Annex-XII

TERMS OF REFERENCE (TOR)

for

Hydro-Geological Study for Urban area

under

"চট্টগ্রাম জেলার মীরসরাই উপজেলার উন্নয়ন পরিকল্পনা প্রণয়ন ঃ সার্বিক দুর্যোগ ব্যবস্থাপনাকে ভূমি ব্যবহারের মাধ্যমে সম্পৃক্তকরণ"

(Preparation of Development Plan for Mirsharai Upazila, Chattogram District: Risk Sensitive Landuse Plan)

URBAN DEVELOPMENT DIRECTORATE
Ministry of Housing and Public Works
Government of the People's Republic of Bangladesh
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APPENDIX 01
BCKGROUND INFORMATION OF THE PROJECT

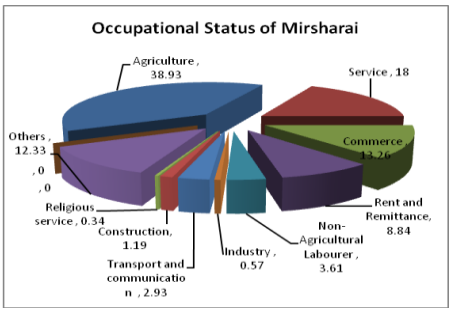
1.1. Project Background

Mirsharai Upazila (CHATTOGRAM DISTRICT) area 482.88 sqkm(BBS)/509.80sqkm(GIS Data), located in between 22°39' and 22°59' north latitudes and in between 91°27' and 91°39' east longitudes. It is bounded by TRIPURA state of India, CHHAGALNAIYA and FENI SADAR upazilas on the north, SITAKUNDA upazila and BAY OF BENGAL on the south, FATIKCHHARI upazila on the east, SONAGAZI and COMPANIGANJ (NOAKHALI) upazilas on the west. Mirsharai Thana was formed in 1901 and it was turned into an upazila in 1983. Mirsharai Upazila consists of 2 Municipality, 16 Union and 113 Mouza.

Mirsharai, the combination of lake and hilly area contains attractive scenic beauty on the southernmost part of Bangladesh. The most important attraction of the upazila is that one can travel Mohamaya Chara Lake by speed boat and explore hilly area and can enjoy Khoiyachora, Baghbiani, Napitachora, Sonaichora, Mithachora and Boyalia waterfalls. This area is located 192.2 km far from DHAKA and 4.5 hour bus journey. Anyone can travel by rail and it is 197 km of rail journey and it takes 4.5 hour from Dhaka to Mirsharai Upazila. 56 km from the CHATTOGRAM Divisional headquarters and takes 1.5 hour travel by bus. The Bangladesh Road Transport Corporation introduced a direct bus service from Dhaka to *Mirsharai* via comilla.(Source: Banglapedia,2012)

At Mirsharai Upazila main river is Feni; Sandwip Channel is notable; canal 30, most noted of which are Feni Nadi, Isakhali, Mahamaya, Domkhali, Hinguli, Moliaish, Koila Govania and Mayani Khal. The hills range on the northern and eastern side of this upazila along the bank of the Feni River extended up to Chattogram and the Chattogram hill tracts

Historical Events: Sultan Fakhruddin Mobarak Shah conquered Chattogram in 1340 AD and established the Muslim rule in this region. During the reign of Gaur Sultans Hussain Shah and Nusrat Shah, Paragal Khan and Chhuti Khan were the rulers of this area. Subsequently Nizam Shah, brother of emperor Sher Shah, was the ruler of this area. Nizampur Pargana is named after Nizam Shah and the whole area of Mirsharai came under the control of Nizampur pargana. From the beginning of the 16th century this region was very rich in Bangla literature. Most of the time between 1580 and 1666 this region was under the control of the Arakanese. The place at which (of the present Mirsharai thana) Bujurg Umed Khan, son of Subadar Sayesta Khan, landed after crossing the Feni River was named as Bujurg Umedpur. With the conquest of Chattogram by Bujurg Umed Khan in 1666, this region came permanently under the Mughal rule. Towards the end of British rule in India, Durgapur and Karerhat areas of Mirsharai upazila were the centres of revolutionary activities of Chattogram . A fierce battle was fought between the freedom fighters (under Capt. Wali Ahmed) and the Pak army at a place adjacent to the Fenafuni Bridge on the south of Mirsharai sadar in which about 100 Pak soldiers were killed. Besides, direct encounters were held between the freedom fighters and the Pak army at many' places including Shuvapur Bridge, Hinguli Bridge, Aochi Mia Bridge and Mostan Nagar.



Main occupations: Agriculture 38.93%, non-agricultural labourer 3.61%, industry 0.57%, commerce 13.26%, transport and communication 2.93%, service 18%, construction 1.19%, religious service 0.34%, rent and remittance 8.84% and others 12.33%. Total cultivable land 22,896.40 hectares, fallow land 147713 hectares; single crop 38.91%, double crop 42.46% and treble crop land 18.63%. At present Cultivable land under irrigation is 6,917.85 hectare. Ownership of agricultural land Landowner 51.30%, landless 48.70%; agricultural landowner: urban 38.82% and rural 52.09%.

Value of land : The market value of the first grade arable land is Tk 30000 per 0.01 hectare. Main crops Paddy, potato, aborigine, bean, tomato, pumpkin and radish. Extinct or nearly extinct crops Sugarcane, jute, arahar, mustard, sesame, linseed, ground nut. Main fruits Mango, blackberry, jackfruit, banana, papaya, litchi, pineapple, water-melon.

Communication facilities Roads: Pucca road 230 km, semi-pucca road 119 km, mud road 1435 km; railway 16 km; waterway 11 nautical miles, Rail junction 4. Extinct or nearly extinct traditional transport Palanquin, bullock cart. Noted manufactories Carpet industry, pipe mill, ice factory, rice mill, bakery, brick-field, steel furniture, fish- poultry' feed' factory, bidi factory. There are also Cottage industries, Goldsmith, blacksmith, potteries, weaving, tailoring, bamboo and wood work. Hats, bazars and fairs Hats and bazars are 52, fairs 5, most noted of which are Abu Torab Bazar, Kamar Ali Bazar, Bara Daroga Hat, Mahajan Hat, Karer Hat, Baraia Hat, Shantir Hat, Zorwarganj Baishakhi Mela, Baruni Snan Mela and Shadhinata Mela. Main exports product is Bamboo, fish, paddy, potato, banana, vegetables.

NGO Activities: Operationally important NGOs are BRAC, Proshika, ASA, Sheba, CARE, and Hunger Project. Upazila health complex 1, family planning centre 16, satellite clinic 11.

Opportunity: Bangladesh can earn money in local and also in foreign exchange by opening a tourist resort at *Mirsharai*. The spot, if properly developed will become an excellent holiday resort and tourist centre. Rowing facility can be arranged easily; fishing and hunting facilities are already there. The success of developing *Mirsharai* as a tourist centre and Special Economic Zone depends much on good communication facilities and availability of modern amenities. Moreover, the proposed *Special Economic Zone* would generate many industry related new activities including huge vehicular traffic such as air, rail, road and water. This phenomenon would have both positive and negative impact on the socio-economic condition and existing land use pattern of the region. The proposed planning package would guide such probable changes in the socio-economic condition and land use pattern of the region, and would also address the adverse impact of such changes.

The proposed project would be prepared on a regional development perspective considering the region as a part of whole of Mirsharai Upazila and its 16 unions. In this development planning package since its location is strategically important from the regional context because this upazila is situated on the way to Dhaka Chattogram highway as the highway runs through this upazila.

Description of the Project Area: A detailed description of the Project Area is given below:

Table: Area, Population and Density of the Project Area:

	Union	Mouza	Village	Population		Density (per sq km)	Literacy Rate (%)
				Urban and Other Urban	Rural		
	16	103	208	31206	367510	826	55.1

Source: BBS, 2011

Mirsharai sea beach, hilly area, Mohamaya Chara Lake, Khaiya Chara region has the greater potential for tourism development as there are abundant resources to attract tourists. Mirsharai is developing in an unplanned and haphazard manner very rapidly due to the ample opportunity for tourism development, which is acting as pull factor for private sector developers. Hence, this project has been under taken to protect the region from depletion of its natural resources and character and tourism development as well.

Moreover, honorable MoHPW Minister expressed his heartiest interest to develop char of this Upazila as an exclusive economic zone; as well as to establish a tourist zone and economic zone covering Mirsharai upazila.

1.2 Objectives of the Project

The objective of the project is to optimize coastal resources and activities for sustenance of marginal people. The coastal activities and resources are very important to the economy and life of the people of Bangladesh whose living conditions are inextricably linked to the productivity and sustainability of coastal zone. There is no long term Holistic Development Plan for the coastal zone. Coastal zone needs to be integrated with the mainstream of development process of the country. So, an interdisciplinary development planning approach is

urgent to optimize livelihood of coastal zone. The Physical development planning problems, needing attention, are as follows:

(i) To integrate coastal zone with the mainstream of development process of the country.
(ii) To frame policies for the best use of land and its control for the Mirsharai Upazila.
(iii) To optimize coastal environment for sustenance of marginal people.
(iv) Formulation of Policies and plans for mitigation of different types of hazards, minimizing the adverse impacts of climate change and recommend possible adaptation strategies for the region.
(v) Formulation of Policies and plans for gradual nucleation of settlements with policies and plans for development of growth centers of the area.
(vi) Formulation of a planning package for development of tourism in Mirsharai Upazila, and also to accommodate future changes in existing land use pattern, socio-economic condition of the area and quality of life of the people due to establishment of the third sea port in the region in an integrated and comprehensive manner.

APPENDIX 02

Scope of Work

The aim of hydrology and hydro-geological study for the study areas of Mirshari Region is to identify the surface water body and aquifer of the region including its seasonal variation. The study is also intended to identify the availability fresh ground water, which would be required for the additional people including tourists after implementation of the project. The hydrological and hydro-geological data and information shall have to integrate from survey program.

With a view to the attain the aim of hydrological and hydro-geological study of Mirshari Upazila, the objectives of the work comprises the following:

a) To identify the surface water body and their management for sustainable management.
b) To identify the aquifer level of the region including its seasonal variation.
c) To identify the areas potential for drawing fresh ground water.
d) To develop a seasonal fluctuation model of regional ground water table.
e) To prepare a 3D model of individual aquifer with lateral extension
f) To develop a water quality map
g) Finally, develop a hydro-geological model for the study area to know the ground water quality and aquifer extension.

Integration of hydro-geological study into land use planning to develop ecology sensitive land use planning package is a new endeavor in the land use planning process of Bangladesh.

2.1 Detailed Activities for the Scope of Work

Detailed activities for the scope of work are stated below:

2.1.1 Establishment of Monitoring Well

The Survey firm shall identify the suitable location for establishing the monitoring well in the project area, and establish the monitoring wells in consultation with PD. The Survey firm shall also responsible for data collection, regular monitoring and management of the Monitoring Well. The Survey firm shall establish 5 nos. of Monitoring Well in the study area in consultation with PD.

2.1.2 Surface water body identification

The expert shall conduct a survey to identify the surface water body and classify them as per their water quality and morphological view. Identify the potential user of them and draw a management plan for their sustainability.

2.1.3 Lab Test for Examining the Water Quality

The expert shall conduct the Lab test for examining the ground water quality including (i) Major Cataion and Anaion, (ii) Trace Element Analysis, and (iii) Grain Size Analysis.

Table: The detail works are given below table -

Item	Unit	Quantity
Establishment of Monitoring Well (250m depth)	no	5
Lab Test (Water Quality Test)	no	5
Major Cataion, Anaion and trace element Analysis	no	5
Grain Size Analysis	no	100
Surface resistivity survey for aquifer identification, Schlumberger array, 300 meter depth of investigation,	no	20
Maintenance for Monitoring Well (1 persons per monitoring well)	no	12

It is to be noted that secondary data of any type on investigations should be used for improving and comparing the findings. But data quality should be assessed before using them.

2.1.4 Data Analysis and Interpretation

The expert shall conduct analysis and interpretation of all collected primary and secondary data and information

2.2 Deliverables and Timeframe

The outlines of the deliverables and the timeframe for their submission are given in the Table-4 below. Any innovative methods, concepts and ideas beyond the outlines of the deliverables can be included with the activities and corresponding reports. The timeframe can be reshuffle as well.

Table 5: List of deliverables with their tentative outlines

Sl No.	Deliverables	Outline of Deliverables
1.	Mobilization Report	Description of objectives and scope of sub-activities Team formation and structure of survey team Actual work schedule for the work Immediate action taken after signing agreement
2	Inception Report	Introduction Description of sub-activities Method and materials for each activity Required resources allocation Revised work schedule for completion of the work
3.	Interim Report	Identified aquifer level of the region including its seasonal variation Areas potential for drawing fresh ground water, Revised work schedule for completion of the work.
4	Final Report	Surface water model with their management option Ground water table fluctuation model for seasonal variation. Groundwater quality map 3D model for Aquifer thickness with aerial extension of the study area. Showing the suitability of ground water potential zone. Land use base interpretation and guideline development.

2.3Report submission schedule and Mode of Payment

Reports shall be presented and illustrated in a clear and concise professional manner, including maps, plans, diagrams and other graphics. Schedule of submission:

Table 5: List of Report with Language, No. of Copies, Period of Submission, Binding status and Mode of Payment

Report	Language	No. of Copies	Period of Submission	Binding Status	Mode of Payment (% of Contract amount)
Mobilization Report	English	50	Within 15 days of signing contract	Spiral Binding	Not more than 15%
Inception Report	English	50	End 1st month	Spiral Binding	Not more than 20%
Interim Report	English	50	End of 2nd month	Spiral Binding	Not more than 35%
Draft Report	English & Bangla	100	End of 3rd month	Spiral Binding	Not more than 10%
Final Report	English & Bangla	100	End of 4rdmonth	Spiral Binding	Not more than 20%

2.4. Some important notes:

- Any report should properly describe the definition, methodology, procedures/steps, reason for accepting/avoiding relevant equation, detail sources of any references, in-depth description of the result, proper way of writing bibliography etc. Report should be provided in doc. format, rather than pdf of other

format. Before submitting the report English (spelling, sentence making etc.) should be varied and edited properly. All references (article, chapter of the book, report etc.) used in the report should be provided to UDD with the submission of each deliverable.

- All data (in excel, access, GIS etc.) used in the text or as reference should be provided with the each deliverable
- The awarded department shall record progress of activities through video, still photographs and stories (as appropriate) and must submit the same to UDD as on when required.
- The awarded department shall follow all the conditions and provisions stated in this document and in case of any confusion regarding any of those, explanation provided by UDD shall be deemed as final.

2.5. QUALIFICATION, EXPERIENCE AND RESPONSIBILITY OF GEOLOGICAL SURVEY FIRM

2.5.1 Qualifications, Experience and Responsibility of Key Personnel of Survey Firm:

A. Hydro-Geologist 1 Person (1*4=4 mm.)

Qualification: M. Sc. in Geology.

Experience: At Least 05 experience in hydro- geological survey, analysis and modeling

Responsibility: (i) To conduct, and monitor, supervise hydro-geological surveys and studies; (ii) To analyze hydro-geological data and information collection from primary and secondary sources. (iii) To conduct lab test of the collected samples and interpretation of the results of lab test; (iv) To prepare seismic hazard, vulnerability, damage and risk assessment map for the area, (v) To identify the areas potential for drawing fresh ground water, and also areas of interruption including probable change in the in the hydrological cycle due to human intervention. (vi) To interlink the attribute and spatial data of hydrogeology with that of other components of the project (vii) To prepare an inter active model for interfacing surface water and groundwater, and (viii) To recommend possible mitigation measures for interruption in the system due to human intervention. (ix) To prepare report on the assigned task. (xi) Any other related jobs assigned by PD.

B. Associate Geologist 1 Person (1*4=4 mm.)

Qualification: M. Sc. in Geology.

Experience:03 experience in engineering and hydro- geological survey and analysis

Responsibility: Assist the Hydro-Geologist-

(i) To conduct, and monitor, supervise hydro-geological surveys and studies; (ii) To analyze hydro-geological data and information collection from primary and secondary sources. (iii) To conduct lab test of the collected samples and interpretation of the results of lab test; (iv) To prepare seismic hazard, vulnerability, damage and risk assessment map for the area, (v) To identify the areas potential for drawing fresh ground water, and also areas of interruption including probable change in the in the hydrological cycle due to human intervention. (vi) To interlink the attribute and spatial data of hydrogeology with that of other components of the project (vii) To prepare an inter active model for interfacing surface water and groundwater, and (viii) To recommend possible mitigation measures for interruption in the system due to human intervention. (ix) To prepare report on the assigned task. (xi) Any other related jobs assigned by PD.

APPENDIX-03
BIDDING FOR TENDER

3.1 Contents of the Technical Proposal

According to the provisions laid in the Public Procurement Regulations 2008.

3.2 Financial Proposal

Financial proposal should be prepared as per following format in the firm's own letter head.

Format of Financial Offer

Sl No	Description of Survey and Studies	Area/no.	Rate (TK.)	Total Amount(TK.)
01	Establishment of Monitoring Well			
02	Lab Test for Examining the Water Quality			
03	Data Analysis and Interpretation			
04	Development of Digital Hydro-Geological Model			
05	Project Team of Consultant			
	TOTAL			

N.B. – Above Quoted rates should be inclusive of the cost Salaries, Management, Transportation, Contingency, Incidental, Income Tax & VAT and other related cost including printing and binding of maps and reports etc.

APPENDIX-04
FORMAT OF CURRICULUM VITAE AND PROJECT TEAM

4.1 Format of Curriculum Vitae of Professionals

According to the provisions laid in the Public Procurement Regulations 2008.

4.2 Format of the Proposed Project Team

Sl. No.	Position	Name	Age (in Years)	Length of Experience (Year)	Qualification	Man month
1.						
2.						
3.						
4.						
5.						

4.3 Format of the Major Experience in Similar Project Completed During Last 05 Years

Sl. No.	Name of the project	Name of the Client	Cost of the Project	Project Duration
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				