CHAPTER 13
ECONOMIC EVALUATION

CHAPTER 13 ECONOMIC EVALUATION

13-1   General

The economic evaluation was conducted by comparing economic costs and benefits in order to determine whether the proposed project would contribute to the overall economy of Bangladesh.

The proposed project which would contribute to the establishment of a smoother transport system inter alia between Dhaka, the capital of Bangladesh, and Chittagong, the second largest city and an international port, would create various kinds of developmental benefits to the country. However, it is not possible to enumerate all the benefits from the project. In the present study only the following four items mainly associated with direct user benefits were counted as direct tangible benefits:

1) Ferry investment cost saving;

2) Ferry operating cost saving;

3) Vehicle operating cost saving; and

4) Time saving

Benefits from the ferry investment cost saving were measured from the total economic investment costs for ferry boats, landing facilities and other ferry terminal facilities, which would be needed in order to cope with the increased traffic volume in the future. Benefits from ferry operating cost saving, vehicle operating cost saving and time saving were quantified from the projected future traffic volume, which consists of normal and induced traffic. The normal traffic is estimated based on the projected natural increase in traffic in the absence of the bridges, while the induced traffic is derived from the projected additional traffic due to the presence of the bridges. The benefits attributed to normal traffic were measured by the difference in cost and time between using the bridges and crossing the rivers by ferry. Benefits from induced traffic were quantified by using the same method as with normal traffic, but only 50% of them were counted as economic benefits. The basic idea for this deduction is as shown in Fig. 13-1-1.
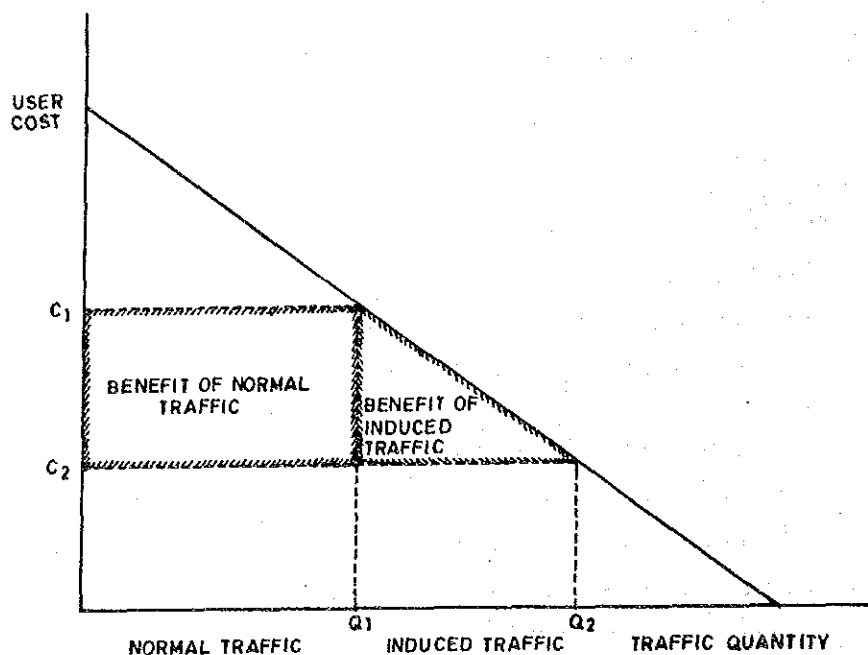
Fig. 13—1—1   Conception of Benefits from Normal and Induced Traffic

The future traffic projection varies considerably between the case that both Meghna and Meghna-Gumti Bridges are constructed and the case that only Meghna Bridge is constructed. For the economic evaluation of the Meghna Bridge, two basic cases were assumed and evaluated separately. However, it was considered rather unrealistic to assume the case that only the Meghna-Gumti Bridge would be constructed without the Meghna Bridge having been constructed. And only one basic case was posited for the economic evaluation of the Meghna-Gumti Bridge. The four basic cases posited for economic evaluation were as follows:

Meghna Case I   :   Construction of Meghna Bridge with no construction of Meghna-Gumti Bridge afterwards.

Meghna Case II   :   Construction of Meghna Bridge in expectation of subsequent construction of Meghna-Gumti Bridge. In this case both costs of, and benefits from, the construction of Meghna-Gumti Bridge were excluded from the evaluation.

Meghna-Gumti   :   Construction of Meghna-Gumti Bridge was evaluated according to the same schedule as in Case II above. In this case costs of, and benefits from, Meghna Bridge were neglected.

Combined : Joint construction of Meghna and Meghna-Gumti Bridges
Meghna/Meghna-
Gumti
was evaluated as one single project. In this case the imple-
mentation schedule is as in Case II above.

The construction schedule of the Meghna and Meghna-Gumti Bridges used for the
above basic cases corresponds to the construction schedule of Alternative 1,
which is stated in Section 13–3–1 (Refer to Fig. 13–3–1).

Finally, sensitivity tests were conducted under several different assumptions for
both economic cost and benefit streams.

13–2 Shadow Pricing

In order to carry out economic evaluations of various kinds of development
projects in Bangladesh, the Planning Commission of the Government of
Bangladesh has been making considerable effort to work out various price conver-
sion factors. From the results of a recent study, the following shadow pricing
factors were suggested to be applied to the proposed project:

Standard Conversion Factor (SCF)	0.82
Shadow Foreign Exchange Rate	1.22
Shadow Wage Rates	
Unskilled Labour Wage	0.75
Skilled Labour Wage	1.00
All (General) Labour Wage	0.80

The computation of SCF is based upon the comparison of the domestic and inter-
national border prices of the commodity basket divided into 31 items. The details
are shown in Ap. Table 13–1. The shadow foreign exchange rate was estimated
as reciprocal of SCF.

13–3 Alternative Plans

13–3–1 Bridge and Ferry Schemes

The following alternative plans for construction or investment schedules were
established: three plans for bridge scheme and the remaining for ferry scheme,
schedules of which are illustrated in Fig. 13–3–1 and Table 13–3–1, respec-

tively. The two schemes are compared for the economic evaluation, and the changes of economic feasibility of three alternative plans for bridge scheme were examined by sensitivity tests (Refer to Section 13–7).

Alternative Plan 1:

By this plan the construction of the Meghna Bridge is started in 1986 and completed in 1990. The construction of the Meghna-Gumti Bridge is started in 1991 and completed in 1995.
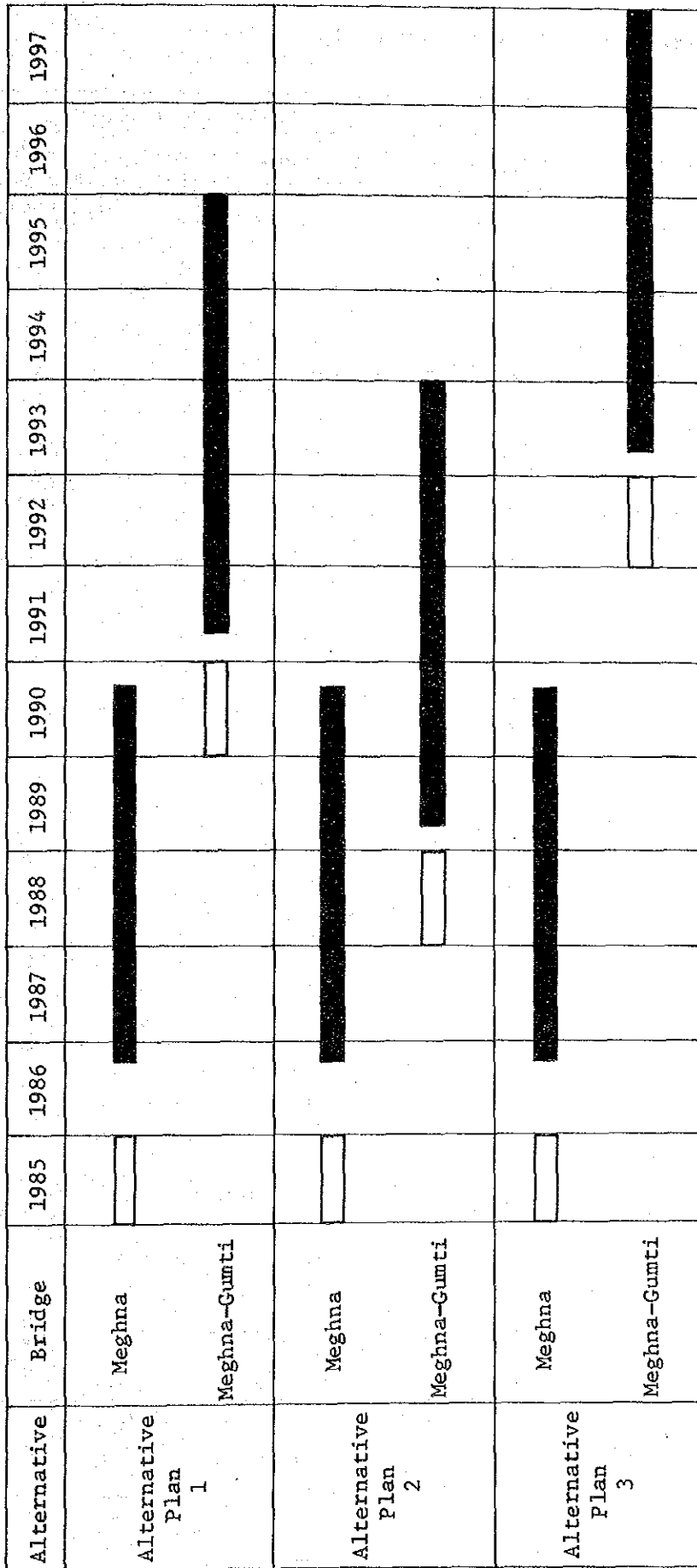
Alternative Plan 2:

This plan is an alteration of Plan 1 above in respect of construction of the Meghna-Gumti Bridge. By this plan the construction of Meghna-Gumti Bridge is started in 1989 and completed in 1993.

Alternative Plan 3:

This plan is another alteration of Plan 1. By this plan the construction of the Meghna-Gumti Bridge is started in 1993 and completed in 1997.

Alternative Plan 4:

This plan is for the ferry scheme corresponding to the without-project-case. Under this plan the existing ferry facilities are proposed to be expanded to accommodate the increasing traffic demand.

Alternative	Bridge	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Alternative Plan 1	Meghna	☐	■	■	■	■	■							
	Meghna–Gumti						☐	■	■	■	■	■		
Alternative Plan 2	Meghna	☐	■	■	■	■	■							
	Meghna–Gumti				☐	■	■	■	■	■				
Alternative Plan 3	Meghna	☐	■	■	■	■	■							
	Meghna–Gumti								☐	■	■	■	■	■

☐ Detail Design

■ Construction Works

Fig. 13–3–1   Alternative Construction Schedules for Bridge Scheme

Table 13-3-1   Procurement Schedule for Ferry Scheme

	Meghna Ferry			Meghna-Gumti Ferry		
	Ferry Boat (unit)	Spare Engine (unit)	Pontoon/Gang-way W.Approach Road (set)	Ferry Boat (unit)	Spare Engine (unit)	Pontoon/Gangway W. Approach Road (set)
1990	-	-	-	-	-	-
91	-	-	-	-	-	-
92	-	-	-	-	-	-
93	-	-	-	1	1	1
94	1	1	1	-	-	-
95	-	-	-	1	-	-
96	-	-	-	-	-	-
97	-	-	-	1	1	1
98	1	-	-	-	-	-
99	-	-	-	-	-	-
2000	1	1	1	1	-	-
01	-	-	-	-	-	-
02	1	-	-	1	1	-
03	1	1	-	1	-	1
04	-	-	-	1	1	-
05	1	-	1	-	-	-
06	-	-	-	1	-	-
07	1	1	-	-	-	-
08	-	-	-	1	1	1
09	1	-	-	1	-	-
10	1	1	1	1	1	-
11	1	-	-	-	-	-
12	1	1	-	1	-	1
13	-	-	-	1	1	-
14	1	-	1	1	-	-
15	1	1	-	1	1	1
16	1	-	-	1	1	1
17	1	-	-	1	1	1
18	1	1	1	1	-	-
19	1	-	-	1	1	-
20	1	1	1	1	-	1
21	-	-	-	1	1	-
22	1	-	-	1	-	-
23	1	1	1	1	1	1
24	1	-	-	1	-	-
25	1	1	1	1	1	-

Source :   Tables 8-4-1 and 8-4-2

13-3-2   Basic Assumptions for Comparison

Bridge and ferry alternatives were studied to make an adequate economic evaluation. The following are the basic items to be used for the evaluation.

Bridge Scheme

Project Life : 30 years after the completion of the bridge

Base Year : 1984

Prices : 1984 constant prices

Construction
Period : One year for the detailed engineering and 4 years and 4.8 years for the construction of Meghna Bridge and Meghna-Gumti Bridge, respectively

Residual Value : 50% of the total construction cost at the end of project life (30 years)

Ferry Scheme

Base Year : 1984

Prices : 1984 constant prices

Ferry-boat

Service Life : 10 years

Residual Value : 30% after the use of 10 years

Pontoon/Gangway:

Service Life : 10 years

Residual Value : 30% after the use of 10 years

Spare Engine

Service Life : 10 years

Residual Value : 20% after the use of 10 years

13-4   Economic Costs

The total project cost is composed of the land acquisition cost, engineering service cost, direct construction cost, overhead costs and cost for physical contingency. Each of these items was subdivided into the local and foreign currency components, and the tax elements for the respective components were subtracted. For both the foreign currency portion and the labour cost in the local currency portion, shadow pricing was applied in order to convert the figures into economic costs.

The disbursement schedule of construction costs was set according to the proposed construction schedule. The economic construction costs by disbursement year are summarised as shown in Tables 13—4—1 and 13—4—2 for the Meghna and Meghna-Gumti Bridges, respectively.

The maintenance costs estimated in Chapter 9 were converted in terms of economic costs and are also shown in Tables 13—4—3 and 13—4—4 for the Meghna and Meghna-Gumti Bridges, respectively. The maintenance costs for the approach roads which were estimated were not counted into economic costs because the costs are common for both "with" and "without" cases in the economic evaluation.

Table 13—4—1   Economic Construction Costs for Meghna Bridge

(Unit: 1,000 Taka)

	Market Costs	Net of Taxes	F/C	L/C Labour	L/C Other	Economic Costs
A. Land Acquisition	11,561	11,561	0	0	11,561	11,561
B. Engineering Services	86,131	82,739	74,923	7,581	235	97,706
Detail Design	(22,256)	(21,883)	(21,112)	(536)	(235)	(26,421)
Supervision	(63,875)	(60,856)	(53,811)	(7,045)	(0)	(71,285)
C. Construction Costs	886,632	631,887	359,035	29,691	243,161	704,937
Direct Costs	(670,865)	(447,309)	(283,039)	(27,619)	(136,651)	(504,054)
Overhead	(153,909)	(140,492)	(50,947)	(0)	(89,545)	(151,700)
Physical Contingency	(61,858)	(44,086)	(25,049)	(2,072)	(16,965)	(49,183)
TOTAL COSTS	984,324	726,187	433,958	37,272	254,957	814,204

Disbursement Schedule

	Market Costs	Net of Taxes	F/C	L/C Labour	L/C Other	Economic Costs
1985	33,817	33,444	21,112	536	11,796	37,982
Land Acquisition	(11,561)	(11,561)	(0)	(0)	(11,561)	(11,561)
Detail Design	(22,256)	(21,883)	(21,112)	(536)	(235)	(26,421)
1986	199,629	123,435	73,411	3,236	46,788	138,939
Supervision	(1,960)	(1,936)	(1,880)	(56)	(0)	(2,339)
Construction	(197,669)	(121,499)	(71,531)	(3,180)	(46,788)	(136,600)
1987	192,422	143,771	79,481	10,474	53,816	159,162
Supervision	(14,696)	(14,005)	(12,392)	(1,613)	(0)	(16,408)
Construction	(177,726)	(129,766)	(67,089)	(8,861)	(53,816)	(142,754)
1988	244,171	177,561	130,016	9,136	38,409	204,338
Supervision	(17,879)	(17,015)	(14,999)	(2,016)	(0)	(19,912)
Construction	(226,292)	(160,546)	(115,017)	(7,120)	(38,409)	(184,426)
1989	174,900	133,463	82,802	7,170	43,491	150,245
Supervision	(16,551)	(15,802)	(14,055)	(1,747)	(0)	(18,545)
Construction	(158,349)	(117,661)	(68,747)	(5,423)	(43,491)	(131,700)
1990	139,585	114,513	47,136	6,720	60,657	123,538
Supervision	(12,789)	(12,098)	(10,485)	(1,613)	(0)	(14,081)
Construction	(126,596)	(102,415)	(36,651)	(5,107)	(60,657)	(109,457)

Source : Ap. Table 9—2—1 and Table 9—2—2

Table 13—4—2 Economic Construction Costs for Meghna-Gumti Bridge
— Alternative Plan 1 —

(Unit: 1,000 Taka)

	Market Costs	Net of Taxes	F/C	L/C Labour	L/C Other	Economic Costs
A. Land Acquisition	5,833	5,833	0	0	5,833	5,833
B. Engineering Services	70,024	66,529	57,262	8,986	281	77,329
Detail Design	(16,671)	(16,666)	(15,541)	(844)	(281)	(19,916)
Supervision	(53,353)	(49,863)	41,721)	(8,142)	(0)	(57,413)
C. Construction Costs	1,187,984	824,906	518,159	34,855	271,892	931,930
Direct Costs	(910,686)	(591,155)	(408,482)	(32,424)	(150,249)	(674,536)
Overhead	(194,415)	(176,201)	(73,527)	(0)	(102,674)	(192,377)
Physical Contingency	(82,883)	(57,550)	(36,150)	(2,431)	(18,969)	(65,017)
TOTAL COSTS	1,263,841	897,268	575,421	43,841	278,006	1,015,092

Disbursement Schedule

	Market Costs	Net of Taxes	F/C	L/C Labour	L/C Other	Economic Costs
1990	22,504	22,499	15,541	844	6,114	25,749
Land Acquisition	(5,833)	(5,833)	(0)	(0)	(5,833)	(5,833)
Detail Design	(16,671)	(16,666)	(15,541)	(844)	(281)	(19,916)
1991	294,688	159,136	96,399	2,827	59,910	179,778
Supervision	(2,922)	(2,888)	(2,810)	(78)	(0)	(3,490)
Construction	(291,766)	(156,248)	(93,589)	(2,749)	(59,910)	(176,288)
1992	155,220	119,567	76,949	7,292	35,326	135,037
Supervision	(12,549)	(11,799)	(10,052)	(1,747)	(0)	(13,661)
Construction	(142,672)	(107,768)	(66,897)	(5,545)	(35,326)	(121,376)
1993	233,196	175,600	116,490	10,128	48,982	199,203
Supervision	(13,733)	(12,754)	(10,469)	(2,285)	(0)	(14,600)
Construction	(219,463)	(162,846)	(106,021)	(7,843)	(48,982)	(184,603)
1994	356,252	265,268	177,628	14,159	73,481	301,514
Supervision	(13,359)	(12,380)	(10,095)	(2,285)	(0)	(14,144)
construction	(342,893)	(252,888)	(167,533)	(11,874)	(73,481)	(287,370)
1995	201,987	155,198	92,414	8,591	54,193	173,811
Supervision	(10,791)	(10,042)	(8,295)	(1,747)	(0)	(11,518)
Construction	(191,190)	(145,156)	(84,119)	(6,844)	(54,193)	(162,293)

Source: Ap. Table 9-3-1 and Table 9-3-2

Table 13-4-3   Economic Maintenance Costs for Meghna Bridge

(Unit: 1,000 Taka)

	Market Costs	Net of Taxes	F/C Costs	L/C Costs Labour	Others	Economic Costs
1. Annual Maintenance	289	274	144	83	47	289
2. Periodical Maintenance (every 5 years)	1,571	912	593	171	148	1,008

Source: Table 9-2-4

Table 13-4-4   Economic Maintenance Costs for Meghna-Gumti Bridge

(Unit: 1,000 Taka)

	Market Costs	Net of Taxes	F/C Costs	L/C Costs Labour	Others	Economic Costs
1. Annual Maintenance	309	294	147	102	45	326
2. Periodical Maintenance (every 5 years)	2,285	1,340	922	216	202	1,500

Source: Table 9-3-4

13—5   Economic Benefits

13—5—1   Ferry Investment Cost Saving

Based on the financial investment cost estimates for the future expansion of ferry facilities, the economic ferry investment costs in 1984 prices were computed. For the computation of economic costs, adjustment was made for such transfer items as taxes and duties, and shadow pricing was applied both to the foreign currency and the labour wage portions of the investment. The details of the calculation of economic unit costs of ferry boats, spare engines, pontoons/gangways and jetties with ferry approach roads are shown in Ap. Tables 13—2 through 13—5, respectively. The summary of economic ferry investment costs by disbursement year are shown in Table 13—5—1.

13—5—2   Ferry Operating Cost Saving

The construction of the proposed bridges will contribute to the saving of ferry operating costs in the future. The economic benefits from the ferry operating cost savings in the future were estimated based on the projected traffic volume. The estimation results are summarised and shown in Tables 13—5—2 and 13—5—3 for Meghna ferry service and Meghna-Gumti ferry service, respectively.

The estimate of economic ferry operating costs was made only for the years of 1990, 1995, 2000, 2005, 2010, 2015 and 2020, and the costs for other years were obtained by interpolation or extrapolation. Further, the annual operating cost estimates were made based on the normal traffic projections.. For the estimate of economic ferry operating costs of induced traffic, unit costs per HVE were calculated and multiplied to the projected induced traffic volume. However, as an economic benefit only 50% of them were counted as discussed in Section 13—1.

Table 13—5—1   Economic Ferry Investment Costs by Year

(Unit: 1,000 Taka)

	Meghna				Meghna-Gumti			
	Ferry Boat	Spare Engine	Pontoon/ Approach	Total	Ferry Boat	Spare Engine	Pontoon/ Approach	Total
1990								
91								
92								
93								
94	6,315	1,975	5,496	13,786				
95								
96								
97					6,315	1,975	5,221	13,511
98	6,315			6,315				
99								
2000	6,315	1,975	5,496	13,786	6,315			6,315
01								
02	6,315			6,315	6,315	1,975		8,290
03	6,315	1,975		8,290	6,315		5,221	11,536
04					6,315	1,975		8,290
05	6,315		5,496	11,811				
06					6,315			6,315
07	6,315	1,975		8,290				
08					6,315	1,975	5,221	13,511
09	6,315			6,315	6,315			6,315
10	6,315	1,975	5,496	13,786	6,315	1,975		8,290
11	6,315			6,315				
12	6,315	1,975		8,290	6,315		5,221	11,536
13					6,315	1,975		8,290
14	6,315		5,496	11,811	6,315			6,315
15	6,315	1,975		8,290	6,315	1,975	5,221	13,511
16					6,315			6,315
17	6,315			6,315	6,315	1.975	5,221	13,511
18	6,315	1,975	5,496	13,786	6,315			6,315
19	6,315			6,315	6,315	1,975		8,290
20	6,315	1.975	5,496	13,786	6,315		5,221	11,536
21					6,315	1,975		8,290
22					6,315			6,315
23					6,315	1,975	5,221	13,511
24					6,315			6,315
25					6,315	1.975		8,290

Source: Table 13-3-1 and Ap. Tables 13-2 through 13-5

Table 13—5—2 Economic Ferry Operating Cost Savings Benefit
for Meghna Bridge

(1) Economic Benefit from Ferry Operating Cost Savings for Normal Traffic

(Unit: 1,000 Taka)

	1984	1990	1995	2000	2005	2010	2015	2020
A. Direct Ferry Operating	7,298	10,494	11,771	14,419	18,359	22,272	27,548	32,815
1. Ferry Crew Wages	(362)	(534)	(567)	(723)	(928)	(1,109)	(1,406)	(1,652)
2. Fuel and Lubricant Oil	(4,812)	(7,418)	(8,344)	(10,200)	(12,982)	(15,761)	(19,469)	(23,179)
3. Ferry Maintenance Costs	(2,124)	(2,542)	(2,860)	(3,496)	(4,449)	(5,402)	(6,673)	(7,944)
B. Terminal Operating Costs	2,219	3,238	3,642	4,420	5,628	6,767	8,377	9,956
1. Terminal Worker Wages	(723)	(1,112)	(1,242)	(1,498)	(1,934)	(2,278)	(2,842)	(3,376)
2. Fuel and Lubricant Oil	(962)	(1,484)	(1,669)	(2,040)	(2,596)	(3,152)	(3,894)	(4,636)
3. Pontoon Maintenance Costs	(62)	(82)	(103)	(123)	(144)	(185)	(226)	(267)
4. Other Maintenance Expenses	(437)	(525)	(593)	(724)	(919)	(1,117)	(1,380)	(1,642)
5. Other Operating Expenses	(35)	(35)	(35)	(35)	(35)	(35)	(35)	(35)
C. General Administration Expenses	1,903	2,746	3,083	3,768	4,797	5,808	7,185	8,554
Total Ferry Operating Costs	11,420	16,478	18,496	22,607	28,784	34,847	43,110	51,325

(2) Economic Benefit from Ferry Operating Cost Savings for Induced Traffic

(Unit: 1,000 Taka)

	1984	1990	1995	2000	2005	2010	2015	2020
Ferry Operating Costs/HVE	8.45	8.33	7.35	7.06	7.26	7.11	7.21	7.05
Induced Traffic Volume in HVE								
Meghna – Case I	--	145	187	240	298	371	450	546
Meghna – Case II	--	463	593	759	944	1,173	1,443	1,775
Ferry Operating Costs								
Meghna – Case I	--	1,208	1,374	1,694	2,163	2,638	3,245	3,849
Meghna – Case II	--	3,857	4,359	5,359	6,853	8,340	10,404	12,514
Effective Rate	--	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Ferry Operating Cost Saving								
Meghna – Case I	--	604	687	847	1,082	1,319	1,623	1,925
Meghna – Case II	--	1,929	2,180	2,680	3,427	4,170	5,202	6,257

(3) Total Economic Benefit from Ferry Operating Cost Saving

(Unit: 1,000 Taka)

	1984	1990	1995	2000	2005	2010	2015	2020
Meghna – Case I	--	17,082	19,183	23,454	29,866	26,166	44,733	53,250
Meghna – Case II	--	18,407	20,676	25,287	32,211	39,017	48,312	57,582

Source: Ap. Tables 13-7 through 13-11 and Table 11-4-5

Table 13—5—3 Economic Ferry Operating Cost Savings Benefit for Meghna-Gumti Bridge

(1) Economic Benefit from Ferry Opeating Cost Savings for Normal Traffic

(Unit: 1,000 Taka)

	1984	1990	1995	2000	2005	2010	2015	2020
A. Direct Ferry Operating Costs	10,877	16,081	20,083	24,133	30,180	38,154	46,258	56,272
1. Ferry Crew Wages	(329)	(493)	(603)	(759)	(960)	(1,142)	(1,454)	(1,729)
2. Ferry Maintenance Costs	(8,424)	(13,043)	(16,302)	(19,561)	(24,453)	(30,974)	(37,495)	(45,646)
3. Ferry Maintenance Costs	(2,124)	(2,542)	(3,178)	(3,813)	(4,767)	(6,038)	(7,309)	(8,897)
B. Terminal Operating Costs	3,000	4,450	5,526	6,574	8,283	10,374	12,577	15,260
1. Terminal Worker Wages	(776)	(1,218)	(1,492)	(1,736)	(2,251)	(2,759)	(3,354)	(4,040)
2. Fuel and Lubricant Oil	(1,685)	(2,609)	(3,260)	(3,912)	(4,891)	(6,195)	(7,499)	(9,129)
3. Pontoon Maintenance Costs	(62)	(62)	(82)	(103)	(123)	(144)	(185)	(226)
4. Other Maintenance Costs	(437)	(521)	(652)	(783)	(978)	(1,236)	(1,499)	(1,825)
5. Other Operating Expenses	(40)	(40)	(40)	(40)	(40)	(40)	(40)	(40)
C. General Administration Expenses	2,775	4,106	5,122	6,141	7,693	9,706	11,767	14,306
Total Ferry Operating Costs	16,652	24,637	30,731	36,848	46,156	58,234	70,602	85,838

(2) Economic Benefit from Ferry Operating Cost Savings for Induced Traffic

(Unit: 1,000 Taka)

	1984	1990	1995	2000	2005	2010	2015	2020
Ferry Operating Costs/HVE	12.33	12.45	12.21	11.51	11.65	11.88	11.81	11.78
Induced Traffic Volume in HVE	—	463	593	759	944	1,173	1,443	1,775
Ferry Operating Costs	—	5,764	7,241	8,736	10,998	13,935	17,042	20,910
Effective Rate	—	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Ferry Operating Cost Saving	—	2,882	3,621	4,368	5,499	6,968	8,521	10,455

(3) Total Economic Benefit from Ferry Operating Cost Saving

(Unit: 1,000 Taka)

	1984	1990	1995	2000	2005	2010	2015	2020
Meghna – Gumti	—	27,569	34,352	41,216	51,655	65,202	79,123	96,293

Source: Ap. Tables 13-7 through 13-11 and Table 11-4-5

1) Personnel Expanses

In accordance with the increase of the number of ferries and landing facilities, the personnel needed for the ferry operation would increase. Ap. Tables 13-6 and 13-7 show the projected total number of personnel and personnel expenditure in the future for both Meghna and Meghna-Gumti ferry services. Personnel expenses in terms of economic costs were computed by applying a shadow wage rate of 0.80.

2) Fuel and Lubricant Oil Costs

From the projected number of ferry round trips and the average consumption volume of fuel and lubricant oil per round trip, the total consumption volumes of fuel and lubricant oil for ferry boats were computed. Then, the costs of fuel and lubricant oil both in financial and economic costs were computed by applying the unit costs. The details of the calculation are shown in Ap. Tables 13-8, 13-9 and 13-10. Further, the consumption of fuel and lubricant oil at ferry terminals was estimated using the assumption that their consumption would be around 20% of direct ferry operation.

3) Maintenance Costs

The future maintenance costs of ferries and pontoons/gangways were estimated using the projected number of the facilities and the unit maintenance costs divided into running, overhauling and regular maintenance costs. The results are shown in Ap. 13-11. The maintenance costs at market prices were converted into economic costs by making use of SCF of 0.82. The maintenance costs for other facilities were computed at 30% of those for ferries and pontoons/gangways.

4) General Administration Expenses/Others

The general administration expenses were estimated at 20% of direct ferry and terminal operating costs.

The expenditures for ferries and other facilities were counted at initial investment bases and depreciation costs of them were not counted. The replacement costs were excluded, which would place economic evaluation results a little on the conservative side.

13—5—3 Vehicle Operating Cost Saving

In order to figure the benefit from the vehicle operating cost savings by the completion of the proposed bridges, the vehicle operating costs on road stretches connecting the starting points of approach roads at both sides of the bridges were determined. The completion of the proposed bridges would increase the running distance of vehicles, in the case of Meghna Bridge from 1.9 km to 2.9 km, and Meghna-Gumti Bridge from 1.4 km to 2.8 km. On the other hand, the completion of the bridges would increase the average running speed of vehicles. At present the running speed of vehicles at approach road sections is relatively low. For one thing, they have to reduce their speeds in order to stop at the ferry terminal. For another, vehicles often have to stop and restart repeatedly as they come near the ferry terminals while making long waiting queues. Taking these conditions into consideration, the average running speed of vehicles on approach road sections was assumed to be 25 km per hour without the bridges. After the completion of the proposed bridges, vehicles would be assured of running smoothly on paved roads without stopping, and the average running speed was assumed to increase to 70 km per hour.

Based on the projected future traffic volume by type of vehicle and the unit vehicle operating costs by running speed, the total vehicles operating costs (VOC) were computed both for "with" and "without" cases, and the benefits on account of VOC savings were obtained. Only 50% of the total benefits from VOC savings for the induced traffic were taken as economic benefits. The details of computation are shown in Ap. Tables 13—12 and 13—13 respectively for Meghna and Meghna-Gumti Bridges, the results of which are shown in Table 13—5—4. Benefit calculations were made only for the years of 1990, 2000, 2010 and 2020, and benefits for other years were obtained by interpolation or extrapolation.

Table 13-5-4 Summary of Economic VOC Savings Benefit

(Unit: 1,000 Taka/Year)

	1990	2000	2010	2020
Meghna - Case I				
Normal Traffic	109.5	255.5	438.0	657.0
Induced Traffic	36.5	36.0	0	0
Total	146.0	292.0	438.0	657.0
Meghna - Case II				
Normal Traffic	109.5	255.5	438.0	657.0
Induced Traffic	36.5	73.0	109.5	182.5
Total	146.0	328.5	547.5	839.5
Meghna-Gumti				
Normal Traffic	-2,263.0	-3,723.0	-5,803.5	-8,650.5
Induced Traffic	- 292.0	- 438.0	- 657.0	-1,022.0
Total	-2,555.0	-4,161.0	-6,460.5	-9,672.5

Source: Ap. Tables 13-12 and 13-13

13-5-4 Time Saving Benefits

The completion of the proposed bridges would also contribute to the saving of travel time. Table 13-5-5 shows comparison of total travel time of vehicles between "with" and "without" cases, and savings of the total travel time by both Meghna and Meghna-Gumti Bridges.

Based on the projected future traffic volume, time value and the total travel time saved by type of vehicle, time cost saving benefits were measured. The details of computation are shown in Ap. Tables 13-14 and 13-15 for Meghna and Meghna-Gumti Bridges, respectively. The unit time savings benefit attributable to the induced traffic was discounted to half of that for the normal traffic. The enumeration results for the years of 1990, 2000, 2010 and 2020 are as shown in Table 13-5-6. As with other benefit items, time saving benefits for other years were estimated by interpolation or extrapolation from those calculation years.

Table 13–5–5   Comparison of Total Travel Time Between "With" and "Without" Cases

(Unit: Minute)

	Truck	Bus & Mini–bus	Car/Others
(Meghna Bridge)			
"Without			
Ferry Crossing Time	58.5	31.0	28.5
Vehicle Running Time[1]	4.6	4.6	4.6
Total	63.1	35.6	33.1
"With"			
Vehicle Running Time[2]	2.5	2.5	2.5
Travel Time Saved	60.6	33.1	30.6
(Meghna-Gumti Bridge)			
"Without"			
Ferry Crossing Time	94.5	52.0	39.0
Vehicle Running Time[3]	3.4	3.4	3.4
Total	97.9	55.4	42.4
"With"			
Vehicle Running Time[4]	2.4	2.4	2.4
Travel Time Saved	95.5	53.0	40.0

Remarks: (1)   (1.9 km ÷ 25 km/h) x 60

          (2)   (2.9 km ÷ 70 km/h) x 60

          (3)   (1.4 km ÷ 25 km/h) x 60

          (4)   (2.8 km ÷ 70 km/h) x 60

Source: Crossing Time Survey

Table 13-5-6   Summary of Time Saving Benefit

(Unit: 1,000 Taka/Year)

	1990	2000	2010	2020
Meghna Case I				
Vehicle Time Value	24,820	40,187	61,539	91,396
(Normal Traffic)	(23,981)	(38,800)	(59,386)	(88,221)
(Induced Traffic)	(839)	(1,387)	(2,153)	(3,175)
Passenger Time Value	25,112	40,113	60,298	87,965
(Normal Traffic)	(24,053)	(38,288)	(57,488)	(83,841)
(Induced Traffic)	(1,059)	(1,825)	(2,810)	(4,124)
Total Time Saving Benefit	49,932	80,300	121,837	179,361
Meghna - Case II				
Vehicle Time Value	26,682	43,253	66,284	98,587
(Normal Traffic)	(23,981)	(38,800)	(59,386)	(88,221)
(Induced Traffic)	(2,701)	(4,453)	(6,898)	(10,366)
Passenger Time Value	27,849	44,384	66,649	97,528
(Normal Traffic)	(24,053)	(38,288)	(57,488)	(83,841)
(Induced Traffic)	(3,796)	(6,096)	(9,161)	(13,687)
Total Time Saving Benefit	54,531	87,637	132,933	196,115
Meghna-Gumti				
Vehicle Time Value	41,866	67,562	103,149	153,154
(Normal Traffic)	(37,632)	(60,700)	(92,564)	(137,240)
(Induced Traffic)	(4,234)	(6,862)	(10,585)	(15,914)
Passenger Time Value	43,873	69,350	103,514	150,380
(Normal Traffic)	(37,997)	(59,897)	(89,316)	(129,429)
(Induced Traffic)	(5,876)	(9,453)	(14,198)	(20,951)
Total Time Saving Benefit	85,739	136,912	206,663	303,534

Source: AP. Tables 13-14 and 13-15

13-6   Economic Cost and Benefit Flows and Evaluation Results

Ap. Tables 13-16, 13-17, 13-18 and 13-19 show the economic cost and bene-
fit flows and the results of the evaluation for Meghna — Case I, Meghna — Case II,
Meghna-Gumti and the combined Meghna and Meghna-Gumti projects, respec-
tively.

The economic feasibility of the project was tested making use of the conventional
criteria of EIRR (Economic Internal Rate of Return), and both B-C (Net Present
Value: Benefit minus Cost) and B/C Ratio (Benefit Cost Ratio) at two discount
rates of 10% and 15%.

Table 13-6-1   Summary of Economic Evaluation

	Economic IRR (%)	Discounted at 10%		Discounted at 15%	
		B-C (Tk. million)	B/C (Ratio)	B-C (Tk. million)	B/C (Ratio)
Meghna - Case I	10.2	17.2	1.03	-207.2	0.57
Meghna - Case II	10.7	52.2	1.09	-193.0	0.60
Meghna-Gumti	14.8	310.0	1.73	-5.3	0.98
Combined Meghna/ Meghna-Gumti	12.4	362.2	1.37	-198.2	0.74

Preliminary conclusion for the proposed project derived from the above evalu-
ation results is briefly summarised as follows:

1) The construction projects of the proposed Meghna and Meghna-Gumti Bridges
are both economically feasible, the IRRs of which are both above 10%.

2) The construction of the Meghna Bridge is feasible both as a single project and
as a joint project with Meghna-Gumti Bridge. However, the economic viabil-
ity is higher in the case of the joint project.

3) The economic evaluation result shows that the feasibility of the Meghna-
Gumti Bridge is higher than that of the Meghna Bridge. This is due mainly to
two factors: one is the fact that the unit length construction cost of the
former is lower than that of the latter, because the Meghna Bridge will require
a large investment cost for its ancillary works to protect it from river erosion;

and the other is the fact that the economic evaluation for the Meghna-Gumti Bridge is conducted under the assumption that its construction is deferred until after the completion of the Meghna Bridge.

4) The earlier implementation of the proposed project is highly recommended from its economic soundness. Especially, the construction of both Meghna and Meghna-Gumti Bridges is more recommendable than the sole construction of the Meghna Bridge due to the higher economic feasibility of the joint project.

13—7 Sensitivity Test

Sensitivity tests were conducted under the follwong different assumptions for economic cost and benefit streams.

Passenger Time Value:

The passenger time saving benefits derived from the proposed project were considered to decrease by 30%, 50% and 80% from the originally estimated time benefits.

Construction Costs:

Economic construction costs were assumed to increase by 10%, 20% and 30% from the original cost estimate.

Construction Schedule of Meghna-Gumti Bridge:

Three alternative plans explained in Section 13—3 are taken into consideration to test their sensitivity.

The results of sensitivity tests are as shown in Table 13—7—1 and the conclusion derived therefrom is briefly summarised as follows:

1) Passenger time savings constitute the largest tangible benefit items related to the proposed project. Even under the severest assumption that only 20% of passenger time saving benefit is counted as a part of the economic benefits, the EIRR of the combined two bridges is 9.7%, which would be judged as economically feasible in the country.

Table 13—7—1   Results of Sensitivity Tests

(Unit: EIRR %)

	Meghna Case I	Meghna Case II	Meghna-Gumti	Combined 2 Bridges
Passenger Time Value				
Base case	10.2	10.7	14.8	12.4
30% Down	9.4	9.8	13.6	11.4
50% Down	8.8	9.2	12.8	10.8
80% Down	7.8	8.2	11.5	9.7
Construction Costs				
Base case	10.2	10.7	14.8	12.4
10% Up	9.5	10.0	13.9	11.6
20% Up	8.9	9.3	13.1	11.0
30% Up	8.4	8.8	12.4	10.4
Construction Schedule of Meghna-Gumti Bridge				
Base case (1991–95)	–	10.7	14.8	12.4
Alternative 2 (1989–93)	–	10.7	14.0	12.3
Alternative 3 (1993–97)	–	10.6	15.6	12.5

2) The proposed project is rather cost resistant to the increase of the construction costs. The impact of the cost increase of 10% is minor. And even under the assumption that the construction costs would increase by 30% from the original estimate, the economic feasibility of the proposed project is not adversely affected.

3) The changes in the construction schedule of Meghna-Gumti Bridge do not exert any significant influence on the economic evaluation results. The late start of the construction of Meghna-Gumti Bridge increases the IRR of both Meghna-Gumti Bridge project and the combined Meghna and Meghna-Gumti Bridge project slightly due to the increase of traffic volume in future. However, the early start of the construction of Meghna-Gumti Bridge produces slightly favourable influence on the economic feasibility of the Meghna Bridge, the IRR of which is comparatively lower than that of the Meghna-Gumti Bridge.

CHAPTER 14
IMPLEMENTATION PLANS

CHAPTER 14 IMPLEMENTATION PLANS

14–1   Implementation Programme for Meghna Bridge

14–1–1   General

The implementation schedule was studied using the condition that the Meghna Bridge and its approach roads would be completed by the end of 1990. Prior to the commencement of the construction it is necessary to carry out such pre-construction works as soils investigation, detailed engineering design, land acquisition, financial arrangement, etc.

14–1–2   Project Cost

Based on the studies of the preliminary engineering, construction cost, construction procedure, etc. the implementation cost for the Meghna Bridge project is summarised in Table 14–1–1.

Table 14–1–1   Implementation Cost of Meghna Bridge Construction

(Taka in Million, June 1984 prices)

Classified Cost	Foreign Currency Portion	Local Currency Portion	Total
Construction Cost	359 (40%)	528 (60%)	887 (100%)
Land Acquisition & Compensation Cost	–	12(100%)	12 (100%)
Engineering Cost	75 (87%)	11 (13%)	86 (100%)
TOTAL	434 (44%)	551 (56%)	985 (100%)

Source: The Study Team

14–1–3   Implementation Schedule

The overall project implementation schedule that was prepared based on the above-mentioned consideration is shown in Fig. 14-1-1. The economic and financial studies were carried out based on this schedule. The requirement of each major activity is as described below:

Years: 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991

F/S (JICA)

D/D (10)

L.A. (12)

TENDER (5)

MOBILIZATION AND SITE PREPARATION

CONSTRUCTION (48)

BRIDGE AND APPROACH ROAD CONSTRUCTION

EMBANKMENT PROTECTION

DEMOBILIZATION
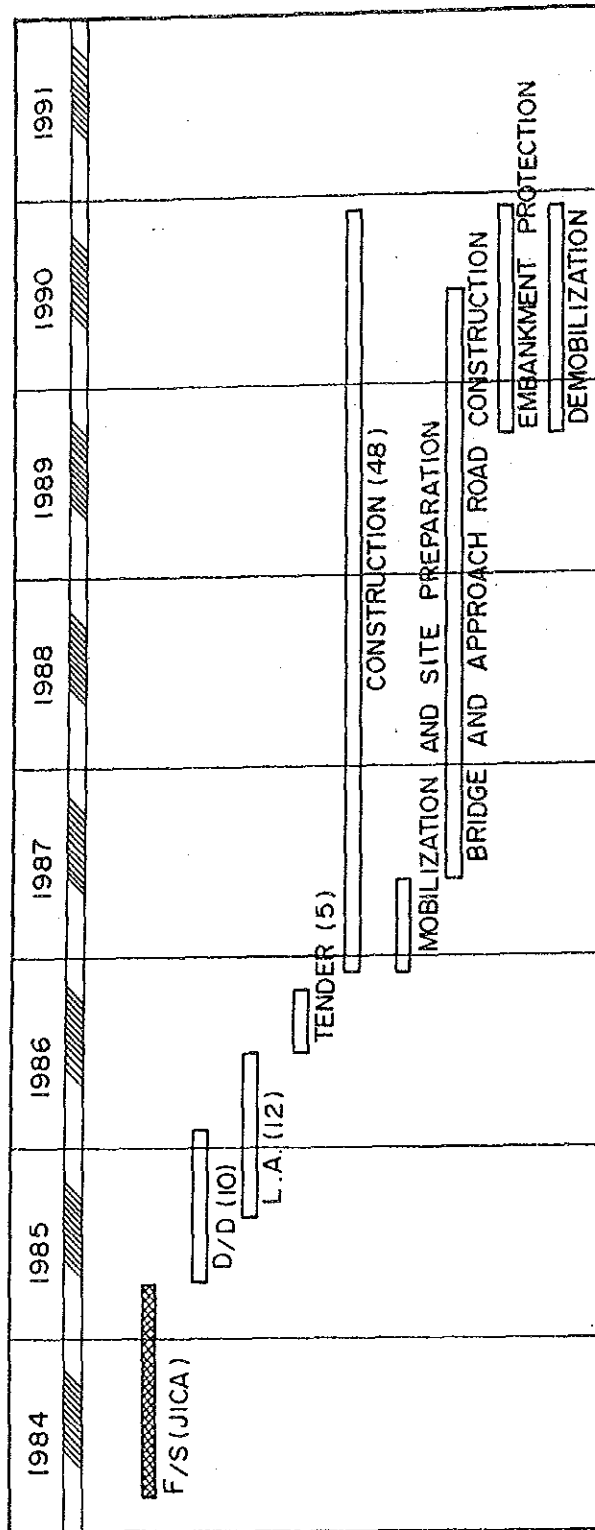
LEGEND :

F/S : FEASIBILITY STUDY

D/D : DETAILED ENGINEERING DESIGN

L.A. : LAND ACQUISITION AND COMPENSATION

▨ : RAINY SEASON

FIG. 14—1—1 OVERALL IMPLEMENTATION SCHEDULE OF MEGHNA BRIDGE CONSTRUCTION

1) Detailed Engineering Design

The detailed engineering design will require about 10 months for its completion. Due consideration should be given to the commencement of the work because some activity of the work will have a seasonal restiction, for example, soils investigation the data of which are required at the initial stage of the design work can be conducted only in the dry season.

2) Tender Process

After completion of the detailed engineering design and financial arrangement, several months will be required for the tender process. The prequalification of contractors may also be required before the tender call.

3) Land Acquisition and Compensation

Since the project site is in a rural area, which is inundated during rainy season, the land acquisition will not cause many serious problems. The period of the land acquisition and compensation was estimated to be 12 months.

4) Construction

Based on the discussion set out in Subsection 7—1—6, it was found that the initial and final stages of construction should be in the dry season in accordance with the characteristics of the works and that foundation work should also be conducted in the low water season. Therefore the construction period was estimated at 48 months.

The disbursement schedule of the project was prepared to meet the above-mentioned requirements and is presented in Table 14—1—2.

Table 14—1—2   Disbursement Schedule of Meghna Briege Project Cost

(Taka in Million, June 1984 prices)

Cost item	1985	1986	1987	1988	1989	1990
Construction Cost	–	198	178	226	158	127
Land Acquisition & Compensation Cost	12	–	–	–	–	–
Engineering Cost	22	2	15	18	16	13
Total	34	200	193	244	174	140

Source: The Study Team

14–2 Implementation Programme for Meghna-Gumti Bridge

14–2–1 General

In Section 14–1 the construction of the Meghna Bridge and its approach roads was proposed for completion by the end of 1990. For the Meghna-Gumti Bridge and its approach roads, three alternative plans were considered in order to find the optimum construction schedule. The commencement of each plan is shown below.

Plan 1: 1991

Plan 2: 1989, and

Plan 3: 1993.

14–2–2 Project Cost

Similarly, the implementation cost for the Meghna-Gumti Bridge project is summarised in Table 14–2–1.

Table 14–2–1   Implementation Cost of Meghna-Gumti Bridge Construction

(Taka in Million, June 1984 prices)

Classified Cost	Foreign Currency Portion	Local Currency Portion	Total
Construction Cost	518 (44%)	670 (56%)	1,188 (100%)
Land Acquisition & Compensation Cost	–	6(100%)	6 (100%)
Engineering Cost	57 (81%)	13 (19%)	70 (100%)
TOTAL	575 (45%)	689 (55%)	1,264 (100%)

Source: The Study Team

14–2–3 Implementation Schedule

Prior to the commencement of the construction of the Meghna-Gumti Bridge, such pre-construction works as discussed in Section 14–1 will be required.

The overall project implementation schedule that was prepared based on the above-mentioned plans is shown in Fig. 14–2–1.

The economic and financial studies were carried out based on these schedules. Period estimated for each major activity is as follows:
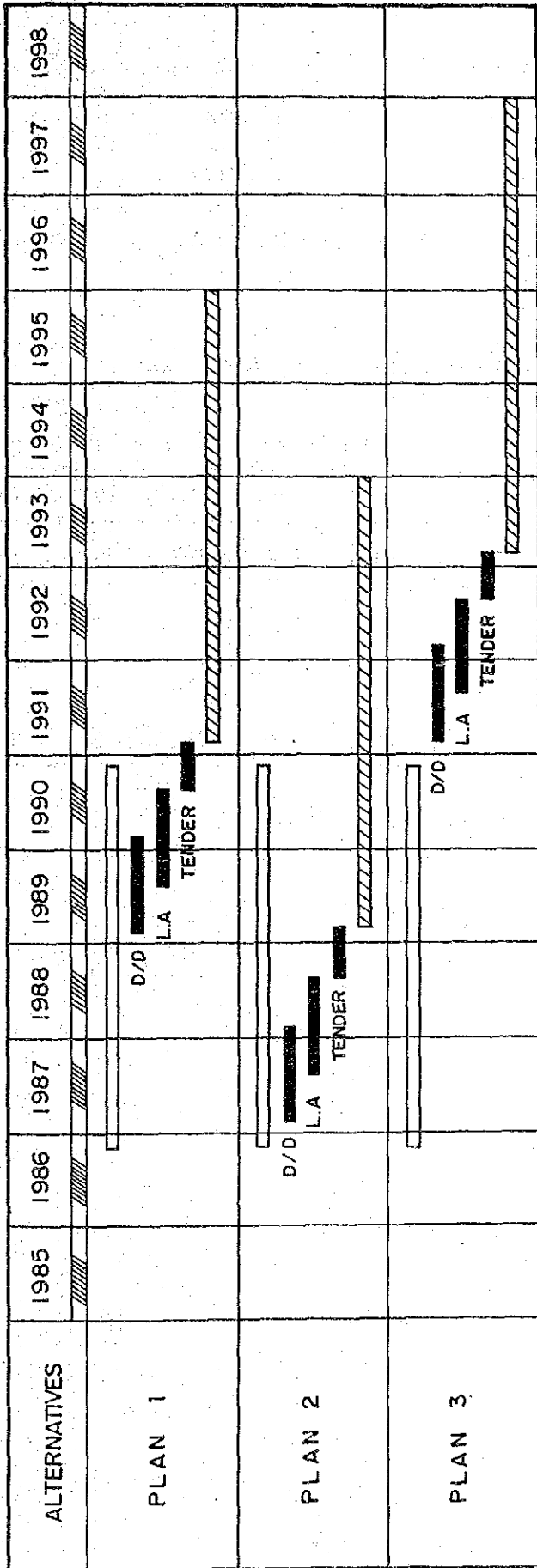
FIG 14-2-1   ALTERNATIVE PLANS FOR OVERALL IMPLEMENTATION SCHEDULE OF
MEGHNA, MEGHNA-GUMTI BRIDGES CONSTRUCTION

Detailed Engineering Design : 12 months

Land Acquisition and Compensation : 12 months

Construction : 58 months

The estimated disbursement schedule for Alternative Plan 1 is presented in Table 14-2-2.

Table 14-2-2 Disbursement Schedule of Meghna-Gumti Bridge Project Cost
— Altenrative Plan 1 —

(Taka in Million, June 1984 prices)

Cost Item	1990	1991	1992	1993	1994	1995
Construction Cost	–	292	143	219	343	191
Land Acquisition & Compensation Cost	6	–	–	–	–	–
Engineering Cost	17	3	13	13	13	11
TOTAL	23	295	156	232	356	202

Source: The Study Team

CHAPTER 15
CONCLUSION AND
RECOMMENDATIONS

CHAPTER 15 CONCLUSION AND RECOMMENDATIONS

15—1 Conclusion

In Bangladesh the road transport subsector (including both modern and traditional modes) comprised about 3.1% and 5.1% of the GDP at current prices in 1973—74 and 1982—83 respectively, whilst the transport and communication sector (including the storage subsector which has so far a very little contribution in the sector) contributed about 6.1% and 8.7% towards the DGP in the same years. Road transport thus has been playing the dominant role in the movement of goods. In recent years the performance of road transport in respect of carriage of freight traffic is generally more than three times the role played jointly by both railway and water transport, and road freight transport recorded the highest rate of increase amongst the three modes of transport.

The Dhaka-Chittagong Highway is the most important arterial road in the country, carrying the heaviest traffic. Truck traffic running on the highway will be compelled to continue to spend many hours waiting for ferry crossings at both the Meghna and Meghna-Gumti ferry ghats, unless the two bridges to replace the existing ferries are constructed.

Without the construction of these bridges the increase in traffic volumes across the two rivers will inevitably bring about demand for the increase in ferry facilities which will result in higher investment of capital in the long run. Based on an improved ferry scheme, which was studied for the without-bridge-case, 7 and 10 sets of terminal facilities which will be in 24 hours daily operation are required around the years 2010 and 2020 respectively, to cope with the increasing traffic. The number of ferry boats also has to be increased accordingly. It is anticipated that there would arise a great problem that the future operation and management of the ferry services would be extremely difficult and impracticable with such numbers of ferry facilities.

Between Dhaka and Chittagong, trucks can, at present, make one one-way trip in daytime hours through the two ferries, however, with the two bridges they could make one round trip in the same hours. The delay in the improvement to the crossing facilities will continue to be a bottleneck to the healthy economic development of Bangladesh.

With the completion of the two bridges the movement of heavy cargos will be speeded up by road transportation. As was seen from the O-D interview survey, the movement of machinery and metal products by truck from Chittagong to Dhaka was predominant. From these only, it can be said that the two bridges would greatly enhance the economic development of the country.

The construction of the bridges will not be anticipated to involve any serious technical problems; subsoil conditions were found to be fairly good, and except for prestressing cable and accessories, plasticisers, deformed bar, fabricated steel and cast iron and shaped steels, most construction materials are locally available.

The design and construction of concrete bridges with a span longer than 60 metres has not been achieved in Bangladesh. It is believed that the construction of the longer span bridges will expedite the technology transfer to the local engineers and technicians concerned, raising the standard of construction technology in Bangladesh, which the Government is eagerly wishing.

There are many indirect benefits that are not measurable. The bridging will reduce the congestion of the highway, giving the vehicles easier passage, which will produce secondary effects such as accelerating development of agricultural areas along the highway and expediting regular investments to already established areas.

The result of the Study has shown the importance of the construction of the bridges over the Meghna and the Meghna-Gumti Rivers and that the Project is proved to be feasible by economic and technical analyses. The implementation of the Project will without doubt act as a great social and development impetus. It is concluded that the Meghna and Meghna-Gumti Bridge construction is an indispensable project and that it is a realistic solution for the development of economy as well as road transportation of the country.

15—2 Recommendations

The following recommendations concerning the Project are made:

1. Earlier Implementation of the Project

   From the socio-economic view point in Bangladesh, the Project should be implemented as soon as possible because of its important functions as dis-

cussed in the preceding chapters. The joint construction of the two bridges is most desirable for enhancing the economic development of Bangladesh and for winning maximum benefits from the construction of the bridges. However, if the joint construction of both bridges are impracticable, either of the two should be constructed immediately, providing that the construction of the remaining bridge would be succeeded. In this case the construction of the Meghna Bridge should precede that of the Meghna-Gumti Bridge because the former involves wider solutions to technological problems and can be constructed within 48 months, compared to 58 months for the latter, thus being able to demonstrate so earlier the construction technology as a pilot project. Prior to the commencement of the construction, the detailed engineering design and the practical implementation schedule of the Project should be prepared.

2. Earliest Acquisition of Land for R.O.W.

Considering the difficulty in land acquisition of the sites for the bridges and approach roads, it is very important that full preparation should be made for the acquisition of land for bridges and approach roads before the commencement of the construction.

3. Cooperation with Other Authorities Concerned

The bridges will have a heavy relationship with the navigation of ships and boats which use the rivers and the bank areas of the rivers. Close cooperation with the authorities concerned should be maintained.

ANNEXES

SCOPE OF WORK

FOR

THE FEASIBILITY STUDY ON

MEGHNA, MEGHNA-GUMTI BRIDGES CONSTRUCTION PROJECT

IN

THE PEOPLE'S REPUBLIC OF BANGLADESH
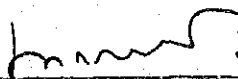
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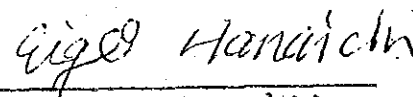
EXTERNAL RESOURCES DIVISION, MINISTRY OF FINANCE AND PLANNING

AND ·

THE JAPAN INTERNATIONAL COOPERATION AGENCY

DATED: 1st December 1983

MUHIUDDIN KHAN ALAMGIR

JOINT SECRETARY

EXTERNAL RESOUCES DIVISION

MINISTRY OF FINANCE AND PLANNING

EIGO HANAICHI

LEADER OF THE JAPANESE

PRELIMINARY STUDY TEAM

I INTRODUCTION

In response to the request of the Government of the People's
Republic of Bangladesh for the feasibility study leading to the
construction of Meghna and Meghna-Gumti Bridges, the Government
of Japan has decided to conduct the Feasibility Study on Meghna,
Meghna-Gumti Bridges Construction Project (hereinafter referred
to as "the Study"), in accordance with the relevant laws and
regulations in force in Japan.

The Japan International Cooperation Agency (hereinafter
referred to as "JICA"), the official agency responsible for the
implementation of the technical cooperation programmes of the
Government of Japan, will carry out the Study in close coopera-
tion with the authorities of the People's Republic of Bangladesh.

Roads and Road Transport Division, Ministry of Communication
(hereinafter referred to as "RRT") shall act as coordinating body
in relation with other organizations concerned for the smooth
implementation of the Study.

II OBJECTIVE OF THE STUDY

The objective of the Study is to carry out feasibility
study for the construction of Meghna Bridge and Meghna-Gumti
Bridge including their approaching roads in order to facilitate
transportation as well as to remove traffic obstruction on
Dhaka-Chittagong Road.

-1-

III SCOPE OF THE STUDY

In order to achieve the above objective, the JICA will carry out the following studies.

1. Traffic and Socio-Economic Studies

    (a) Traffic data collection, traffic survey and analysis.

    (b) Socio-economic data collection and analysis.

    (c) Review of population and socio-economic conditions.

    (d) Forecast of future traffic demand.

2. Engineering Studies

    (a) Topographic map collection

    (b) Engineering data collection and analysis.

        b-1 soil and geological data

        b-2 hydrological and hydrographic data

        b-3 materials data

        b-4 meteorological data

        b-5 seismic factor

    (c) Surveying

        c-1 soil and geological surveying including drilling and testing

        c-2 center line surveying

        c-3 hydrographic surveying (cross-sectional surveying, etc.)

    (d) Design criteria.

        d-1 geometric design standards

        d-2 structural design standards

        d-3 navigation clearance

(e) Engineering works

    e-1 preliminary alternative design

    e-2 quantity estimation for each alternative design

    e-3 cost estimation for each alternative design (land

        aquisition cost, construction cost, maintenance cost)

    e-4 construction program for each alternative design

        (construction method, construction schedule)

3. Economic Evaluation

   (a) Estimates of benefit

   (b) Estimates of NPV, IRR and B/C ratio

   (c) Sensitivity analysis

4. Implementation Program

An implementation program will be prepared based on the
construction program and the study of budgetal and financial
aspect.

IV STUDY SCHEDULE

The study will be conducted according to the tentative schedule
attached hereto as Appendix. The work in this respect will
commence in May 1984.

V REPORTS

JICA will prepare and submit the following Reports in English
to the Government of Bangladesh.

1. Inception Report

   30 copies

   At the beginning of field survey

2. Progress Report

   30 copies.

Every three months during course of the study in Bangladesh

3. Interim Report

   30 copies.

   At the end of the study in Bangladesh

4. Draft Final Report

   20 copies

   Within four months after presentation of Interim Report

5. Final Report

   50 copies

   Within two months after receipt of the Bangladesh Government's comments on the Draft Final Report.

VI   UNDERTAKINGS OF THE GOVERNMENT OF BANGLADESH

The Government of Bangladesh shall accord priviledges, immunities and other benefits to the Japanese study team and, through the authorities concerned, take necessary measures to facilitate the smooth implementation of the Study.

1. RRT shall make necessary arrangements with the cooperation of other organizations concerned for the following;

   (a) To secure the safety of the Study team

   (b) To permit the members of Japanese study team to enter, leave and sojourn in Bangladesh for the duration of their assignment therein, and exempt them from alien registration requirements.

   (c) To exempt the members of Japanese study team from taxes, duties and other charges on equipment, machinery and other materials brought into Bangladesh for the implementation of the Study.

(d) To exempt the members of the Japanese study team from income tax and other charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Japanese study team for their services in connection with the implementation of the Study.

(e) To provide the necessary facilities to the Japanese study team for the remittances as well as utilities of fund introduced into Bangladesh from Japan in connection with the implementation of the Study.

(f) To provide the medial services as needed and its expenses will be chargeable on the members of the Japanese study team.

(g) To secure permission to take all data and document related to the Study out of Bangladesh to Japan by the Study team.

2. RRT shall, at its own expense, provide the Japanese study team with the following, in cooperation with other organizations concerned;

(a) Available data and information related to the Study.

(b) Counterpart personnel

(c) Suitable office with necessary furniture, telephone, airconditioner or ceiling fan and cabinets.

(d) Credentials or identification cards

3. The Government of Bangladesh shall bear claims, if any arises against the members of the Japanese study team resulting from, occurring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise form gross negligence or wilful misconduct.

on the part of the members of the Japanese study team.

VII UNDERTAKINGS OF THE GOVERNMENT OF JAPAN

For the implementation of the Study, the Government of Japan, through JICA, shall take the following measures;

1. To dispatch, at its own expense, study teams to Bangladesh

2. To pursue technology transfer to the Bangladesh counterpart personnel in the course of the Study.

3. To provide the required equipment and machinery for the implementation of the Study, which will remain the property of JICA unless othersie agreed upon.

    (a) To bear charges of residential accommodation and living expenditure for the members of the Study teams.

    (b) To provide the Study team with vehicles and drivers

VIII JICA and RRT will consult with each other in respect of any matter that may arise from or in connection with the study.

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TENTATIVE SCHEDULE

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
WORK IN BANGLADESH																
WORK IN JAPAN																
REPORT PRESENTATION	Ic/R			P/R I			P/R II		I/R				DF/R		F/R	

Minutes of Discussion Between Staff of ERD, PC, MOC of
the Government of the People's Republic of Bangladesh
and Japanese Preliminary Study Team concerning the
Proposed Meghna and Meghna-Gumti Bridge.

1. Preamble

(1) The Japanese Government, on the request of the People's
Republic of Bangladesh, dispatched the preliminary study
team to Bangladesh from November 20th to December 1st in 1983
through program arranged by Japan International cooperation
Agency (JICA) in order to make preliminary study for the
planned feasibility study of Meghna and Meghna-Gumti
Bridges on Dhaka - Chittagong Road.

(2) The team carried out field surveys and had a series of
discussions with the Bangladesh authorities concerned
during their stay in the country.

(3) The Government of Bangladesh (GOB) and the team through
the discussions agreed to conclude the scope of work
for the comming feasibility study as attached herewith.

(4) Followings are the minutes of major points of discussion
on the scope of work.

2. Items Concerning the Scope of Work.

(1) Article III(e) Engineering Works

Concerning engineering works, both the GOB and the team
agreed with the necessity of studying both concrete
structure and steel structure in the feasibility study.

(2) Article III(e) Engineering Works

. The GOB strongly requested to include detailed design
for the selected type of bridge in the feasibility study
to make construction of both bridges start as soon as
possible.

. The team promised to transfer the request to the Japanese
Government, because detailed design cannot be started
without finishing the feasibility study and also it is
beyond the authority of the team.

-1-

(3) Article VII Undertakings of the Government of Japan

. The association with local consultants and the technology
transfer to local consultants in the course of the
feasibility study which were requested from the GOB
will be considered in case it is possible.

(4) Article IV Study Schedule

. With respect to the request from the GOB to finish the
feasibility study within 9 months, the team suggested that
the Japanese side will consider the request in detail
so that the schedule be shortened as far as possible
before starting the feasibility study.

3. List of Participants

Bangladesh Team

1. Dr. Muhiuddin Khan Alamgir	Joint Secretary, External Resources Division, Ministry of Finance and Planning
2. Mr. Saifur Haque	Deputy Chief, ERD, MOFP
3. Mr. A.B.M. Shiddique	Section Chief, Roads and Road Transport, Planning Commission.
4. Mr. Noor Mohammad	Joint Secretary, Roads and Road Transport Division, Ministry of Communication.
5. Mr. A. R. Chowdhury	Chief Engineer, Roads and Highway Department, MOC
6. Mr. Bazlur Rahman	Additional Chief Engineer (Special Project), RHD, MOC

Japanese Team

1. Mr. Eigo Hanaichi	Leader, Japanese Preliminary Study Team (JPST)
2. Mr. Yoshiyuki Yamamoto	Road Planner, JPST
3. Mr. Masato Nakamura	Bridge Planner, JPST
4. Mr. Tetsuo Komatsubara	Coordinator, JPST
5. Mr. Saburo Sato	Second Secretary, Embassy of Japan.
6. Mr. Koichi Morita	Second Secretary, Embassy of Japan.
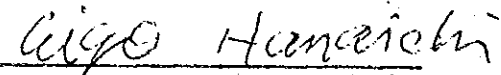
4. Adoption of Minutes

The minutes were reviewed throughly after which
they were adopted as reflecting the true record of
the understandings reached by both sides.

DATE.   1st December 1983

MUHIUDDIN KHAN ALAMGIR   EIGO HANAICHI
JOINT SECRETARY   LEADER OF THE JAPANESE
EXTERNAL RESOUCES DIVISION   PRELIMINARY STUDY TEAM
MINISTRY OF FINANCE AND
PLANNING

GOVERNMENT OF BANGLADESH
ROADS AND HIGHWAYS DEPARTMENT
FOREIGN AIDED SCHEMES, DHAKA

JAPAN INTERNATIONAL
COOPERATION AGENCY

Minutes of the Meeting to Discuss the Draft Final
Report Submitted by Japan International Coopera-
tion Agency (JICA) on the Feasibility Study on
Meghna, Meghna-Gumti Bridges Construction Project

(1)   Members Present :

Roads & Highways Department (RHD)
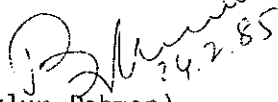
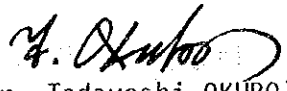|		
1)	Mr A.R. Chowdhury	Chief Engineer, RHD
2)	Mr A.B. Siddique	Joint Chief, Transport Section, Planning Commission
3)	Mr M. Giasuddin	Deputy Secretary (Development) Ministry of Communication
4)	Mr Bazlur Rahman	Additional Chief Engineer, RHD, Foreign Aided Schemes
5)	Mr M.E. Khan	SE, RHD, Special Project Circle, Dhaka
6)	Mr M. Islam	Director, RHD, Road Research Laboratory, Dhaka
7)	Mr K.B.L. Karim	SE, RHD, Bridge Design Circle, Dhaka
8)	Mr Md. A. Wadud	EE, RHD, Special Project Division, Dhaka
9)	Mr Md. A.B. Siddique	EE, RHD, Structural Design Divn., Dhaka
10)	Mr A.K.M. Faizur Rahman	EE, RHD, Hydraulic & Bridge Survey, Dhaka
11)	Mr Farooq Ahmed	Asstt. Engineer, RHD, Special Project Division, Dhaka
12)	Mr Mohiuddin Ahmad	Sub-Divisional Engineer, RHD, Special Project, Dhaka
13)	Mr W.G. Hodgkinson	Road Research Laboratory, RHD
14)	Mr J. Carr	Road Research Laboratory, RHD.

Japan International Cooperation Agency (JICA)

1)	Mr Hideya ASANUMA	Head of Advisory Committee Members, Ministry of Construction
2)	Mr Yoshiyuki YAMAMOTO	Member of Advisory Committee, Ministry of Construction.

3)	Mr Masahisa EZAKI	Director of JICA Dhaka Office
4)	Mr Hideki KOMATSU	Japan International Cooperation Agency
5)	Dr Tadayoshi OKUBO	Team Leader of the JICA Study Team
6)	Mr Kunio TESHIMA	Deputy Team Leader of the JICA Study Team
7)	Mr Tohru KAWAKAMI	Member of the JICA Study Team

(2) A meeting was held at 9:30 a.m. on February 23, 1985 at RHD Conference
Room, Sharak Bhaban, Dhaka and ended at 11:30 a.m. The Additional Chief
Engineer delivered an introductory speech. The RHD Officers were intro-
duced. Mr. Asanuma, Head of the JICA Advisory Committee members delivered
a short speech expressing profound satisfaction over the cooperation recei-
ved from RHD. The members of JICA Advisory Committee, Director of JICA
Dhaka Office and JICA Study Team members were introduced.

(3) Dr Okubo, Team Leader of the JICA Study Team gave a presentation about
the contents of the Draft Final Report.

(4) The Chief Engineer, the Additional Chief Engineer and other RHD Officers
commented on various points, which were all clarified and accepted.

(5) Points requested at the meeting for the Interim Report held on November
25,1984 have been incorporated.

(6) After detail discussion the following points were agreed upon :

- Provision of public utility services such as gas pipe line, electricity
  cable and telephone cable will be considered in the detailed design.

- During the detailed design period the land acquisition plan should be
  prepared as soon as possible and the output will be handed over to RHD
  for processing land acquisition.

- Detailed COST will be scrutinised further in the detailed design.

(7) The contents of the Draft Final Report were accepted.

(Mr. Bazlur Rahman)
Additional Chief Engineer, RHD
Foreign Aided Schemes
Dhaka, Bangladesh

(Dr. Tadayoshi OKUBO)
Team Leader of
the JICA Study Team

24th Feb., '85

JICA