



OUT LINE OF THE PROJECT

- ❖ Project site : Proposed Bridge Site is at Ferry Location at 70 th km. on Lebukhali-Dumki-Boga-Dasmina-Golachipa-Amragachi Road (Z8806).

- ❖ Bridge : Total length of the bridge is 1580.0m.The Main bridge and Viaduct are as follows;
Main Bridge is 500.0m long consist of segmental pre-stressed post tensioned box girder.
Structural forms: 2x50+4x100 =500.0m
Viaduct is 1080m long consist of pre-stressed I section
Structural forms: 18x30+18x30 =1080.0m

- ❖ Approach Road : Approx. 700m

- ❖ River Training Work (RTW) : River Bank protection works would be 100m upstream and 50m downstream of the bridge centre line on both sides of the river.

- ❖ Project Cost : BDT 4886.93 Million

- ❖ Construction Period : 2014 to 2017 (4 years)

- ❖ NPV : BDT 828.50 Million

- ❖ BCR : 1.30

- ❖ EIRR : 18.64%

- ❖ Traffic Volume : Motorized Traffic 20,355 Veh /day at the Year 2047.

- ❖ Indirect Benefit : Will increase the economic activity, educational activity and overall benefit of the region.

EXECUTIVE SUMMARY

01) INTRODUCTION

Govt. of Bangladesh, through Bangladesh Bridge Authority as executing agency contracted JV of SARM Associates Ltd and BETS Consulting Engineers for carrying out Feasibility Study for constructing of bridges at 3 ferry locations namely

- a) At Charkhali Ferry Ghat (R870) on Kocha River
- b) At Galachipa Ferry Ghat (Z8806) on Galachipa River
- c) At Mirganj Ferry Ghat (Z8034) on Arial khan (Branch)

The purpose of the Executive Summary is to highlight the Major findings of various studies and the conclusions and recommendations of the study team.

The Notification of Award for providing Consultancy Services was issued by the Chief Engineer on 28 June 2011. The Consultant has started their work from July 2011. The Consultant submitted the reports as following table;

Types of Report	Date of submission
Inception Report	27 July 2011
Interim Report	29 December 2011
Draft Final Report	04 April 2012
Draft Final Report Revised	06 June 2012

02) Project Background

Reasons for the project

Bangladesh is a country with innumerable rivers flowing across its territory. The Padma River is the mightiest of all these and ranks as the fifth largest river in the world in terms of volumetric discharge. The western part of deltaic Bangladesh is physically detached from northern and eastern part including capital city, until a massive bridge is built across the Padma River.

Ferry crossing at Ferry locations which are the major tidal stream, considerably hampers road communication particularly during flood season. The 3 (Three) bridges at those ferry locations as mentioned will grossly improve the road communications. These will improve the socio-economic condition and industrial development of the area.

Construction of Bridge At Galachipa Ferry ghat (Z8806) on Galachipa river

Description of the River

The Galachipa River takes from Lohalia River near Patuakhali Town and flows as Golachipa River. It is also locally called Lohalia/ Ramandabad etc. Then after passing Golachipa upazila it falls on Agunmukha River (a branch of Tetulia River) . The combined flows fall to

Bay of Bengal. The Golachipa River is tidal one with a tidal variation of about 2m. The normal direction of flow is from east to west.

Importance and justification of the proposed bridge at 70km th km on Lebukhali- Dumki – Boga- Dashmania – Galachipa-amragachi Road(Z8806)

The Zilla road Z8806 starts from national highway N8 and meets the highway then renamed regional road R880. The proposed bridge will give Bauphal, Dashmania, Golachipa with districts of Patuakhali and Barisal and other parts of Bangladesh. The proposed bridge will save time and money from transportation of people and goods. After the construction of the Padma Bridge the traffic will increase manifold and it will be very difficult for the ferry service for carrying all the transports smoothly and timely.

The ferry service at present is giving connectivity with other places. But at ferry points we have to wait average one and half hour or more. If the bridge is constructed, the commercial vehicles will give more trips and working hour of people will be saved.

At the natural calamity the ferry services disrupts economic and social activities seriously. The Consultant found the construction of the bridge is economically viable. So construction of the bridge at the ferry location is justified.

03) Traffic Survey and Forecast

The main objective of traffic survey and analysis is to determine to extent of traffic demand on a road/bridge project. The result of this process will form the basis for traffic forecast and projection on the road/bridge project.

The summery of the study findings starting from traffic survey through traffic projection are follows;

- From traffic projection of total motorized traffic(Table 2.5.4, Volume – 1), it is found that AADT in the year 2047 is 20,355veh / day (Normal traffic 12,395 nos, generated traffic 4336 nos and diverted traffic 3624 nos) which is less than 35,000, the saturation capacity of two lane Bridge & 2 lane carriage way (Ref: ADB TA# 4821- BAN 2009)
- From traffic projection of total non-motorized traffic (Table 2.5.5, Volume – 1) it is found that AADT in terms of PCU / hr. in the year 2047 is 67 PCU / hr. which is less than 400 PCU / hr, the minimum requirement of provision of NMV lane according to the Roads & Highways Department rule.
- From the traffic survey, it may be concluded that the Bridge with both side approach road is feasible for 2-lane carriage way.

The two lanes cost of bridge is found to be BDT 4886.93Million whereas the cost of four lane bridge will be BDT 9442.93 Million.

From above study based on traffic volume and cost of the bridge, it is seen that construction The construction of four lane bridge is neither justified from traffic point of view nor from construction cost.

04) Hydrological and Morphological Study

The Ferry Ghat is located at 70th km. of the above mentioned road on **Golachipa River**. The name of the ferry ghat is 'Golachipa Ferry Ghat' and connects the Upazila Head Quarter Municipal Town with the regional highway R880. The river width across Ferry Ghat is about 470m. The landing stations are located at an oblique angle with each other. Vehicular traffic movements on the road consisted of buses, trucks, trailers, tractors, microbus, pickups, jeeps, cars, motorcycle, non-motorized vehicles like by-cycle, cart and rickshaws etc. Passenger ships, lanches and various Marine vessels move through the river.

The Golachipa River is a tidal one with a reported tidal variation of about 2m. The normal direction of flow is from east to west. Its northern bank has mild slope. The southern bank is a vast flat char which is frequently flooded during high tide. During low tide the depth of the river is not so much, with main flow passing close to the northern bank.

05) Morphological Study

This study has been conducted keeping in mind to collect information for river bank stability and/or shifting of river course, if any, in the vicinity of the probable bridge location covering nearly 5 km upstream and 5 km downstream of the existing Z8806 alignment of Labukhali-Golachipa road across the river. Available satellite maps of this area between the years 1990 to 2010, covering a period of 20 years has been collected and analyzed by super impositions of these maps on a single map. The detail of this study together with all the maps has been presented in Chapter-3 of this report.

The following data and figures have been collected from field surveys

- The river is a tidal one.
- High bank to high bank distance of the river along analysis option: 575 m
- Average ground level on Patuakhali side: 3.34 mPWD
- Average ground level on Golachipa side: 3.09 mPWD
- RL of the river at bank full stage: 3.10 mPWD
- Cross section area of the river at bank full level: 4,054 m²
- Length of the proposed main bridge: 500 m
- Length of the proposed viaduct: 1080 m
- Observed lowest bed level of the river: (-) 10.45 m PWD
- Mean High Water Spring at Golachipa (as per BIWTA Tide Table)
= 3.245 m in CD = 3.245 – (5.119 – 4.404) = 2.530 mPWD
- Mean Low Water Spring at Golachipa (as per BIWTA Tide Table)
= 0..283 m in CD = 0. 283 – (5.119 – 4.404) = (-) 0.432 mPWD

Review and analyses of the prevailing hydrological and morphological environment of the proposed Golachipa Bridge area leads to the following conclusions and recommendations:

- Design High Water Level: 4.2158 mPWD
- Design Low Water Level: (-) 1.425 mPWD

- Regime Width of the Golachipa River at Bridge Site: 354 m
- Anticipated Maximum Scour at Bridge Pier: upto (-) 16.43 mPWD
- Bridge Soffit Level over Navigable Portion of the Channel: 22.5158 mPWD
- Minimum Bridge Span Openings on Navigable Portion of the Channel: 76.22 m
- Bridge alignment: On or near morphological analysis option – 2.

River Training work

At the Bridge location site, the width of the river from bank to bank at the centreline of the proposed bridge is about 750m. The proposed bridge has been designed for a span length of 1580m. Thus from spanning of the bridge, it is evident that the bridge abutment are located at a safe distance from the main river channel. The river will be flowing normally under the bridge and no specific guide bank are required for the bridge.

Length of the river banks to be protected from site inspection and morphological study at the proposed bridge site it is seen that both river bank at the bridge site are stable. However, river bank protection works would be done for a length of about 100 m upstream and 50m downstream of the bridge centerline on both sides of the river.

The river banks could be protected by stone pitching or by concrete blocks or by growing vegetative cover. Concrete blocks are costly. For this reason the Consultant suggests stone pitching work for river protection work.

06) Bridge Location Study

In reconnaissance survey from the ferry location of Galachipa Ferry Ghat, 2.00 km upstream & 3.00 km downstream of river a total of 10nos X- section were taken at 10 different locations. Then after the screening of all 10nos. sections & from hydraulic considerations, the following 4 locations were considered.

- The Option-1 is at about 1.8 upstream of ferry ghat where the river banks are stable the side slope of river bank is mild & no significant bank shifting has occurred during last 20 years. However, this will involve nearly 3.0 km of approach road embankment on each side through valuable agricultural land and homestead land. In this alignment 3.41 hac. Land will need to be acquired, 02 nos house hold and 04 nos of structures will be affected.
- The Option-2 is along the existing roads connecting the existing Z8806 route will involve minimum additional land to be acquired for the bridge approach. The side slope of river bank is mild & no significant bank shifting has occurred during last 20 years. In this alignment 1.80 hac. land will need to be acquired, 01 nos house hold and 90 nos temporary structures will be affected.
- The Option-3 is about 1.6 km. on the downstream side of Ferry ghat no significant bank shifting has occurred during last 20 years. However, this will also involve nearly

2.8km of approach road embankment on each side through valuable agricultural land. In this alignment 2.78 hac. Land will need to be acquire, 02 nos house hold and 02 nos of structures will be affected.

- The Option-4 is about 0.5 km. Upstream of the existing ferry ghat. It will require about 1.4 km of approach road on each side through valuable agricultural land. In this alignment 2.28 hac. Land will need to be acquired, 01 nos house hold and 02 nos of structures will be affected.

Therefore, considering the above aspects, the Consultants feel that the Alignment along Option-2 would be the most suitable location for the bridge.

07) Selection of Final Bridge Alignment

The following 4 alternative locations were selected

a) Option -1

Main Bridge $2 \times 50 + 5 \times 100 = 600$ m
Viaduct. Patukhali end: $16 \times 30 = 480$ m
 Golachipa end: $18 \times 30 = 540$ m
Total Length of the bridge: **1620m**

b) Option-2

Main Bridge $2 \times 50 + 4 \times 100 = 500$ m
Viaduct Patukhali end: $18 \times 30 = 540$ m
 Golachipa end: $18 \times 30 = 540$ m
Total Length of the bridge: **1580m**

c) Option-3

Main Bridge $2 \times 50 + 6 \times 100 = 700$ m
Viaduct. Patukhali end: $14 \times 30 = 420$ m
 Golachipa end: $16 \times 30 = 480$ m
Total Length of the bridge: **1600m**

d) Option-4

Main Bridge $2 \times 50 + 5 \times 100 = 600$ m
Viaduct. Patukhali end: $16 \times 30 = 480$ m
 Golachipa end: $18 \times 30 = 540$ m
Total Length of the bridge: **1620m**

The alternative alignments were then evaluated for technical & financial costs. The final location of the bridge is Option -2.

Comparative study of four Options of the bridge

The Consultant performed detail study and prepared a comparative study of the four alternative options of the proposed bridge for social environmental and economic aspects for final selection. These are shown in the following table

Feasibility Study and Preliminary Design for construction of Bridge at Ferry Location at 70th Km. on Labukhali-Dumki-Boga- Dashmina –Golachipa-Amragachi Road (Z8806).

Table: Comparative Study of alternatives

Description	Option -1	Option-2	Option-3	Option-4
Construction Cost (BDT)	4645.59 Million	3953.09 Million	4907.31 Million	4003.44 Million
Project cost (BDT)	6172.14 Million	4886.93 Million	6517.10 Million	5750.6 Million
Length of the approach road	2.98 km	500m	2.8 km	1.4 km
Land Acquisition	3.41 hac.	1.8 hac.	2.78 hac.	2.28 hac.
Land Acquisition, Resettlement & EMP cost (Million BDT)	25.31	3.03	24.22	19.85
Environmental impact	More land acquisition will result in social impact	Less land acquisition will result in less social impact	More land acquisition will result in social impact	More land acquisition will result in social impact
Household and structures affected	2 nos household and 04 nos structures	1 nos house hold and 90 nos temporary structure	2 nos. house hold and 2 nos structure	1 nos household and 2 nos. Structures
Social impact	More land acquisition will result in social impact	Less land acquisition will result less social impact	More land acquisition will result in social impact	More land acquisition will result in social impact
NPV (Million BDT)	91.3	828.5	-104.5	620.8
BCR	1.03	1.30	97.17	1.20
EIRR	15.43%	18.64%	14.61%	17.78%
Ranking	4	1	Economically not feasible	3

The report concludes that the proposed bridge at Option -2 location along the existing Z8806 route would provide the minimum project cost with minimum disturbance to the existing properties and with maximum benefit for the techno-economic evaluation. Therefore, Option-1 location has been suggested by the Consultant for the proposed bridge and approach roads location.

Selection of Structural Configuration

For structural configuration following two alternatives have been studied for the selected alignment

Alternative-1: PSC Box Girder

Main bridge - 4x100m + 2 x 50m in PSC box type = 500m
Viaduct - 18x30m + 18x 30m in PSC I - Girder type = 1080m
Total Length of bridge = 1580m
Total cost of the bridge: BDT 4886.93 Million

Alternative-2: Extra dosed PSC Box Girder

Main bridge - 3x150m + 2 x 75m in Extra dosed PSC box type = 600m
Viaduct - 15x30m + 16 x 30m in PSC I - Girder type = 930m
Total Length of bridge = 1530m Total cost of the bridge: BDT 7502.29 Million

The bridge type selected through cost comparison between two options is PSC Box Girder .

07) Geotechnical Investigation for the Structure

Here the grey medium stiff clayey silt and some fine sand upto 15.0m, from 15.0m~25.0m medium dense to fine sand & silt and after 25.0m medium to very dense sand found.

08) Design Approach and Technical Standards

The Consultants preliminary designs are in accordance with international standards and procedures but are largely based on Roads and Highways Departments (RHD) standards for design of Bridges and geometric design standard. The principal international standards adopted are;

- a) For approach roads and bridge alignment:-
Guide lines for Design of Flexible Pavement, and Pavement Design Guide followed by Roads and Highways Department (RHD), Latest revision of AASHTO (1993), guide for Design of Pavement structure, presently in use in Bangladesh.
- b) For the bridge: AASHTO latest revision applicable in use in Bangladesh on Standard Specifications for Highway Bridges.
- c) For Material standard: AASHTO latest revision in use in Bangladesh.

09) Findings and Sum-up

The consultant has conducted the following surveys and investigation;

- a) Extensive reconnaissance survey by the team members to select the possible locations of the bridge and associated approach roads/ link roads to existing roads.
- b) River Crossing Traffic Survey to assess the Normal Traffic and their mode of crossing, over the proposed bridge.
- c) Preliminary Social, Resettlement and Environmental impact study at the selected 3 possible bridge locations and approach roads.
- d) Topographic Survey at the selected bridge location.
- e) Hydrographic survey at the selected bridge location.
- f) Geotechnical Investigations along the selected bridge and approach road alignment, and
- g) Morphological (satellite imagery) studies over the last 20 year in the vicinity of the proposed bridge to assess the river bank shifting and requirement for bank protection work

In addition to the above Hydrological studies have been carried out including the study for Navigational clearance requirement.

10) Environmental Impact Assessments

Potential Adverse Impact

Among the physical negative environmental impact mainly on air quality may appear during construction of the bridge. During post –construction operational phase, the negative impacts on air quality will come from vehicle exhaust emission pollutants. As a result air will be deteriorated. The impacts on noise level may be increased during the time of construction. The impacts on biological environment will appear in cutting of some trees and plants on both side of the approach roads of the bridge. As a result roadside erosion and some negative impacts on ecology may be approved. Erosion may be appearing on both bank side earth work of the river during construction of the bridge. Some drainage congestion may arrive on the approach roadside of the bridges during construction phase. Some land acquisition and resettlement will be required. Navigation may be disrupted. Fish habitat may be affected. Quality of water may be affected.

Mitigation measures

Increase channel capacity to handle big barges and water crafts. Providing adequate Flood passage structures for fish migration and careful alignment of the bridge without disturbing fish habitat and fishing. Limiting works to dry Season. Carefully planning navigation bypass. Restoring and Rehabilitation navigation Channel for safe transport and storing construction materials. Spraying water to reduce dust hazards and limited use of machinery to reduce noise. Proper monitoring of soil erosion, navigation, chemical storage and use; site inspection, condition of construction camp, surface water quality, measurement of DO, BOD,SS. FECEL coli forms, drinking water quality, inspection of brick, bitumen & cement

facilities as per methods/ procedures recommended by department of environment, checking noise and vibration and inspection of health and safety.

Positive Impact

In the long run the project will replace ferry services. Improve regional hydrology by cross drainage structures. Reduce dust pollution and improve water quality by bituminization of the pavement. Facilitate and improve access to markets for income generation. Allow easy movement of motorized and other traffic. Improve aesthetic quality of the region. Agricultural development will occur. Better access to growth center markets.

Environmental Management Plan

Environmental Management Plan (EMP) is suggested to avoid any adverse impact during construction of the bridge and operation maintenance phases and it will ensure environmental provisions and management for the bridge. The EMP cost will include river bank erosion on the approaches of the bridge, drainage congestion, air quality, noise level, removal of trees and plantation, water quality, land loss/ acquisition, homestead loss, agricultural and commercial loss, health and sanitation, traffic management and congestion. The EMP cost will be approximately 5% of the cost of the bridge.

- ❑ On critical review of the potential environmental impacts, the specific mitigation and monitoring measures proposed and the benefits described, the project will not lead to any long term irreversible adverse impact on the adjacent environmental quality and resources.
- ❑ Most of the potential impacts are short-term and minor in nature. The anticipated adverse effects could be greatly controlled / minimized or eliminated through adoption of suggested mitigation measures and implementation of the Environmental Management Plan.
- ❑ Considering the civil engineering requirements from environmental advantage point of view, the current location and functional route of the project is acceptable.

11) Operation & Maintenance:

In order to ensure long time durability and services of the bridge operation and maintenance of different components of main bridge, viaducts, services and other ancillary structures of the bridge will be an essential activity. These will include routine inspections at weekly or monthly basis, general inspection after two year's time and principal inspection after every five year's time.

However, the Construction Company with due agreement and concurrence of supervision consultant and Manufacturer's specifications will prepare necessary Operation and Maintenance manual for the main bridge and Viaducts and connections, supports, services, and other ancillary structures . The qualified Operation and Maintenance Operator will follow the detail manuals in operation and maintenance work

12) Economic Evaluation

Comparison of costs and Benefits.

To arrive at the conclusion of economic appraisal of the project, it is necessary to compare the costs and benefits and find out Net Present Value (NPV) Benefit – Cost Ratio (BCR), and the Internal Rate of Return (IRR).

The costs and benefits were discounted initially at 15 percent (as prescribed by the Planning Commission) and based on the result, were further discounted at 10 percent to arrive at IRR. The following table provided the summary position of the economic analysis:

Sensitivity Analysis: Cost and Benefits of the project are based on estimates and projection. In reality it may vary with actual costs and available benefits. To test the worthiness of the project, it is considered that sensitivity analysis is carried out taking into account three alternative situations.

- (i) With 10% increase in cost stream ;
- (ii) With 10% decrease in benefit stream;
- (iii) With combined effect of (i) and (ii)

The results of Sensitivity Analysis as per alternatives (i) (ii) and (iii). above are presented in the following table.

ECONOMIC ANALYSIS: NPV, BCR & IRR BASE CASE and Sensitivity Analysis

SI No.	Economic Evaluation	NPV (Million Taka) at 15% discount	BCR	EIRR (%)
01.	Base Case	828.50	1.30	18.64
02.	Benefit (10% reduced)	551.80	1.18	17.49
03.	Cost (10% increased)	469.00	1.17	17.31
04.	Combined effect of benefit 10% reduced and cost 10% increased	192.30	1.06	15.99

The economic indicators for design options on the selected alignment justify the economic viability of the project.

13) Project Cost

The project Cost includes the following components of cost:

1. Total Construction Cost;
2. Engineering Cost
3. Land Acquisition, Resettlement
4. Administrative Cost;
5. Physical Contingencies.
6. Price Contingency
7. VAT, TAX and Duties.

The table below shows the cost of the components of the Project Cost:

Total Project Cost (Golachipa Bridge, Option - 2)

SI No.	Description	Amount in Million BDT	Remarks
1	Construction Cost		
	a) Bridge	BDT 3,739.27	
	b) Approach Road	BDT 35.00	
	c) River Bank Protection Work	BDT 178.82	
	Total Construction Cost	BDT 3,953.09	
2	Engineering Cost		
	a) Detailed design	BDT 98.83	2.5% of SI No. 01
	b) Construction Supervision	BDT 138.36	3.5% of SI No. 01
3	Land Acquisition, Resettlement and EMP.	BDT 3.03	
4	Administration Cost	BDT 24.02	10% of SI No. 02 & 03
5	Physical Contingencies	BDT 395.31	10%-15% of SI No. 01
6	Price Contingencies	BDT 91.71	2%-5% of SI No. 01, 02 and 05
7	VAT, TAX and DUTIES	BDT 182.28	14.5% for importation @ 30% of SI No. 01 & 02
Total Project Cost		BDT 4886.93	

14) Conclusion from the Study

14.1 Structural Configuration

From the hydraulic (including navigational clearance requirement), topographical and Geotechnical studies and the acceptable (3.5%) longitudinal grade, the total length of the proposed bridge has come to 1580m, Comprising of the main bridge over the main river channel followed by viaduct on either bank covering the flood plain.

The main bridge has been suggested in **Alternative-2** comprising of post-tensioned pre-stress concrete Single Box Girder (PSC Box Girder) continuous with segmental cantilever construction with span of 100m. The viaduct portions comprise of pre-stress Girder of span 30 m. The total length of option-2 being 1580m comprises of(4x100+2x50+36x30)m.

14.2 Foundation Type Consideration

The foundation type of 100m span PSC box type bridge is quite common in Bangladesh with large diameter (1200mm) cast-in-situ RCC bored piles and that of viaduct span being with 1000mm diameter Cast-in-situ bored piles.

14.3 Social and Resettlement Impact Consideration

The survey was conducted in the immediate vicinity of the final bridge alignment and both side of approach roads. The existing **Labukhali-Dumki –Golachipa-Amragachi Road (Z8806)** route causes least disturbance to the existing settlement and is the least cost solution.

14.4 Environmental Consideration

On critical review of the potential environmental impacts, the specific mitigative and monitoring measures proposed and the benefits to be derived, the project at the proposed alternative-2 location will not lend to any long term irreversible adverse impact on the adjacent environmental quality and resources.

14.5 Economic Justification

The economic analysis carried out for the proposed Bridge for 30 years evaluation period shows that from the point of view of all the economic parameters considered the project is economically viable and the investment is highly justified.

The NPV of the bridge at 15% discount rate is placed Tk. 828.50 million.

The EIRR of the project at about 18.64% is above the 15% accounting rate of return considered for taking investment decision in Bangladesh. The benefit cost ratio is about 1.30

15. Recommendations of the Study

The recommendations of the study for the proposed Golachipa Bridge are as follows:

- a) The bridge for the options -2 is found to be feasible from technical and economic consideration and may be taken up for construction.

- b) The most suitable foundations of the piers in the waterway are found to be large diameter (1200mm for the 100m span PSC Box Girder) RCC cast-in-situ bored piles with permanent steel casing and that of the viaduct portion in 1000mm diameter RCC cast-in-situ bored piles with temporary casing.

- c) The bridge may not be effective for traffic flow without the minimum improvement of the Labukhali Golachipa-Amragachi road(Z8806) starting from Labukhali to Amragachi.

Summary of Costs of Different Options At a Glance

<u>Golachipa Bridge</u>	Total Project Cost for 2 Lane Bridge (Mill BD)	Total Project Cost for 4 Lane Bridge (Mill BD)	Total Project Cost of Extra-dosed for 2 Lane Bridge (Mill BD)
Option – 1	6,172.14	10,802.89	-
Option – 2	4,886.93	9,442.93	7,502.29
Option – 3	6,517.10	11,488.00	-
Option – 4	5,750.6	10,309.45	

SUMMARY OF COST OF TWO LANE BRIDGE

Total Project Cost (Golachipa Bridge, Option - 1)

SI No.	Description	Amount in Million BDT	Remarks
1	Construction Cost		
	a) Bridge	BDT 4,086.33	
	b) Approach Road	BDT 380.44	
	c) River Bank Protection Work	BDT 178.82	
	Total Construction Cost	BDT 4,645.59	
2	Engineering Cost		
	a) Detailed design	BDT 116.14	2.5% of SI No. 01
	b) Construction Supervision	BDT 162.60	3.5% of SI No. 01
3	Land Acquisition, Resettlement and EMP.	BDT 25.31	
4	Administration Cost	BDT 30.40	10% of SI No. 02 & 03
5	Physical Contingencies	BDT 696.84	15% of SI No. 01
6	Price Contingencies	BDT 281.06	5% of SI No. 01, 02 and 05
7	VAT, TAX and DUTIES	BDT 214.21	14.5% for importation @ 30% of SI No. 01 & 02
Total Project Cost		BDT 6,172.14	

Total Project Cost (Golachipa Bridge, Option - 2)

SI No.	Description	Amount in Million BDT	Remarks
1	Construction Cost		
	a) Bridge	BDT 3,739.27	
	b) Approach Road	BDT 35.00	
	c) River Bank Protection Work	BDT 178.82	
	Total Construction Cost	BDT 3,953.09	
2	Engineering Cost		
	a) Detailed design	BDT 98.83	2.5% of SI No. 01
	b) Construction Supervision	BDT 138.36	3.5% of SI No. 01
3	Land Acquisition, Resettlement and EMP.	BDT 3.03	
4	Administration Cost	BDT 24.02	10% of SI No. 02 & 03
5	Physical Contingencies	BDT 592.96	15% of SI No. 01
6	Price Contingencies	BDT 239.16	5% of SI No. 01, 02 and 05
7	VAT, TAX and DUTIES	BDT 182.28	14.5% for importation @ 30% of SI No. 01 & 02
	Total Project Cost	BDT 4886.93	

Total Project Cost (Golachipa Bridge, Option - 3)

SI No.	Description	Amount in Million BDT	Remarks
1	Construction Cost		
	a) Bridge	BDT 4,360.65	
	b) Approach Road	BDT 367.84	
	c) River Bank Protection Work	BDT 178.82	
	Total Construction Cost	BDT 4,907.31	
2	Engineering Cost		
	a) Detailed design	BDT 122.68	2.5% of SI No. 01
	b) Construction Supervision	BDT 171.76	3.5% of SI No. 01
3	Land Acquisition, Resettlement and EMP.	BDT 24.22	
4	Administration Cost	BDT 31.87	10% of SI No. 02 & 03
5	Physical Contingencies	BDT 736.10	15% of SI No. 01
6	Price Contingencies	BDT 296.89	5% of SI No. 01, 02 and 05
7	VAT, TAX and DUTIES	BDT 226.28	14.5% for importation @ 30% of SI No. 01 & 02
	Total Project Cost	BDT 6,517.10	

Total Project Cost (Golachipa Bridge, Option - 4)

SI No.	Description	Amount in Million BDT	Remarks
1	Construction Cost		
	a) Bridge	BDT 4,003.44	
	b) Approach Road	BDT 149.20	
	c) River Bank Protection Work	BDT 178.82	
	Total Construction Cost	BDT 4,331.46	
2	Engineering Cost		
	a) Detailed design	BDT 108.29	2.5% of SI No. 01
	b) Construction Supervision	BDT 151.60	3.5% of SI No. 01
3	Land Acquisition, Resettlement and EMP.	BDT 19.85	
4	Administration Cost	BDT 27.97	10% of SI No. 02 & 03
5	Physical Contingencies	BDT 649.72	15% of SI No. 01
6	Price Contingencies	BDT 262.05	5% of SI No. 01, 02 and 05
7	VAT, TAX and DUTIES	BDT 199.72	14.5% for importation @ 30% of SI No. 01 & 02
Total Project Cost		BDT 5,750.67	

SUMMARY OF COST OF FOUR LANE BRIDGE

Total Project Cost (Golachipa Bridge, Option - 1)

SI No.	Description	Amount in Million BDT	Remarks
1	Construction Cost		
	a) Bridge	BDT 7,587.55	
	b) Approach Road	BDT 380.44	
	c) River Bank Protection Work	BDT 178.82	
	Total Construction Cost	BDT 8,146.81	
2	Engineering Cost		
	a) Detailed design	BDT 203.67	2.5% of SI No. 01
	b) Construction Supervision	BDT 285.14	3.5% of SI No. 01
3	Land Acquisition, Resettlement and EMP.	BDT 25.31	
4	Administration Cost	BDT 51.41	10% of SI No. 02 & 03
5	Physical Contingencies	BDT 1,222.02	15% of SI No. 01
6	Price Contingencies	BDT 492.88	5% of SI No. 01, 02 and 05
7	VAT, TAX and DUTIES	BDT 375.65	14.5% for importation @ 30% of SI No. 01 & 02
Total Project Cost		BDT 10,802.89	

Total Project Cost (Golachipa Bridge, Option - 2)

SI No.	Description	Amount in Million BDT	Remarks
1	Construction Cost		
	a) Bridge	BDT 6,923.28	
	b) Approach Road	BDT 35.00	
	c) River Bank Protection Work	BDT 178.82	
	Total Construction Cost	BDT 7,137.10	
2	Engineering Cost		
	a) Detailed design	BDT 178.43	2.5% of SI No. 01
	b) Construction Supervision	BDT 249.80	3.5% of SI No. 01
3	Land Acquisition, Resettlement and EMP.	BDT 3.03	
4	Administration Cost	BDT 43.13	10% of SI No. 02 & 03
5	Physical Contingencies	BDT 1,070.57	15% of SI No. 01
6	Price Contingencies	BDT 431.79	5% of SI No. 01, 02 and 05
7	VAT, TAX and DUTIES	BDT 329.09	14.5% for importation @ 30% of SI No. 01 & 02
Total Project Cost		BDT 9,442.93	

Total Project Cost (Golachipa Bridge, Option - 3)

SI No.	Description	Amount in Million BDT	Remarks
1	Construction Cost		
	a) Bridge	BDT 8,119.05	
	b) Approach Road	BDT 367.84	
	c) River Bank Protection Work	BDT 178.82	
	Total Construction Cost	BDT 8,665.71	
2	Engineering Cost		
	a) Detailed design	BDT 216.64	2.5% of SI No. 01
	b) Construction Supervision	BDT 303.30	3.5% of SI No. 01
3	Land Acquisition, Resettlement and EMP.	BDT 24.22	
4	Administration Cost	BDT 54.42	10% of SI No. 02 & 03
5	Physical Contingencies	BDT 1,299.86	15% of SI No. 01
6	Price Contingencies	BDT 524.28	5% of SI No. 01, 02 and 05
7	VAT, TAX and DUTIES	BDT 399.58	14.5% for importation @ 30% of SI No. 01 & 02
Total Project Cost		BDT 11,488.00	

Total Project Cost (Golachipa Bridge, Option - 4)

SI No.	Description	Amount in Million BDT	Remarks
1	Construction Cost		
	a) Bridge	BDT 7,450.25	
	b) Approach Road	BDT 149.20	
	c) River Bank Protection Work	BDT 178.82	
	Total Construction Cost	BDT 7,778.27	
2	Engineering Cost		
	a) Detailed design	BDT 194.46	2.5% of SI No. 01
	b) Construction Supervision	BDT 272.24	3.5% of SI No. 01
3	Land Acquisition, Resettlement and EMP.	BDT 19.85	
4	Administration Cost	BDT 48.65	10% of SI No. 02 & 03
5	Physical Contingencies	BDT 1,166.74	15% of SI No. 01
6	Price Contingencies	BDT 470.59	5% of SI No. 01, 02 and 05
7	VAT, TAX and DUTIES	BDT 358.66	14.5% for importation @ 30% of SI No. 01 & 02
Total Project Cost		BDT 10,309.45	