survey of existing 10 TTWs and available SW if exists																											
Installation of 3 TTWs in each Paurashava																											
Selecting component of WSS and its hydraulic design and preparing feasibility report.																											
Detail Project Report for 30 Paurashava																											
Bidding Documents for water supply																											
Report of sanitation facility: i) assessment report, ii) city sanitation improvement plans,																											
Report of drainage facility includes: i) Assessment of the present drainage situation, ii) Identification of the future requirements , iii) Suggestion for improvement of the drainage network																											
Draft completion Report																											
Final Completion Report																											

Note: In case of failure to deliver the above reports by proposed man-months, the cost for extra man-month to complete the reports shall be borne by the consultant.

5.1. Format of Reports

All reports shall be delivered in sets of at least 10 copies and shall be in English. The soft copies of reports shall be in Microsoft Office 2010 version or as updated during the term of project. The descriptive reports shall be in MSWord and financial analysis in MS Excel as the case may be. All drawings shall be in AutoCAD 2012 format or updated during the term of project.

In addition, all feasibility reports need to be prepared following the standard feasibility report format of planning commission and submit to PMU (hard and soft copy)

5.2. Office Space

DPHE shall provide space for the consultants' office. The Consultants have to arrange all furniture, office equipment and other logistic support to their staff. The consultant staff shall work full-time on the project under the direct supervision of the Team Leader / Deputy Team Leader who shall be reporting to the Project Director in day-to-day affairs.

5.3. Duration of the Consultancy

The duration of the consultancy services shall be 25 months or project closing date or credit/loan closing date, whichever is earlier. The total towns may be addressed in a number of phases, the number of towns in each phase would be determined during the implementation period. Thus, the consultants will be required to perform the tasks on a rolling basis to cover the Pourashavas in phases that must be reflected in their planning and manning schedule.

5.4. Ownership of Documents

- a) DPHE shall be the owner of all the software, design, reports, modules, manuals, and other documents prepared and equipment procured under the project.
- b) After completion of the project all documents/results/tools and equipment and all necessary software should be handed over to DPHE before final payment.

6. Requirement of Staffs

Services of all Experts, Consultants, Professionals and Engineers are subject to field visit as and when required i.e. above personnel must visit the field for gathering the required data to deliver concerned report/document etc.

The Consultant shall be required to deploy to DPHE an appropriate team consisting of professionals as per the requirements mentioned below. The Consultant should include the number and the level of people to be deployed along with timeframes as indicated. The expectations on the resources that would be proposed for the project are as follows:

The core team should have experts as stated below.. The indicated core team requirements are the mandatory minimum required and the Consultants shall estimate the actual requirements or the core team and support team as per the work plan and staff deployment plan and propose the

additional staff required for ensuring the deliverables at the specified timelines.

The consultant shall ensure that the appropriate team shall be deployed on an exclusive basis in order to ensure the required coordination with DPHE and to complete the project or tasks assigned.

Since an array of disciplines is required from time to time, the Consultant should propose a resource pool across disciplines, which should be approved by DPHE.

Through the resource pool, the Consultant shall ensure access to services of its technical, social, commercial, financial, and other experts, as and when required enabling Experts to give all-inclusive comment / opinion on the queries / matters forwarded by DPHE.

Consultant shall ensure that services of the resource team are provided full-time for the contractual period

Requirements of Key Staff, Qualifications and Experience:

A. Team Leader/ Water Supply Specialist (1):

Qualifications and Experiences:

The Team Leader/ Water Supply Specialist will be graduate in Civil engineering with master's degree in water supply/environmental/water resource/public health engineering and relevant disciplines with work experience of more than 20 yrs. She/he will have about 15-year experience in the field of planning, design and implementation of water supply project in Bangladesh. S/He will have a working experience minimum 5 years as a team leader/deputy team leader. S/He should have good communication skills, be familiar with participatory approaches to project design and implementation and be able to assist in the capacity building and training program.

Tasks and Responsibilities:

1. The Team Leader cum Water Supply Specialist will be responsible for (but not limited to) the following:
 - i. Lead the TA, and is responsible for overall management and supervision of the consultant team and liaison with members of the PMU, PIU and government counterpart;
 - ii. Review and assess existing studies, documents, and other available information relevant to the water sector;
 - iii. Incorporate the lessons learned from the previous project in project planning and design, especially in the establishment of a Human Resource Department and in the monitoring of regular keeping of inventory in city corporation/pourashava; and
 - iv. Prepare a comprehensive, high quality feasibility study, institutional modality, detailed engineering designs and documentation, and project proposal acceptable to donors and the government.

B. Deputy Team Leader/ Water Supply Engineer (1):

Qualification and Experiences

Graduate in civil engineering with master's degree in water supply/environmental/water resource/public health engineering or similar / relevant discipline with a minimum of 15 years relevant working experience, including at least 10 years experience in hydraulic and process engineering design, detailed engineering, and implementation of water supply transmission, distribution and water treatment plant. She/he should have good communication skills, and be able to assist in the capacity-building and training program.

Tasks and Responsibilities

Deputy Team Leader/ Water Supply Engineer will be responsible for carrying out the following tasks in association with the Hydraulic and Network specialist/ Structural Engineer and other consultants in the consultant team:

- i. Closely monitor the feasibility study including field survey and investigation
- ii. Forecast/estimate water supply demand of the town for 25 years design period including the demand of nearby town/township through clustering;
- iii. Analyze raw water quality and select the components of the water supply system such as intakes, raw water storage, pump station, treatment plants, reservoir, bulk water facilities, transmission, distribution networks, etc.
- iv. Complete the hydraulic and detailed design of the intake, collection, and treatment plant and assist in the design of transmission and distribution facilities;
- v. Guide the junior Engineers in conducting relevant field surveys and preparation of bill of quantities, cost estimates, drawings, specifications, and bid documents for water supply contract packages;
- vi. Assist team leader in planning and designing a service delivery mechanism through outsourcing or Pourashava;
- vii. Assist team leader to define the service delivery modalities
- viii. Assist team leader in preparing the O&M manual

C. Senior Hydrogeologist (1):

The senior Hydrogeologist should be a postgraduate in geology, hydrogeology, water resources engineering, or relevant specialization with at least 15 years of working experience in water supply/treatment plant project. Minimum 10 years of experience in hydrogeological/ groundwater assessment studies, preparing litho-stratigraphy borehole logging, surface geophysical interpretation, hydrochemistry, well design, pump/ aquifer test design, especially for groundwater usage for public water supply systems;

Tasks and responsibilities

Senior Hydrogeologist will be responsible for carrying out the following principle tasks in

association with the mainly junior hydrogeologist and other consultants in the consultant team:

- i. Guide the junior hydrogeologists in conducting a detail survey for exploration of water sources (ground / surface water)
- ii. Examine the collected data of existing operational wells, especially bore logs to distill information on aquifer conditions and related lithological data
- iii. Prepare a report on findings and provide guidance for drilling new test wells
- iv. Closely monitor the installation works of new wells in context to well development, long-term pumping test, draw down test, water quality test, etc., and finally design the production well
- v. Collect and analyze the data to define the hydrological setting of the nearby potential surface water source to confirm the sustainable water source for the target towns.
- vi. Contribution in the preparation of reports regarding source exploration and finalization.

D. Social Development Specialist (1):

The social development specialist should be a postgraduate in Sociology/ Anthropology/ Social Welfare, or relevant with specialization with at least 12 years of working experience in social mobilization with a focus on improving water supply, sanitation, and personal hygiene in urban communities;

Tasks and responsibilities

Social Development Specialist will be responsible for carrying out the following tasks in association with the sanitation specialist, junior Social Development Specialist, and other consultants in the consultant team:

- i. Guide the junior Social Development Specialist in conducting a detail field survey regarding social issues.
- ii. Locate and identify the communities in the scheme areas and document their current practices for paying for urban services;
- iii. Mobilize community members, women's groups, vulnerable groups etc. and raise awareness about the objectives and how to participate in the project
- iv. Closely work with the community-level workers in the scheme areas
- v. Mobilize communities to participate in the water supply and sanitation improvement processes and capture their voice and ideas

Closely works in resettlement and gender issues for preparation of resettlement and gender action plan

- vi. Contribute to preparation of reports on social intervention.

E. Financial Management Specialist (1):

Graduate degree in Financial Management/Business administration or related field and be a chartered

accountant (CA) or certified public accountant (CPA) or equivalent with at least 12 years professional experience in relevant field. Minimum 5-year experience in financial and economic analysis including modeling, preparing balance sheets, cost and revenue projections in infrastructure sector. She/he should have good communication skills, and be able to assist in the capacity building and training program.

Tasks and Responsibilities

The FMS will be responsible for (but not limited) to perform the following responsibilities:

- i. Conduct economic analysis of the project, including (i) demand analysis, (ii) least economic cost analysis, (iii) economic cost and benefit analysis, (iv) economic internal rates of return, (v) average incremental economic costs, (vi) sensitivity analysis, (vii) risk analysis, (viii) benefit distributional analysis, (ix) poverty impact ratios, and (x) assessment of subsidies, and (xi) other relevant works.
- ii. Review tariff policies, current tariff levels and structures, and collection mechanisms for water supply services.
- iii. Recommend suitable tariff structure and user charges.
- iv. Assess the pricing of services for the poor, willingness to pay, ability to pay of different user groups, and cost-sharing mechanisms.
- v. Assist PMU in preparing bid documents and negotiating the contracts regarding financial matters.

F. Structural Engineer (1):

Graduate degree in Civil Engineering preferably masters in structural engineering with at least 12-year experience in designing civil structure out of which minimum 5-year experience in water supply and sanitation infrastructure or relevant projects. She/he should have good communication skills, and be able to assist in the capacity building and training program.

Tasks and Responsibilities

The Structural Engineer will be responsible for (but not limited to) the following:

- i. Collect sub-soil/geotechnical data of the building sites of water supply and sanitation infrastructure.
- ii. Assimilate appropriate design criteria for the structural design of the WSS infrastructure
- iii. Perform all structural design of civil works for water supply and sanitation infrastructures such as at intake, pump station, treatment plant, overhead tank, any other buildings, etc. using the standard structural design practices.
- iv. Preparing relevant structural drawings, specifications, design reports,
- v. Prepare the relevant construction manual incorporating the required construction/building practices and specifications conforming to standard requirements;

- vi. Assist to prepare the standard bidding documents
- vii. Assist in the preparation of detailed estimate and bill of quantities; and

G. Water Distribution Network Design Engineer (1):

Qualifications and Experiences

Graduate degree in civil/water supply engineering or similar/relevant discipline with a minimum of 10 years relevant working experience, including at least 5 years experience in network modeling, planning and design water supply systems and a thorough knowledge on the use of popular software, namely EPANET, WaterCAD, WaterGems etc.

Tasks and Responsibilities

Network Design Specialist will be responsible for (but not limited to) the following:

- i. Guide data processing and computation of field data including quality check of field surveys,
- ii. Assessing present demand calculation and future demand projection analyze the data using computer-based programme, and prepare the hydraulic design of pipe network.
- iii. Guide in preparing the drawing and specification of pipe network
- iv. Co-ordinate with DPHE for maintaining proper record of pipes and other facilities in digital form, including all works to be developed under the project;

H. Environmental Specialist (1):

Qualification and Experience

Master's degree in environmental engineering, environmental science or relevant discipline with at least 12 years of relevant working experience in the environmental field including at least 5 years professional experience in undertaking environment impact studies and developing environmental compliance protocols.in urban water supply and sanitation or relevant project.

Tasks and responsibilities

Environmental Specialist will be responsible for carrying out the following tasks in association with the other consultants in the consultant team:

- i. Review and update the existing Environmental Management framework already prepared for similar type project of DPHE in accordance with WB's Safeguard Policy and the country's legal requirements;

- ii. Assess government policies, experiences, institutions, and the legal framework for environmental assessment.
- iii. Prepare the Environmental and Social Management Plan in line with the Environmental Management Framework
- iv. Prepare the environmental impact assessment and/or initial environmental examinations, appropriate for each subproject.
- v. Evaluate all possible environmental and social impacts of the scheme and ways to mitigate them
- vi. Prepare all safeguard documents in meaningful consultation with project affected persons and communities as part of the safeguard documentation; and
- vii. Assist the DPHE in complying with WB's disclosure requirements.
- viii. Develop and undertake training program on environmental monitoring management to be followed under the project.

I. Electro-Mechanical Engineer (1):

Qualifications and Experiences

Graduate degree in Electrical Engineering /Mechanical Engineering or relevant with working experience about 10 years in design, selection and installation of relevant electro/mechanical components of water supply and sanitation infrastructure. She/he should have good communication skills, and be able to assist in the capacity building and training program.

Tasks and Responsibilities

The Electro-Mechanical Engineer will be responsible for (but not limited to) the following:

- i. Support to prepare/update the feasibility studies;
- ii. Perform all electrical and mechanical design works for water and sanitation infrastructures such as intake, pump station, treatment plant, overhead tank, fecal sludge treatment plant, solid waste treatment plant any other buildings, etc.;
- iii. Perform design of sub-station & standby power supply & well pumping equipment required for water and fecal sludge treatment plant
- iv. Collect relevant data, and information related to the electrical and mechanical design of schemes included above;
- v. Inspect and certify mechanical & electro-mechanical equipment, piping material,
- vi. Undertake detailed design, and prepare design reports including drawings; Assist in the preparation of detailed estimates and bill of quantities and specifications of all electro-mechanical items

J. GIS Specialist (1):

Qualification and Experience

Graduate in engineering, urban planning, and/or geography or similar/relevant discipline with at least 8 years of relevant working experience in designing and operating GIS systems in urban water and sanitation. She/he should have good communication skills, and be able to assist in the capacity

building and training program.

Tasks and Responsibilities

GIS Specialist will assist and be responsible to the Team Leader for implementing the following principle tasks:

- i. Prepare GIS-based maps required for subprojects;
- ii. Assist the consultant team in preparing and analyzing the GIS database and maps;
- iii. Provide GIS material for presentation purposes;
- iv. Develop and deliver on-the-job training to PIU and PMU staff; and
- v. Assist in any other task assigned by the supervising consultants as per requirement.

K. Sanitation Specialist (1):

Qualification and Experience

The Sanitation Specialist should be a post-graduate in Wastewater Engineering, Sanitary Engineering, Public Health Engineering, Civil Engineering or relevant with at least 12 years working experience in in the field waste management and at least 5 years working experience in solid waste and fecal sludge management in Bangladesh.

Tasks and Responsibilities

He/she will be responsible to the Team Leader and work closely with the Social Development Specialist, Junior Social Development Consultants, and other members of the consulting team and implement the following tasks:

- i. Assess the existing and projected sanitation systems in towns including quantity and quality of effluent from households, commercial, and industries;
- ii. Identify problems and opportunities for the provision, operation, and management of a sustainable sanitation system in town;
- iii. Prepare city sanitation improvement plan
- iv. Select appropriate sanitation technology options with alternatives and preferred options for sanitation improvements along the service delivery chain from access, containment, emptying, transport, treatment and disposal identifying gaps and options for improvement;
- v. Prepare a complete plan for access, containment improvement, fecal sludge/septage management systems from collection to treatment and final end-use/disposal in the context of Bangladesh;
- vi. Assist in preparing detailed design for solid waste disposal and fecal sludge disposal site and for maximizing opportunities for sludge after-use;
- vii. Prepare detailed cost estimates and specifications for proposed sanitation equipment (e.g. de-sludging vehicles and pit latrines/septic tanks);
- viii. Prepare operation and maintenance (O&M) manual; and
- ix. Design a sustainable service delivery operation with participation of private sector/outsourcing or community management and suggest tariffs to meet operation and maintenance costs.

L. Senior Drainage Engineer (1):

Qualifications and experience

Graduate in Civil /Water Resources Engineering with at least 15 years of experiences of which 10 years in the relevant subject that is in planning, design drawing of drains and drainage infrastructures)

Tasks and Responsibilities

Senior Drainage Engineer will be responsible for carrying out the following principal tasks in association with the junior drainage engineer and other consultants in the consultant team:

- i. Overall guidance in the collection of all the field data and information on the drainage system necessary to study and prepare the feasibility reports and list of the priority drainage work on completion of the Feasibility Studies.
- ii. Study all the collected data and information such as existing drainage situation, existing drains and the locations and conditions of existing outfall sources, topographical features and ground levels, catchment area under the existing and proposed drain layouts, rainfall data, etc.
- iii. Prepare the overall drainage layout plan and design sections of the drains mainly the primary and secondary drains and outfall structures following the hydrological analysis as well as hydraulic designs, etc.
- iv. Guidance the junior drainage engineer in preparing the cost estimates and conduct the economic and financial analysis to check and find out the feasibility of the project;
- v. Select the priority drains and prepare a list of these drains as proposal for preparing detailed design drawings, BOQ and cost estimates for implementation followed by the Feasibility Studies.

Requirements of Non-Key Staff, Qualifications and Experience:

A. Junior Hydrogeologist (5):

Qualification and Experience

Master's Degree in geology, hydrology, engineering geology, physical, or earth science, or in the related field with preferably 02 years of relevant working experience.

Tasks and Responsibilities

Junior Hydrogeologist will be responsible for carrying following activities with the senior hydrogeologist and other consultants in the team.:

- i. Collect and analyze hydrogeological data (aquifer characteristics, water table, water

- quality, litho- and hydro-stratigraphic data)
- ii. Carry out existing tube well survey for water quality, depth, water table, GPS data and decide suitable location and aquifer for installing test tube well.
- iii. Supervision and monitoring of test well drilling and record field data in a structured way.
- iv. Design tentative production well assimilating water quantity and quality data.

B. Junior Engineer (5):

Qualification and Experience

Bachelor's Degree in Civil / Water Supply / Water Resources Engineering with minimum 02 years' relevant experience.

Tasks and Responsibilities

Junior Engineer will be responsible for carrying following activities in association with Water Supply Specialist, Senior Drainages Specialist, Sanitation Specialist, and other consultants in the team.

- i. Collect relevant field data required for designing the water supply system, drainage facilities and sanitation improvement
- ii. Assist water supply engineer in the design of different components of the water treatment plant including its hydraulic design.
- iii. Assist structural engineer in detailed structural design of all components of water supply system
- iv. Prepare cost estimate for all components of water supply system
- v. Assist drainage engineer in preparation of drainage lay out plan, hydraulic design etc.
- vi. Assist sanitation engineer in preparation of lay out plan of integrated waste management facilities.

C. Junior Social Development Consultant (5):

Qualifications and experience

The social development consultant should be a postgraduate in Sociology/ Anthropology/ Social Welfare, or relevant with specialization with at least 05 years working experience in social mobilization with focus on improving water supply, sanitation and personal hygiene in urban communities;

Tasks and Responsibilities

Junior Social Development Consultant will be responsible for carrying out the following principal tasks in association with the Senior Social Development Specialist, Sanitation Specialist and other consultants in the consultant team:

- i. Collect relevant field data required for preparation of socio-economic profile of each Pourashava

- ii. Assist Sr. Social Development Specialist in analysis of socio-economic data and preparing feasibility report
- iii. Organize stakeholder consultation (1 for each Pourashava) through focused group discussions (FGDs) with concerned stakeholders to present the proposed WSS and drainage intervention of the project, service delivery option with the corresponding tariff/revenue requirements
- iv. Assist Sr. Social Development Specialist in preparation of resettlement and gender action plan

D. Procurement Expert (1):

Qualifications and experience

Graduate in engineering/ supply chain management/ commerce / finance/ business/ management/ law/environmental science or suitable equivalency having at least 10 years relevant experience in procurement.

Tasks and Responsibilities

The Procurement Expert will be responsible for carrying out the following principal tasks in association with other consultants in the consultant team:

- i. Ensure that procurement will be conducted at the district level and municipalities in accordance with World Bank Procurement Regulations and the procurement laws of Bangladesh;
- v. Help to conduct procurement activities under the project using CPTU's e-GP portal as applicable;
- vi. Prepare bid document in consultation with concerned consultants for concerned field.
- vii. Provide operational advice to municipal personnel on procurement under World Bank procurement guidelines;
- viii. Prepare contract, negotiation, work order and maintenance agreement, and other related documents;
- ix. Help to address the procurement related complaints, which will include (a) review of the complaints vis-à-vis the respective procurement processes and documents, and (b) participation in discussions that PMU members may have with complainants;
- x. Carry out all other tasks and activities as needed.

E. Quantity Surveyor (1):

Qualifications and experience

Diploma (with 6 years) / Bachelor (with 3 years working experiences in the relevant field) degree in Civil/Water Resource Engineering having knowledge on :

- i. PWD / LGED/DPHE rate including analysis and specifications.;
- ii. Current market rate and its incorporation in cost estimate.

Tasks and Responsibilities

The Quantity Surveyor will be responsible for preparation of cost estimate for all items of works in association with Structural and network consultant

7. Indicative Timelines and Level of Effort

An indicative estimate of personnel time required for this assignment is detailed as below:

SL. No.	Personnel	Number	Person Man month (Spread over 25 months)	Total Man Month
Key Staff				
1	Team Leader/Water Supply Specialist	1	25	25
2	Deputy Team Leader/ Water Supply Engineer	1	25	25
3	Senior Hydrogeologist	1	20	20
4	Social Development Specialist	1	20	20
5	Financial Management Specialist	1	15	15
6	Structural Engineer	1	15	15
7	Water Distribution Network Design Engineer	1	15	15
8	Environmental Specialist	1	12	12
9	Electrical - Mechanical Engineer	1	15	15
10	GIS Specialist	1	15	15
11	Sanitation Specialist	1	20	20
12	Senior Drainage Engineer	1	20	20
Non-Key Staff				
1	Junior Hydrogeologist	5	15	75

2	Junior Engineer	5	15	75
3	Junior Social Development Consultant	5	15	75
4	Procurement Expert	1	12	12
5	Quantity Surveyor	1	12	12
	Support Staff			
1	Auto Cad Operator	1	25	25
2	Office Assistant / Office manager for CTSU	1	25	25
3	Office peon	1	25	25