

CHAPTER IX ECONOMIC COSTS

1. Construction Costs.

The financial construction costs of the project were estimated at about Tk 11,212 million (equivalent to US\$ 862 million) in total, consisting of Tk 2,138 million for the domestic currency portion and Tk 9,073 million (equivalent to US\$ 698 million) for the foreign currency portion (see Table 7-1 of CHAPTER VII).

For the purpose of making the economic analysis, the economic costs were estimated using the financial costs mentioned above through the following procedure:

- (1) The costs were classified into such five categories as equipment, materials, skilled and unskilled labour, and land acquisition, by domestic and foreign exchange components.
- (2) Taxes, consisting of import duties for the foreign exchange component, sales taxes for the equipment and materials, and income taxes for the labour, were deducted from the financial costs. As mentioned in the previous Chapter, since it was assumed that the import duties and sales taxes would not be imposed on the equipment and materials to be procured from abroad at the construction stage, these prices will here be left as estimated in CHAPTER VII. Similarly, costs for land acquisition will also be left as estimated in CHAPTER VII because it was assumed that the tax would not be imposed.
- (3) After deducting the taxes, the shadow rate of 1.75 times the official foreign exchange rate was applied to the equipment, materials and services to be procured from abroad, and also the shadow wage of 0.5 times the actual wage was applied to the unskilled labour to be employed locally.

Table 9-1 shows a comparison between the financial costs and the economic costs for the implementation of the project. As shown in the table, the economic costs were estimated at about Tk 17,887 million in total including contingency costs of Tk 2,333 million, or higher than the financial costs by Tk 6,675 million. They consist of the domestic currency component of Tk 2,008 million and the foreign exchange component of Tk 15,879 million, and as given in Table 9-2, they are composed of the following six items; equipment of Tk 5,672 million, materials of Tk 5,912 million, skilled labour of Tk 3,792 million, unskilled labour of Tk 72 million, land acquisition of Tk 107 million, and contingency of Tk 2,333 million.

Table 9-1 Construction Costs

Unit: Thousand Tk

Item	Financial costs		Economic costs	
	Domestic	Foreign	Domestic	Foreign
Construction base	500,523	1,947,920	481,325	3,408,951
Main works	1,077,732	5,746,273	997,503	10,056,397
Land acquisition	106,583	—	106,583	—
Administration	174,720	195,780	160,981	342,446
Contingency	278,934	1,183,494	261,959	2,071,173
Total	2,138,492	9,073,467	2,008,351	15,878,967
		11,211,959	2,008,351	17,887,318

Table 9-2 Economic Costs of Construction Works

Unit: Thousand Tk

Year	Construction base, main works and administration						Land Acquisition	Sub-total			Contingency			Total		
	Equipment		Materials		Labor			D.C.	D.C.		D.C.		D.C.		D.C.+F.C.	
	D.C.	F.C.	D.C.	F.C.	Skilled	Unskilled			D.C.	F.C.	D.C.	F.C.	D.C.	F.C.	D.C.	F.C.
1st	2,323	5,031	1,328	13,494	8,286	28,522	790	17,408	47,047	2,611	7,059	20,019	54,106	74,125		
2nd	11,381	36,244	10,061	38,207	11,236	49,972	2,119	35,417	124,423	5,313	18,655	40,730	143,078	183,808		
3rd	31,141	805,740	5,013	4,433	10,673	59,267	162	51,265	869,050	7,690	130,416	58,955	999,856	1,058,811		
4th	199,427	923,685	24,227	108,810	7,586	81,419	320	233,636	1,113,814	35,045	167,076	268,681	1,280,890	1,549,571		
5th	45,678	1,306,812	76,450	145,587	7,398	138,970	3,096	140,216	1,591,369	21,032	238,706	161,248	1,830,075	1,991,323		
6th	7,121	792,558	118,030	316,849	17,260	197,405	3,126	148,932	1,306,812	22,340	196,027	171,272	1,502,839	1,674,111		
7th	4,376	710,281	102,287	774,033	20,509	562,809	5,779	139,562	2,047,123	20,934	307,073	160,496	2,354,196	2,514,692		
8th	1,559	199,030	100,035	887,991	20,829	402,168	6,550	131,265	1,879,189	19,690	223,379	150,955	1,712,568	1,863,523		
9th	1,498	184,314	119,078	891,332	23,022	733,304	7,199	170,526	1,808,950	25,580	271,336	196,106	2,080,286	2,276,392		
10th	1,598	136,474	62,813	804,778	22,877	428,467	8,333	127,426	1,369,719	19,114	205,452	146,540	1,575,171	1,721,711		
11th	62,401	110,383	84,318	597,025	27,335	428,259	13,959	211,516	1,135,667	31,727	170,352	243,243	1,306,019	1,549,262		
12th	41,085	41,561	77,042	191,464	23,992	302,341	10,955	153,074	535,366	22,961	80,314	176,035	615,680	791,715		
13th	2,010	8,905	126,258	231,088	48,986	128,882	8,895	186,149	368,875	27,922	55,328	214,071	424,203	638,274		
Total	411,598	5,260,918	906,940	5,005,091	249,989	3,541,785	71,282	1,746,392	13,807,794	261,959	2,071,173	2,008,351	15,878,967	17,887,318		

D.C.: Domestic currency portion

F.C.: Foreign currency portion

2. Maintenance Costs.

As shown in CHAPTER VII, the total financial costs for maintenance amount to Tk 1,226 million including contingency costs of Tk 58 million during the project life period. Among them, the amount of Tk 905 million corresponds to the domestic currency component and that of Tk 321 million corresponds to the foreign exchange component. In the last year of construction stage (1989), an amount of Tk 57 million is required for initial procurement of the equipment and materials for the maintenance, after which an amount of about Tk 40 million per annum is required on the average for the maintenance taking into consideration procurement of equipment and materials at need. The maintenance costs are shown by year in Table 7-5 of CHAPTER VII.

In calculating the economic costs, the maintenance costs were also classified into such four categories as equipment, materials, and skilled and unskilled labour. Successively, in the same manner as the construction costs, adjustments were made by eliminating the taxes and by multiplying the shadow rate. Thus the calculated economic costs for the project life period were estimated at about Tk 1,169 million slightly less than their financial costs, or the average annual cost for maintenance amounts to Tk 38 million. Table 9-3 shows the economic maintenance costs by year.

Table 9-3 Economic Cost for Maintenance

Unit: Thousand Tk

Year	Equipment		Materials		Labor				Sub total		Contingency		Total		
	D.C.	F.C.	D.C.	F.C.	D.C.	F.C.	Unskilled	D.C.	F.C.	D.C.	F.C.	D.C.	F.C.	D.C.	F.C.
0	650	59,293	0	0	0	0	0	0	650	59,293	32	2,951	682	62,257	62,939
1st	1,080	0	8,591	10,985	8,800	0	560	19,031	10,985	951	546	19,982	11,531	31,513	31,513
2nd	1,080	0	7,542	"	8,773	0	637	18,037	"	902	"	18,939	"	30,470	30,470
3rd	1,080	0	6,780	"	8,665	0	527	17,052	"	853	"	17,905	"	29,436	29,436
4th	1,085	0	7,542	"	8,773	0	637	18,037	"	902	"	18,939	"	30,470	30,470
5th	1,497	10,530	10,275	"	8,907	0	722	21,401	21,515	1,069	1,079	22,470	22,594	45,064	45,064
6th	1,085	0	7,542	"	8,773	0	637	18,037	10,985	902	546	18,939	11,531	30,470	30,470
7th	1,080	0	6,780	"	8,665	0	527	17,052	"	853	546	17,905	11,531	29,436	29,436
8th	1,085	0	7,542	"	8,773	0	637	18,037	"	902	559	18,930	11,544	30,483	30,483
9th	1,084	0	6,780	"	8,665	0	527	17,052	"	853	559	17,905	11,544	29,449	29,449
10th	2,664	50,674	16,937	12,337	9,299	0	1,093	29,993	63,011	1,500	3,146	31,493	66,157	97,650	97,650
11th	1,080	0	6,780	10,985	8,665	0	527	17,052	10,985	853	546	17,905	11,531	29,436	29,436
12th	1,085	0	7,542	"	8,773	0	637	18,037	"	902	"	18,939	"	30,470	30,470
13th	1,080	0	6,780	"	8,665	0	527	17,052	"	853	"	17,905	"	29,436	29,436
14th	1,085	0	7,542	"	8,773	0	637	18,037	"	902	"	18,939	"	30,470	30,470
15th	1,586	19,175	10,275	"	8,907	0	722	21,490	30,160	1,074	1,508	22,564	31,668	54,232	54,232
16th	1,085	0	7,542	"	8,773	0	637	18,037	10,985	902	546	18,939	11,531	30,470	30,470
17th	1,080	0	6,780	"	8,665	0	527	17,052	"	853	"	17,905	11,531	29,436	29,436
18th	1,085	0	7,542	"	8,773	0	637	18,037	"	901	559	18,939	11,544	30,482	30,482
19th	1,080	0	6,780	"	8,665	0	527	17,052	"	853	"	17,905	11,544	29,449	29,449
20th	2,664	50,661	17,107	13,702	9,361	0	1,135	30,267	64,363	1,513	3,211	31,780	67,574	99,354	99,354
21st	1,080	0	6,780	10,985	8,665	0	527	17,052	10,985	853	546	17,905	11,531	29,436	29,436
22nd	1,085	0	7,542	"	8,773	0	637	18,037	"	902	"	18,939	"	30,470	30,470
23rd	1,080	0	6,780	"	8,665	0	527	17,052	"	853	"	17,905	"	29,436	29,436
24th	1,085	0	7,542	"	8,773	0	637	18,037	"	902	"	18,939	"	30,470	30,470
25th	1,497	10,530	10,275	10,998	8,907	0	722	21,401	21,528	1,070	1,079	22,471	22,607	45,078	45,078
26th	1,085	0	7,542	"	8,773	0	637	18,037	10,998	902	546	18,939	11,544	30,483	30,483
27th	1,080	0	6,780	"	8,665	0	527	17,052	"	853	546	17,905	"	29,449	29,449
28th	1,085	0	7,542	"	8,773	0	637	18,037	"	901	559	18,938	11,557	30,495	30,495
29th	1,080	0	6,780	"	8,665	0	527	17,052	"	852	559	17,904	"	29,461	29,461
30th	2,103	0	16,937	12,337	9,299	0	1,093	29,432	12,337	1,471	624	30,903	12,961	43,864	43,864

D.C. : Domestic currency portion
 F.C. : Foreign currency portion

CHAPTER X
ECONOMIC BENEFITS

1. General Description.

The economic benefits which arise by executing the project amount to about Tk 31,133 million in total, during its construction period of 13 years and its economic life of 30 years. They consist of direct benefits of Tk 22,530 million and indirect benefits of Tk 8,603 million.

The direct benefits are represented by reduced transport costs for passengers and freight and time savings for passengers, and average annual direct benefits were estimated at around Tk 750 million during the project life, while the indirect benefits consist of reduced ferry facilities and salvage values of equipment, materials and land after finishing the construction works. Among them, the reduced ferry facilities including their maintenance and operating costs were estimated at Tk 7,431 million in total during the project life, or around Tk 250 million per annum on the average. Other indirect benefits, i.e. the salvage values amount to about Tk 1,172 million.

As described in VOLUME VII TRAFFIC AND ECONOMIC BENEFITS, the following procedure was taken for estimating the future population and traffic to be required for calculating the economic benefits of the project mentioned above.

(1) Future population of Bangladesh to be required for estimating the future traffic volume was forecasted under the conditions as indicated below:

- 1) Population of Bangladesh in 1974 was assumed at 76,002 thousand in accordance with a result of 1974 census made by the Census Commission of Bangladesh.
- 2) An intermediate estimate between two rates of population growth was adopted for the population forecast in consideration of the population control policy of the Government; one is a value estimated by the Census Commission of Bangladesh and the other is the lowest value among three estimates by the IBRD (see APPRAISAL REPORT OF A POPULATION PROJECT IN BANGLADESH, IBRD, 1975).
- 3) For years up to 1978, however, estimates made by the Census Commission were applied to the rate of population growth.
- 4) The estimated results are shown in Table 10-1.

Table 10-1 Future Population and Rate of Its Growth

Year	Population (thousand)	Rate of population growth
1974	76,002	1.00
1983	100,200	1.32
1993	123,800	1.63
2003	147,700	1.94
2010	164,200	2.16
2020	185,100	2.44
2030	202,500	2.66

- 5) Figures indicated in Table 10-1 were used for control of total in estimating the future population of each district.
- 6) It was assumed that the future population of each district would be proportioned to the ratio of population of each district to the total population of Bangladesh as of 1974.
 - (2). The future passenger traffic was estimated based on the future population of the districts forecasted above through the following procedure.
 - 1) First, the passenger traffic in 1993 and 2020 was estimated. Next, the passenger traffic in years from 1990 to 2020 other than the above two years was calculated by means of the methods of linear interpolation and extrapolation.
 - 2) Inter-district passenger trip was assumed to 0.0077 per person a day on the basis of data in Japan because of lacking in available data in Bangladesh. As a result, annual generated passenger trip turns out 288 million in 1993 and 429 million in 2020 in the whole country. The generated passenger trip in each district will be given distributing the above-mentioned total trip in proportion to the population estimated by district (see Table 3-2 of VOLUME VII).
 - 3) Origin-destination distribution (O-D distribution) of passenger traffic for all of the pairs among the 19 districts was established by making use of the generated passenger trip in each district, taking into account the future railway and road networks as well as their existing networks. In this case, the future networks were set on reference to the Bangladesh Transport Survey Report and the time table of the railways. And also a formula of gravity model and the Fratar's method were applied to calculate the O-D distribution and to adjust its convergence, respectively. Time distance between every two districts in the gravity formula was calculated by assuming the average traveling speed at 30 km per hour for vehicles and 40 km per hour for trains.
 - 4) In calculating the future O-D distribution of the passenger trip by transport modes of railway and road across the Jamuna bridge, adjustments were made as follows; based on the results of traffic survey carried out by the present feasibility study team, it was assumed that the rates of water-borne passenger trips in future would be 10

percent of the total passenger trips for the trips between Rajshahi and Dacca divisions, 50 percent for between Rajshahi and Chittagon divisions, 20 percent for between Khulna and Dacca divisions, and 80 percent for between Khulna and Chittagong divisions. Where, these divisions consist of 4 through 6 districts, respectively (see Table 3-2 of VOLUME VII). The passenger trips other than water-borne i.e. the railway and road passenger trips were divided at the ratio of both time-distances of railway and road in the inter-district routes. As a result, the passenger trips across the Jamuna bridge in 1993 and 2020 were estimated as shown below;

Unit: Million persons per year

Mode of transport	Year	
	1993	2020
Railway	1,239	1,916
Road	884	1,406
Total	2,123	3,319

- (3) The future freight traffic across the Jamuna bridge after its construction was estimated on the basis of the following conditions and assumptions, using data obtained by the traffic survey in 1974 by the Japanese Study Team.
- 1) Economic growth of Bangladesh to be used for forecasting the future freight traffic was estimated on the basis of THE FIRST FIVE-YEAR PLAN of Bangladesh.
 - 2) The freight traffic by railway and road transports in 1993 was calculated based on the rates of agricultural, industrial and population growths, taking into account general economic and social conditions of Bangladesh.
 - 3) To calculate the freight traffic in years after 1993, it was assumed that average annual rates of railway and road traffic growths would be 4.0 and 0.5 percent, respectively. The following table shows the freight traffic across the Jamuna bridge in 1993 and 2020.

Unit: Thousand tons per year

Mode of transport	Year	
	1993	2020
Railway	2,504	7,212
Road	246	806
Total	2,750	8,018

- (4) The passenger and freight traffic estimated in the above (2) and (3) respectively were further expressed in numbers of vehicles and trains in accordance with the following conditions.
- 1) For the passenger traffic, the conditions were set as below:

1. For railway transport

numbers of passengers per car : 70 persons,
numbers of cars per train : 20 cars, and
operating days of trains : 365 days a year.

ii. For vehicles transport

ratio of passenger cars to buses
in traffic on the Jamuna bridge : 1 : 1,

numbers of passengers per car : 3.5 persons, and
numbers of passengers per bus : 40 persons.

2) For the freight traffic, the conditions were set as below:

1. For railway transport

capacity per freight car : 20 tons,
numbers of freight cars per
train : 60 cars,
rate of loading per freight
car : 80 percent of its capacity, and
operating days of trains : 365 days a year.

ii. For truck transport

capacity per truck : 5 tons, and
rate of loading per truck : 80 percent of its capacity.

3) Under the above-mentioned conditions, first, the traffic which would cross the Jamuna bridge in 1993 and 2020 was calculated for each of passenger cars, buses, trucks, passenger trains and freight trains. Next, the traffic in years other than 1993 and 2020 was estimated by means of the methods of linear interpolation and extrapolation on the basis of the traffic in both the above years. The results are shown in Table 10-2.

(5) The traffic shown in Table 10-2 consists of three categories as follows; (a) traffic to be diverted from ferry traffic on the Sirajganj route crossing the Jamuna river (normal traffic), (b) traffic to be diverted from ferry traffic other than the Sirajganj route (diverted traffic), and (c) traffic to be induced newly after construction of the Jamuna bridge (induced traffic). (see Table 3-21 of VOLUME VII). Among them, for the induced traffic, it was assumed that unit benefit which arises from the induced traffic would be taken to be one-half of that from the normal traffic or diverted traffic. As indicated in Table 3-21 of VOLUME VII, the induced traffic for passengers turns out around 13 percent of the total passenger traffic. However, the induced traffic for freight has not been calculated because it is difficult to estimate with a reasonable degree of accuracy.

Table 10-2 Average Daily Traffic Across the Jamuna Bridge

Unit: Numbers per day

Year	Road transport				Railway transport		
	Passenger cars	Buses	Trucks	Total	Passenger trains	Freight trains	Total
1990	3,234	283	126	3,643	23	6	29
1991	3,309	290	141	3,740	23	6	29
1992	3,385	296	155	3,836	24	7	31
1993	3,460	303	169	3,932	24	7	31
1994	3,535	310	183	4,028	25	8	33
1995	3,611	316	197	4,124	25	8	33
1996	3,686	323	212	4,221	26	9	35
1997	3,761	329	226	4,316	26	9	35
1998	3,837	336	240	4,413	27	10	37
1999	3,912	342	254	4,508	27	10	37
2000	3,988	349	268	4,605	28	11	39
2001	4,063	355	283	4,701	28	11	39
2002	4,138	362	297	4,797	29	12	41
2003	4,214	369	311	4,894	29	12	41
2004	4,289	375	325	4,989	30	13	43
2005	4,364	382	339	5,085	30	13	43
2006	4,440	388	353	5,181	31	14	45
2007	4,515	395	368	5,278	31	14	45
2008	4,591	401	382	5,374	32	15	47
2009	4,666	408	396	5,470	32	15	47
2010	4,741	415	410	5,566	33	16	49
2011	4,817	421	424	5,662	33	16	49
2012	4,892	428	439	5,759	34	17	51
2013	4,967	434	453	5,854	34	17	51
2014	5,043	441	467	5,951	35	18	53
2015	5,118	447	481	6,046	35	18	53
2016	5,194	454	495	6,143	36	19	55
2017	5,269	460	510	6,239	36	19	55
2018	5,344	467	524	6,335	37	20	57
2019	5,420	474	538	6,432	37	20	57
2020	5,495	480	552	6,527	38	21	59

2. Direct Benefits:

Based on the passenger and freight traffic forecasted in the previous section, the direct benefits of the project, consisting of reduced transport costs for passengers and freight and time-savings for passengers, were estimated under the following conditions.

- (1) The reduced transport costs can be obtained by multiplying the unit cost of transportation by difference in both time-distances between districts, with and without the project.
- (2) To calculate the time distance between districts, the time required for passenger and freight to cross the Jamuna river by ferryboat was assumed at 5 hours including time for loading and unloading.

- (3) The transport costs by vehicles in Bangladesh were estimated as shown in Table 10-3.

Table 10-3 Transport Costs by Vehicles

	Unit: Tk/vehicle/km		
	Passenger car	Truck	Bus
Fuel	0.23	0.48	0.43
Lubricant	0.03	0.04	0.06
Tire & Tube	0.07	0.14	0.25
Maintenance	0.18	0.27	0.47
Depreciation	0.30	0.46	0.53
Fixed expenses	-	0.53	0.69
Total	0.81	1.92	2.43

Note: The above costs are net of taxes.

- (4) For railway transport, the passenger fare and freight transport costs were estimated as shown below on the basis of the railway fare of Bangladesh and other data concerned:

1) Passenger fare

	Rate of share (%)	Fare (Tk/person/km)
Second class	10	0.05
Third class	90	0.04

The first class fare was omitted from the calculation of the passenger transport costs on railway by reason that it shares less than one percent of the total fare revenue of the Railways of Bangladesh in 1968/69.

2) Freight transport costs

The unit cost of Tk 0.33 per ton per km was applied to the freight transport on railway based on the railway data obtained in Bangladesh.

- (5) The unit benefits which arise from time-savings for passengers were assumed as shown below:

	per Passenger (Tk/hour)	per Car or Bus (Tk/hour)
Passenger car	3.14	11.0
Bus	1.26	50.5
Train	1.75	-

The values shown in the above table were calculated on the assumptions:

- 1) Time-saving cost per hour for passenger was assumed to be one-half of its wage per hour.
- 2) Passengers which have time-saving benefits were assumed to be 80 percent of the total for the car passengers and 70 percent of the total for the bus and train passengers.
- (6) In making the economic evaluation of the project, the economic benefits were given by making the adjustments for taxes and shadow rates in the same manner as those for the economic costs in the previous section.
- (7) Table 10-4 shows the economic direct benefits by mode of transport in 1993 and 2020 which are represented by the reduced transport costs and time-savings. According to the table, the annual economic direct benefits are Tk 538 million in 1993 and Tk 1,038 million in 2020.
- (8) The annual direct benefits in each year between 1990 and 2020 were calculated by means of the method of linear interpolation and extrapolation using those of 1993 and 2020 as shown in Table 10-5. According to the table, it is expected that the economic direct benefits amount to around Tk 483 million in the opening year of the Jamuna bridge (1990), and approximately Tk 22,530 million in total during the project life of 30 years from 1990 to 2019.

Table 10-4 Annual Direct Benefits in 1993 and 2020

Unit: Million Tk

Benefit	Year	Road transport				Railway transport			Total
		Passen-ger car	Bus	Truck	Sub-Total	Passen-ger train	Freight	Sub-total	
Time saving	1993	51	21	-	72	72	-	72	144
	2020	81	33	-	114	114	-	114	228
Reduced transport costs	1993	152	37	19	208	67	119	186	394
	2020	238	58	65	361	107	344	451	812
Total	1993	203	58	19	280	139	119	258	538
	2020	319	91	65	475	221	344	565	1,040

Table 10-5 Annual Direct Benefits

Unit: Million Tk

Year	Benefits	Year	Benefits
1990	483	2005	760
1991	501	2006	779
1992	520	2007	797
1993	538	2008	816
1994	557	2009	834
1995	575	2010	853
1996	594	2011	871
1997	612	2012	890
1998	631	2013	908
1999	649	2014	927
2000	668	2015	945
2001	686	2016	964
2002	705	2017	982
2003	723	2018	1,001
2004	742	2019	1,019
		Total	22,530

3. Indirect Benefits.

Among many indirect benefits expected by executing the project, tangible benefits to be taken up in the present project consist of ferry facilities and their maintenance and operating costs to be reduced by opening the Jamuna bridge, and salvage values of equipment, materials and land for construction bases after completion of the construction works. For some indirect benefits other than those mentioned above, discussions will be made in the succeeding chapter.

(1) Reduced ferry facilities.

Traffic between the eastern and western regions of the Jamuna river is being held mainly at three points; Aricha, Sirajganj and Bahadurabad, using the ferryboats. After construction of the Jamuna bridge, it is expected that most of the traffic would be diverted from ferryboats to the bridge. As shown in Table 3-21 of VOLUME VII, daily traffic to be diverted to the bridge by opening the Jamuna bridge in 1990 was estimated at 2,810 vehicles of passenger cars, 246 vehicles of buses and 126 vehicles of trucks for the road traffic, and 27,717 persons of train passengers and 5,427 tons of train freight for the railway traffic. The ferry facilities on the Jamuna river which are proportionated to the diverted traffic mentioned above should be reduced after construction of the bridge.

To calculate the costs of reduced ferry facilities including reduced their maintenance and operating costs, the conditions were set as shown below.

- 1) The following matters were assumed concerning the ferry capacity and its operation:

i. Car ferry

Loading capacity : 35 cars per boat.
Operating hour : 7 hours a round trip.
Service times : two round trips a boat per day.
One pontoon needs per boat and can deal with four boats per day.
A large-sized car such as bus and truck is evaluated to be equal to 2.5 passenger cars.

ii. Railway ferry

Railway ferry is divided into two types, passenger ferry and freight-car ferry.

1) Passenger ferry

Loading capacity : 1,000 persons per boat.
Operating hour : 6 hours a round trip.
Service times : 3 round trips a boat per day.
Accordingly, available transport volume is estimated at about 5,400 persons per day assuming the carrying rate of 90 percent of its capacity.
Two pontoons need per boat and can deal with five boats per day.

ii) Freight-car ferry

One set of ferry consists of one tugboat and three barges, but the tugboat deals with only one barge during operation.
Loading capacity : 25 freight-cars a barge.
Service times : 4 round trips a ferry set per day.
Tonnage of freight-car : 8.56 tons a car.
Accordingly, available transport tonnage is estimated at about 1,540 tons per day assuming the carrying rate of 90 percent of its capacity.

2) To calculate the economic costs of ferry facilities to be reduced, the following matters were assumed:

- i. The economic life will be 18 years for such ferry facilities as ferryboat, tugboat, barge and pontoon.
- ii. Prices of the ferry and pontoon to be procured newly will be as follows:

	Prices of ferry			Prices of pontoon			
	Unit: Million Tk			Unit: Million Tk			
	Car ferry	Railway Ferry		Car pontoon	Railway Pontoon		
	Passenger	Car		Passenger	Car		
Tugboat	-	6.66	6.66	for passenger	1.2	3.55	-
Ferry boat	10.0	20.00	-	for loading	-	-	9.65
Barge	-	-	12.00	for berthing	-	-	1.2

Note: The above values are net of taxes.

- iii. Annual costs for the maintenance and operation of ferry boats would be 20 percent of their purchase prices including the costs of spare parts equivalent to 5 percent of the ferryboat prices, and those for pontoons would be 10 percent of their purchase prices.
- iv. The ferryboat, its spare parts and pontoon will be procured from abroad.
- v. All of costs mentioned above will be expressed as economic costs with the shadow prices of 1.75 times the CIF prices for the foreign exchange component.

Based on the above conditions, reduced costs of the ferry facilities including their maintenance and operating works were estimated at Tk 654.39 million in the opening year of the Jamuna bridge (1990). These are negative costs, or benefits for the project. Table 10-6 shows annual reduced costs during the project life of 30 years from 1990 to 2019.

However, residual values of the ferry facilities to be reduced in the last year of project life will be given as negative benefits in 2020.

Table 10-6 Benefits of Reduced Ferry Facilities

Unit: Million Tk

Year	Ferry facilities costs		Maintenance & operating expenses		Total
	Ferry	Pontoon	Ferry	Pontoon	
1990	423.47	116.90	104.92	9.1	654.39
91	52.5	-	106.94	9.1	168.54
92	127.16	-	121.28	9.1	257.54
93	52.5	4.2	123.30	9.34	189.34
94	52.5	-	125.31	9.34	187.15
95	52.5	-	127.32	9.34	189.16
96	52.5	-	129.33	9.34	191.17
97	81.66	-	129.33	9.34	220.33
98	99.16	4.2	136.72	9.58	249.66
99	52.5	-	138.73	9.58	200.81
2000	173.81	125.65	140.75	9.58	449.74
01	35.0	-	142.76	9.58	187.34
02	35.0	4.2	144.77	9.82	193.79
03	81.66	-	146.79	9.82	238.27
04	35.0	-	148.80	9.82	193.62
05	156.31	-	163.15	9.82	329.28
06	35.0	4.2	165.16	10.06	214.42
07	81.66	-	172.54	10.06	264.26
08	116.66	-	174.55	10.06	301.27
09	52.5	-	174.55	10.06	237.11
2010	144.66	-	176.56	10.06	331.28
11	70.0	8.4	178.57	10.30	267.27
12	70.0	-	180.59	10.30	260.89
13	70.0	-	182.60	10.30	262.90
14	70.0	-	184.61	10.30	264.97
15	145.81	4.2	192.00	10.54	352.55
16	116.66	4.2	194.01	10.54	325.41
17	70.0	-	196.03	10.54	276.57
18	191.31	-	210.37	10.54	412.22
19	127.16	129.85	212.39	10.79	480.18
20	-806.21	-114.31	-	-	-920.52

(2) Salvage values.

1) Salvage value of land for construction bases.

An allowance will be made for the salvage value of land which has been used for the construction bases, excepting land to be used for maintenance works after completion of the construction works. As shown in Table 5-1 of APPENDIX B, area of land to be acquired for the construction bases was estimated at about 362.8 ha in total of both lands for the main and branch bases, consisting of areas of 124.4 ha for job settlement, 76.0 ha for dwelling settlement, 102.0 ha for stone storage yard, 39.5 ha for temporary road and 20.9 ha for temporary railway. Among them, area of land to be valued for salvage value are 152.4 ha, comprising 81.8 ha out of the job settlement and

70.6 ha out of the dwelling settlement. Such a land, in its function, would be nearly equal situations with that in the urban area since the public facilities to be required for civic life are already well-equipped.

According to the survey in July 1975, the prices of land ranged from Tk 200,000 to Tk 900,000 per acre in the urban area nearby the construction bases. Referring to such prices, we adopted intermediate value of Tk 500,000 per acre (equivalent to Tk 1,236,000 per ha) in calculating the salvage value of land for the construction bases. As a result, the salvage value was estimated at Tk 188,351 thousand in the last year of construction period (the thirteenth year).

2) Salvage values of equipment and materials.

The total economic costs of the equipment and materials to be procured for the construction works were estimated at Tk 11,585 million as shown in Table 9-2. Allowances will however be made for the salvage values of these equipment and materials after completion of the works.

Table 10-7 shows the economic costs of their salvage values which were calculated in consideration of the period of economic life of each equipment and material. In this calculation, it was assumed that their values would decrease linearly with year and that for equipment and materials which exceed the period of economic life fixed, the values would be 10 percent of the purchase prices at the end of the last year of each use. As a result, the total salvage values were estimated at about Tk 984,100 thousand or 8.5 percent of their total purchase prices.

Table 10-7 Salvage Values of Equipment and Materials

Unit: Thousand Tk

Item	Year								Total	
	6th	7th	8th	9th	10th	11th	12th	13th		
1. Construction Bases	1,183								97,617	98,800
2. Bridge										
i. Substructures	0	6,097	2,366	1,664	23,790	176,540	34,489	93,548		338,494
ii. Superstructures	0	0	0	2,340	2,873	137,904	100,308	54,392		297,817
iii. Approaches	0	0	0	728	0	85,228	2,275	6,097		94,328
iv. Guide Banks	0	0	0	114,140	32,058	0	8,463	0		154,661
Total	1,183	6,097	2,366	118,872	58,721	399,672	145,535	251,654		984,100

CHAPTER XI
COST-BENEFIT ANALYSIS

1. Comparison of Costs and Benefits.

All of the economic costs and benefits estimated in CHAPTERS IX and X are tabulated in Table 11-1. According to the table, the total economic costs of the project amount to around Tk 19,057 million including the economic maintenance costs of around Tk 1,169 million. On the other hand, the total economic benefits amount to around Tk 31,133 million including the salvage value of around Tk 1,172 million, during the economic life of 30 years. Therefore, for both values not discounted, the economic benefits exceed the economic costs by Tk 12,076 million.

To make the economic comparison between the costs and benefits, they have to be discounted at certain rates. Table 11-2 shows a comparison between the costs and benefits discounted at each rate of 12, 6, 3 and 2 percent, taking the beginning of 1977 as the base of calculation.

The net present costs of the project exceed the net present benefits by Tk 6,117 million when the both are discounted at 12 percent, the benefit-cost ratio of which works out at 0.24, and the internal rate of return is 2.6 percent. Table 11-2 means that the benefits will never exceed the costs so far as the discount rate to be used is larger than 3 percent, while the benefits exceed the costs in case of 2 percent, the benefit-cost ratio of which works out at 1.11. Therefore, the project appears to be of doubtful justification so far as the analyses mentioned here are concerned.

The costs and benefits discounted at rates ranging from 2 to 12 percent are shown in Tables 1 to 11 of APPENDIX C.

Table 11-2 Net Present Costs and Benefits

Discount Rates (%)	Net Present Costs (Million Tk)	Net Present Benefits (Million Tk)	Net Present Values (Million Tk)	Benefit-Cost Ratio	Internal Rate of Return
12	8,079	1,962	-6,117	0.24	
6	11,949	6,631	-5,318	0.55	
3	14,899	13,717	-1,182	0.92	2.6
2	16,118	17,834	1,716	1.11	

2. Sensitivity Analysis.

Sensitivity to the results obtained in the previous section was examined in three major factors; population, foreign exchange rate and project timing.

(1) Population.

The benefits of the project will be affected by population forecasted. If the population is more (or less) than the forecasted, the benefits will

Table 11-1 Economic Costs and Benefits

Unit: Thousand Tk

Year	Costs			Benefits		
	Construction costs	Maintenance costs	Total	Benefits	Salvage values	Total
1st 1977	74,125		74,125			
2nd 1978	183,808		183,808			
3rd 1979	1,058,811		1,058,811			
4th 1980	1,549,571		1,549,571			
5th 1981	2,019,109		2,019,109			
6th 1982	1,668,631		1,668,631	1,183		1,183
7th 1983	2,544,426		2,544,426	6,097		6,097
8th 1984	1,855,507		1,855,507		2,366	2,366
9th 1985	2,262,784		2,262,784		118,872	118,872
10th 1986	1,706,435		1,706,435	58,721		58,721
11th 1987	1,541,629		1,541,629	399,672		399,672
12th 1988	784,208		784,208	145,535		145,535
13th 1989	638,274	62,939	701,213	440,005		440,005
14th 1990		31,513	31,513	1,137,390		1,137,390
15th 1991		30,470	30,470	669,540		669,540
16th 1992		29,436	29,436	777,540		777,540
17th 1993		30,470	30,470	727,340		727,340
18th 1994		45,064	45,064	744,150		744,150
19th 1995		30,470	30,470	764,160		764,160
20th 1996		29,436	29,436	785,170		785,170
21st 1997		30,483	30,483	832,330		832,330
22nd 1998		29,449	29,449	880,660		880,660
23rd 1999		97,650	97,650	849,810		849,810
24th 2000		29,436	29,436	1,117,790		1,117,790
25th 2001		30,470	30,470	873,340		873,340
26th 2002		29,436	29,436	898,790		898,790
27th 2003		30,470	30,470	961,270		961,270
28th 2004		54,232	54,232	935,620		935,620
29th 2005		30,470	30,470	1,089,280		1,089,280
30th 2006		29,436	29,436	993,420		993,420
31st 2007		30,482	30,482	1,061,260		1,061,260
32nd 2008		29,449	29,449	1,117,270		1,117,270
33rd 2009		99,354	99,354	1,071,110		1,071,110
34th 2010		29,436	29,436	1,184,280		1,184,280
35th 2011		30,470	30,470	1,138,270		1,138,270
36th 2012		29,436	29,436	1,150,890		1,150,890
37th 2013		30,470	30,470	1,170,900		1,170,900
38th 2014		45,078	45,078	1,191,970		1,191,970
39th 2015		30,483	30,483	1,297,550		1,297,550
40th 2016		29,449	29,449	1,289,410		1,289,410
41st 2017		30,495	30,495	1,258,570		1,258,570
42nd 2018		29,461	29,461	1,413,220		1,413,220
43rd 2019		43,864	43,864	1,499,180		1,499,180
44th 2020				-920,520		-920,520
Total	17,887,318	1,169,257	19,056,575	29,960,960	1,172,451	31,133,411

Note: Economic costs and benefits shown in the table were calculated using the shadow rates of 1.75 times the official rate for foreign exchange component and 0.5 times the actual wages for unskilled labour.

be higher (or lower) than the estimated because the traffic which directly affects the benefits will increase with increase in population. As stated at the beginning of the preceding chapter, for the population forecast, an intermediate estimate between the two rates of population growth, the rate by the Census Commission of Bangladesh and the lowest rate among three estimates by the IBRD, has been used in the present study. If, for example, the relatively high rate of population growth which were forecasted by the Census Commission of Bangladesh is applied to the estimation of traffic, the traffic across the Jamuna bridge will increase by about 5 percent in the opening year of the bridge (1990) and by about 17 percent in 2020. As a result, it is expected that the project benefits will be higher than the estimated by about 10 percent during the period of the project life. Therefore, although the ratio of benefits and costs discounted at the rate of 12 percent increases slightly from 0.24 to 0.26 and the internal rate of return also increases from 2.6 to 2.8 percent, the net present value is still negative. This means that change in population forecasted is not noticeably sensitive to the conclusion of the economic evaluation.

(2) Foreign exchange rate.

As mentioned in CHAPTER IX and X, the shadow prices of 1.75 times the CIF prices have been applied to the foreign exchange component in estimating the economic costs and benefits. The rate of 1.75 was determined with reference to the actual foreign exchange rate for the last one year and the opinion of the Planning Commission of Bangladesh.

Information for the last one year indicates the fluctuation of actual foreign exchange rate in the range of Tk 32 to Tk 20 to the U.S. dollar. Namely, it means that the ratio of actual rate to official rate has ranged from 2.5 to 1.5. The rate, 1.75, that has been used in the present study lies nearly in the middle of the above range. As against this, if the lowest shadow rate of 1.5 is used instead of 1.75, it is naturally expected that the net present value of the project is improved. However, even if the shadow prices of 1.5 times the CIF prices are applied, the benefits of the project will still remain less than the costs so far as both are discounted at 12 percent. Actual calculation indicates that the benefit-cost ratio is slightly improved to 0.26 in comparison with 0.24 calculated previously, and the internal rate of return is also slightly improved to 3.0 percent in comparison with the previous 2.6 percent (see Tables C-12 to C-17 of APPENDIX C). As is obvious from these results, change in the shadow rate for the foreign exchange component is also not noticeably sensitive to the conclusion of evaluation.

While, according to information from the Planning Commission of Bangladesh, the shadow rate for the foreign exchange component has not been used by the Planning Commission to find out the economic costs and benefits. In other words, the official rate has been applied to the foreign exchange component. In this case, the benefit-cost ratio of the present project works out to be 0.33 in the case of the discount rate of 12 percent, and the internal rate of return works out to be about 4.5 percent (see Tables C-18 to C-24 of APPENDIX C).

(3) Project timing.

It is assumed in this study that the present project needs 13 years to complete the construction works and its economic life will continue for 30 years after the construction. In calculating the economic benefits, we further assume that the construction works will be started in 1977 and, consequently, the Jamuna Bridge will be opened in 1990.

On this assumption, the traffic across the Jamuna Bridge will gradually increase at an annual rate of about 2% as is shown in Table 10-2. If the traffic growth will further continue in the future, it is expected that the railway traffic across the bridge will reach to its capacity of 74 trains per day by 2040 and the road traffic will reach to its capacity of 9,800 cars per day by 2050. That is, the undiscounted benefits which accrue from the traffic across the bridge will have an annual increase with the traffic growth until about 2040 for the railway transport and until about 2050 for the road transport.

On the other hand, the huge capital amounting to about Tk 17,887 million is to be invested in the construction during the first thirteen years. In addition, the maintenance costs are to be expended at the average rate of about Tk 37 million per annum during the project life of 30 years without such increase as shown in case of benefits. Judging from these conditions, the net present value of the project is expected to increase if commencement of the project is postponed.

In order to find out the optimum time of the project, benefits due to postponement i.e. reduction in discounted costs must be compared with costs of delay i.e. loss of benefits due to postponement.

On the assumption that the project life will continue for thirty years with no salvage value thereafter, postponement of one year, for example, will reduce the present costs discounted at the rate of 12% from Tk 8,076 million to Tk 7,213 million, or by Tk 866 million, including the maintenance costs discounted. On the other hand, the postponement will affect the benefits in two aspects that the benefit in the first year (1990) of the project life will be lost, while another benefit will accrue in the year (2020) following the end of the project life. This will result in reducing the present value of the benefits from Tk 1,962 million to Tk 1,779 million including the salvage value discounted. The net loss in benefits will thus be only Tk 183 million, while the reduction in costs is Tk 866 million.

Such calculations were conducted in regard to postponement up to the fortieth year and are summarized in Table 11-3. The table indicates that the optimum time of the project will not be found in the near future but postponement more than about 40 years will not be profitable although the longer the postponement, the more the profit is.

Table 11-3 Reduction in Costs and Benefits due to Postponement of the Project (at Discount Rate of 12 %)

Unit: Million Tk

Delay (year)	Reduction in Costs	Reduction in Benefits	Difference
1	866	183	683
2	783	139	644
5	516	118	398
10	299	83	216
15	150	50	100
20	110	20	90
30	28	9	19
40	10	4	6

Next, relations between benefit-cost ratio and postponement of the project were examined. Table 11-4 indicates that the benefit-cost ratio will not exceed 1.0 so far as both the benefits and costs are discounted at a rate higher than 6% even if the commencement of the project was postponed within 40 years. This implies that the project is of doubtful justification.

Table 11-4 Relations between Benefit-Cost Ratio and Project Timing

Starting year	Delay	Benefit-cost ratio		
		Discount rates		
		3%	6%	12%
1977	0	0.921	0.555	0.243
1978	1	0.939	0.565	0.247
1982	5	1.024	0.617	0.269
1987	10	1.127	0.679	0.296
1994	17	1.258	0.759	0.328
1995	18	1.276	0.769	0.333
1999	22	1.349	0.815	0.353
2000	23	1.367	0.827	0.359
2010	33	1.511	0.915	0.397
2011	34	1.526	0.925	0.401
2012	35	1.539	0.933	0.405
2016	39	1.586	0.962	0.418
2017	40	1.598	0.970	0.421

3. Conclusion.

Economic evaluation of such national project should ultimately be made by comparing the total capital costs to be invested with the increase in net national income to be brought by it. In this case, an input-output analysis, for example, is regarded as one of the most effective measures, provided that reasonable data required for the analysis are given. But in the present study, the economic benefits were evaluated, for lack of such data, by making use of the method of common direct measurement as described in the preceding chapter.

These benefits will be only a part of the entire profits to be brought by the project because most of them were excepted from the benefit estimation as intangible ones. In this section, therefore, such major intangible benefits as increase in employment, time-savings in freight transportation and increase in agricultural and industrial productions must be discussed.

(1) Increase in employment.

The present project requires as many local laborers as about 1,200 thousand man-days per annum on the average during the construction period of 13 years. After the construction, laborers of about 200 thousand man-days per annum must be further employed for the maintenance works during the project life.

In view of large unemployment prevailing in the country, it is obvious that this project will bring increase in income of a large number of laborers. Some of this effect has already been incorporated in the economic evaluation as a reduced cost of unskilled laborers by applying the shadow wages of 0.5 times their actual wages. But this is not all of the benefits of increase in employment. Other benefits still remain uncounted because there must be a multiplier effect that the increase in their income will increase their consumption which, in turn, will give rise to income and consumption.

Furthermore, we must notice another effect of training laborers in a wide range of technics to be involved in the present construction works which are to be executed with high-grade technics over thirteen years. The technical training should greatly contribute to growth in economy of the country as well as growth in engineering.

(2) Time-savings for freight transport.

Time-savings for freight transport should also be taken up as one of the direct benefits of the project as well as those for the passenger transport, but we had to abandon to measure it in monetary terms because there were no available data on the nature of commodities to cross the bridge.

As the freight tied up during transit is in fact capital, the time-savings may be given as reduced costs of capital or reduced interest of capital. In addition, equipment costs and charges for custody will be reduced to make possible lower inventories by faster delivery of the freight after the opening of the bridge.

(3) Increase in agricultural and industrial productions.

Opening of the Jamuna Bridge has an important significance for economic development of Bangladesh in improving the communications between the capital, Dacca and the north-western part of the country, a central region of agricultural production. The bridge, if completed, is expected not only to smoothen the traffic flow between the regions on both sides of the Jamuna River, but also to dissolve the interruption of traffic due to floods. The bridge, therefore, will greatly contribute to prompt supply of perishable vegetables and fruits produced in the north-western region to markets in the Dacca region at all seasons. As

a result, the project will lead to increase in agricultural production in the north-western region and reduction in prices as well. In this aspect, the net value of increased agricultural production will become a development benefit to be brought by the project.

Similarly, another development benefit in industry can also be expected from the project. In addition, the investment of huge capital at the construction stage will give a stimulus to development of allied industries and consequently will give increase in industrial production and employment. It is expected that the national income will ultimately increase by the multiplier effect which, in turn, will give rise to income and consumption.

In conclusion, there can be no doubt as to the national importance of this project when we consider the above-mentioned intangible benefits together. In this sense, the project will surely be realized in course of time. But, at present, it does not seem to be economically feasible to implement it immediately. Until the time comes, improvement or strengthening of the ferry facilities will have to be considered for promoting the economic development of the country.

APPENDICES

APPENDIX A
DATA FOR CHAPTER III

1. Maximum Number of Dwellers in Construction Bases.

Number of workers and dependents given in Table 1 was estimated on the following assumptions for both the domestic workers and the foreign workers:

- a. Number of workers without dependents = $0.8 \times$ (total number of workers).
- b. Number of workers with dependents = $0.2 \times$ (total number of workers)
- c. Number of dependents = $2.0 \times$ (number of workers with dependents)
- d. Family make-up of foreign workers was assumed to be two children besides wife and it was further assumed that two children are equivalent to one adult in utilization of facilities. Domestic workers are supposed to have more dependents, but the above-mentioned family make-up was also assumed on the average since it may be presumed that one family has more than one worker.

Table 1 Maximum Number of Dwellers in Construction Bases

		(unit: men/day)											
Right side bank		3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	
Right base													
Total workers		180	330	2,400	2,800	5,000	5,800	3,500	3,800	3,200	1,200	1,400	
Workers without dependents		140	260	1,900	2,200	4,200	4,600	2,800	3,000	2,500	1,200	1,400	
Workers with dependents		40	70	500	600	1,100	1,200	1,700	1,400	800	400	300	
Dependents		80	150	1,000	1,100	2,200	2,400	3,400	2,800	1,500	900	700	
Total dwellers		260	480	3,400	3,900	7,500	8,200	7,900	7,200	4,800	2,500	2,400	
Left side bank													
Left base		3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	
Total workers		-	-	-	-	300	-	4,800	3,000	470	540	-	
Workers without dependents		-	-	-	-	(200)	-	3,800	2,400	380	430	-	
Workers with dependents		-	-	-	-	(100)	-	(1,000)	(600)	(90)	(110)	-	
Dependents		-	-	-	-	-	-	-	-	-	-	-	
Total dwellers		-	-	-	-	(200)	-	3,800	2,400	380	430	-	
Total													
Total of right & left base		3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	
Total workers		180	330	2,400	2,800	5,300	5,800	8,300	6,800	3,700	2,000	1,700	
Workers without dependents		140	260	1,900	2,200	4,200	4,600	6,600	5,400	2,900	1,600	1,400	
Workers with dependents		40	70	500	600	1,100	1,200	1,700	1,400	800	400	300	
Dependents		80	150	1,000	1,100	2,200	2,400	3,400	2,800	1,500	900	700	
Total dwellers		260	480	3,400	3,900	7,500	8,200	11,700	9,600	5,200	2,900	2,400	

* Figures in () show population at day-time and without () shows that of right.

2. Electric Power Demand in the Construction Bases.

Electric power required for the facilities in both construction bases was assumed as follows.

Table 2 Electric Power Demand in Construction Bases

Item	Power demand (KW)
Right dwelling settlement	
Quarters for workers without depts: $4,600 \times 0.8 \text{ KW} \times 1.2$	4,420
Houses for workers with depts. : $1,700 \times 1.5 \text{ KW} \times 1.2$	3,060
Public facilities : $(4,420 + 3,060) \times 20 \%$	1,500
(Subtotal)	(8,980)
Right job settlement and main works	
Motor pool	200
Power station	50
Purification plant	200
Cargo-handling pier	200
Warehouses, yards for equipment, forms, steel bars, caissons, aggregate, temporary construction materials and stones	550
Superstructure yard	1,500
Concrete plant	150
Asphalt plant	150
Office houses	100
Lighting	200
Main works	1,000
(Subtotal)	(4,300)
(Total on the right bank)	(13,280)
Left dwelling settlement	
Quarters for workers without depts.: $3,800 \times 0.8 \text{ KW} \times 1.2$	3,650
Public facilities : $3,650 \times 10 \%$	370
(Subtotal)	(4,020)
Left job settlement and main works	
Workshop	50
Power station	25
Purification station	100
Cargo-handling pier	200

Warehouses, yards for heavy equipment, forms, steel bars, aggregate, temporary construction materials and stones	355
Office houses	50
Lighting	150
Main works	1,000
(Subtotal)	(1,930)
(Subtotal on the left bank)	(5,950)
Grand total on both banks	19,230

3. Area Required for Job Facilities in the Main and Branch Bases:

Area required for the job facilities in the main and branch bases was assumed as follows.

Table 3 Area Required for Job Facilities in Main and Branch Bases

Facilities	Floorage(m ²)	Plotage(m ²)
Right Main Base		
Offices incl. garage, parking, open space	3,580	25,000
Temporary equipment	-	27,000
Steel caisson yard	-	48,000
Batcher plant	120	8,000
Aggregate yard	-	40,000
Steel bar yard	120	50,000
Forms and scaffolds yard	120	8,400
Machinery yard	-	28,600
Warehouses	5,450	25,200
Water supply plant	-	13,000
Electric power station	-	22,000
Fuel storage yard	-	14,000
Motor pool	3,890	32,500
Truss assembly yard	-	109,500
Asphalt plant	120	60,000
Heliport	-	11,000
(Total)		(522,200)
Left Branch Base		
Offices incl. garage, parking, open space	1,000	10,200
Temporary equipment yard	-	20,800
Aggregate yard	-	19,800
Steel bar yard	100	15,300
Forms and scaffolds yard	120	8,000
Machinery yard	-	19,500
Warehouses	2,480	7,200
Water supply plant	-	5,000
Electric power station	-	7,700
Fuel storage yard	-	8,800
Motor pool	2,250	23,400
(Total)		(145,700)

4. Area Required for the Dwelling Settlements.

Daily maximum number of dwellers on each side of the river is estimated as follows based on Table 1 in APPENDIX A.

Table 4 Daily Maximum Number of Dwellers in Construction Bases

	Right bank	Left Bank
Workers without dependent (men/day)	4,600	3,800
Workers with dependent (men/day)	1,700	—
Dependents (men/day)	3,400	—
Total dwellers (men/day)	9,700	3,800

Table 5 Area Required for Dwelling Settlements

	Floorage (m ²)	Plotage (m ²)
Right bank settlement		
Quarters for workers without dependents	$4,600 \times 12 \text{ m}^2/\text{hear} \times 1.2 = 66,200$	$66,200 \times 2 = 132,000$
Houses for households	$5,100 \times 15 \text{ m}^2/\text{head} \times 1.2 = 91,800$	$91,800 \times 2.5 = 230,000$
Public facilities	$(66,200 + 91,800) \times 0.1 = 15,800$	$15,800 \times 2 = 32,000$
Common area (40% of the above)		158,000
(Total)		(560,000)
Left bank settlement		
Quarters for workers without dependents	$3,800 \times 12 \text{ m}^2/\text{head} \times 1.2 = 54,700$	$54,700 \times 2 = 109,000$
Public facilities	$54,700 \times 0.05 = 2,735$	$2,735 \times 2.5 = 6,838$
Common area (40% of the above)		47,400
(Total)		(163,900)

DATA FOR CHAPTER VII

Table 1(1) Construction Costs of Construction Base Works

Tables and description involved in APPENDIX B are as follows,

Tables 1(1) through 1(20) Cost Estimation of Construction Base Works.

Table 1(1) Construction Costs of Construction Base Works.

- a. "D.C." stands for domestic currency in Tk.
- b. "F.C." stands for foreign currency in US\$.
- c. Exchange rate : US\$ 1 = Tk 13.

Table 1(2) Summary of Construction Costs of Construction Base Works.

This table is the summary of cost estimation shown in Table 1(3) through 1(20) by work items and items of equipment, materials and labor. Costs of imported equipment and materials in this table are counted in FOB prices except those of fuel, lubricant and asphalt.

Tables 1(3)-1 through 1(3)-18 Cost Estimation of Construction Base Works.

- a. Figures in () show total amount of each cost item.
- b. "f.sk.1." stands for foreign skilled laborers.
- c. "d.sk.1." stands for domestic skilled laborers.
- d. "d.unsk.1." stands for domestic unskilled laborers.

Costs of imported equipment and materials in these tables are counted in FOB prices except those of fuel, lubricant and asphalt.

Tables 2(1) through 2(8) Costs of Construction Base Works and Main Construction Works by Year.

Table 3 Costs of Land Acquisition.

Table 4 Administration Costs.

Table 5 Maintenance Costs.

30,147		
29,147	548,58	
844,1	288,1	
204,00	204,00	
044,841	282,008	

Items listed for construction base works are shown by year in Table 2(1) through 2(8), APPENDIX B.

Table 1(1) Construction Costs of Construction Base Works

Item	D.C. (10 ³ Tk)	F.C. (10 ³ \$)
EQUIPMENT & FACILITIES		
a. Costs of domestic ones	233,493	-
b. Costs of imported ones except c. counted in CIF	-	1,746
c. FOB costs of imported ones	-	86,673
d. Costs at site for c.	21,411	96,118
Sub-total	254,904	97,864
e. Miscellaneous	12,749	4,904
Total	267,653	102,768
MATERIALS		
a. Costs of domestic ones	152,282	-
b. Costs of imported ones except c. counted in CIF	26,741	9,085
c. FOB costs of imported ones	-	5,110
d. Costs at site for c.	4,797	6,596
Sub-total	183,820	15,681
e. Miscellaneous	9,205	786
Total	193,025	16,467
LABORS		
a. Costs of domestic unskilled laborers	22,347	-
b. Costs of domestic skilled laborers	15,600	-
c. Costs of foreign skilled laborers	-	29,147
Sub-total	37,947	29,147
d. Miscellaneous	1,898	1,458
Total	39,845	30,605
GRAND TOTAL	500,523	149,840

Note: Costs for construction base works are shown by year in Tables 2(1) through 2(8), APPENDIX B.

Table 1 (2) Summary of Construction Costs of Construction Base Works

Unit: 10³\$

	Equipment	Materials	Labor	Total
Reclamation of land for bases	15,530.6	2,746.8	24.6	18,301.9
Temporary roads	—	4,876.5	1,077.8	5,954.4
Temporary railway	—	1,049.1	408.1	1,457.1
Canals and canals	—	3,374.3	3,536.2	6,910.4
Water supply facilities	1,884.0	870.5	1,434.8	4,189.3
Electric power supply facilities	8,965.6	6,561.9	1,006.2	16,533.7
Job settlements	5,279.7	2,475.3	1,062.6	8,817.6
Dwelling settlements	42,196.7	1,670.6	1,347.1	45,214.3
Sewage treatment facilities	513.0	238.2	407.5	1,158.7
Motor pools	1,732.4	212.9	2,106.3	4,051.6
Heliport	1,746.2	65.1	672.0	2,483.2
Medical facilities	262.8	337.9	1,112.5	1,713.3
Transportation facilities in base	3,724.2	457.6	1,108.3	5,290.2
Equipment for base works	24,544.4	3,029.3	16,762.2	44,335.9
Total	106,379.6	27,966.0	32,066.2	166,411.6

Table 1(3)-1 Cost Estimation of Construction Base Works

Item	Specification	Unit	Quantity	Unit cost	Amount	Remarks
Reclamation of Lands for Based						
Equipment					(18,301,922)	
	4,000 PS	nos.	1	8,900,000	8,900,000	
pump dredger						
anchor barge	15 t	"	1	325,000	325,000	
dredging pipes	φ710mm×5m	sets	500	808	404,000	
floaters	φ1,300mm×4.5m	"	134	3,630	486,000	
joints	λ=1.5m, rubber	"	133	1,400	186,000	
pump dredger	600PS	nos.	1	1,300,000	1,300,000	
anchor barge	5t, 50PS	"	1	43,000	43,300	
tugboat	60t, 300PS	"	1	173,000	173,000	
dredging pipes	φ410mm×6.0m	sets	140	217	30,380	
floaters	"	"	70	1,170	81,900	
joints	rubber	"	70	243	17,010	
spare parts		l.s.	-	-	3,583,977	30% of equip.
Materials					(2,746,793)	
bats		m ³	94,700	16.2	1,534,140	
heavy oil		kl	7,855	94.3	740,727	
other oil		l.s.	-	-	222,218	30% of heavy oil
timber & others		l.s.	-	-	249,709	10% of materials
*Labor					(24,563)	
d.unsk.l.	arranging land	man-day	18,750	1.31	24,563	

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* Laborers for dredging are included in the works of "cambers and canals", Table 1(6).

Table 1(3)-2

Item	Specification	Unit	Quantity	Unit cost	Amount	Remarks	Unit: \$
Temporary Roads					(5,954,367)		
Materials					(4,876,538)		
bats		m ³	238,000	16.2	3,855,600	115(R)+79(L) +44(10 ³ m ³)	
paving materials							
crushed stone		"	27,000	16.9	456,300	33.0x10 ³ m ³ x0.64 {x1.05x4.8	
sand		"	15,000	10.0	150,000	33.0x0.34x1.10+2.7	
asphalt		"	2,300	130.0	299,000	33.0x0.06+0.3	
drain ditches							
brick		10 ³ pcs	2,121	53.8	114,110	39.28 x 54,000	km pcs
cement		t	38	31.0	1,178	{ 4.714x0.01x0.25x3.2	m ³ t/m ³
sand		m ³	35	10.0	350	4.714x0.01x0.75m ³	
Labor					(1,077,830)		
f.sk.l.		man-day	8,850	70.0	619,500		
d.sk.l.		"	39,850	2.31	92,054		
d.umsk.l.		"	279,600	1.31	366,276		

Table 1(3)-3

Unit: \$

Item	Specification	Unit	Quantity	Unit cost	Amount	Remarks
Temporary Railway						
Materials						
ballast		m ³	49,700	14.2	705,740	m ³ /m 8,350 x 2 + 33,000
rails, etc.		t	835	200.0	167,000	8,350 x 2 x 0.05
sleepers	9' x 5" x 10"	pcs.	11,100	3,300	36,630	8,350m ÷ 0.75m
turn outs		sets	6	-	19,800	
signals, etc.		l.s.	-	-	33,300	
Labor						
f.sk.l.		man-day	3,400	70.0	238,000	for const. & maintenance
d.sk.l.		"	29,400	2.31	67,914	- do -
d.unsk.l.		"	78,000	1.31	102,180	- do -

REVISIONS
 1. (10/10/50)
 2. (10/10/50)
 3. (10/10/50)
 4. (10/10/50)
 5. (10/10/50)
 6. (10/10/50)
 7. (10/10/50)
 8. (10/10/50)
 9. (10/10/50)
 10. (10/10/50)

Table 1(3)-4

Unit: \$

Item	Specification	Unit	Quantity	Unit cost	Amount	Remarks
Cambers & Canals					(6,910,427)	
Materials					(3,374,267)	
heavy oil		kl	2,478	94.3	233,675	for maintenance work
other oil		l.s.	-	-	70,103	- do -
structural steel		t	11,488	230.0	2,642,240	- do -
fenders		l.s.	-	-	77,500	-do- 30% of oil
bollards	10t	nos	18	190.0	3,420	
rails		m ³	234	18.5	4,329	
tie rods	φ60 220m	nos.	455	700.0	318,500	
timber		m	100	245.0	24,500	
Labor					(3,536,160)	
f.sk.l.		man-day	45,300	70.0	3,171,000	incl. dredger crew
d.sk.l.		"	56,000	2.31	129,360	
d.unsk.l.		"	180,000	1.31	235,800	

Table 1(3)-5

Item	Specification	Unit	Quantity	Unit cost	Amount	Remarks
Water Supply Facilities						
Equipment						
well equipment	0.5 t/min.	units	10	16,700	167,000	
boring machine		set	1	-	50,000	
purification plants	20 t/hr.	units	10	166,700	1,667,000	
					(4,189,269)	
					(1,884,000)	
Materials						
cement		t	960	31.0	29,760	
gravel		m ³	3,120	16.9	52,728	
sand		"	2,160	10.0	21,600	
steel bars		t	340	233.0	79,220	
structural steel		"	640	230.0	147,200	
service steel pipes		"	900	230.0	207,000	
vinyl pipes, etc.		l.s.	-	-	333,000	
					(1,434,761)	
Labor						
f.sk.l.		man-day	16,700	70.0	1,169,000	
d.sk.l.		"	19,350	2.31	44,699	
d.unsk.l.		"	168,750	1.31	221,063	

Table 1(3)-6

Unit: \$

Item	Specification	Unit	Quantity	Unit cost	Amount	Remarks
Electric Power Supply Facilities						
Equipment						
Diesel generators	2,000 KVA	units	10	666,700	6,667,000	(16,533,715)
transformer facilities		stations	32	-	337,000	(8,965,600)
electric control facilities		places	2	-	238,000	
equipment for residence		l.s.	-	-	1,000,000	
lighting for streets, etc.		"	-	-	293,000	
Lightning rods		"	-	-	9,600	
information facilities		"	-	-	33,000	
buildings		m ²	3,880	100	388,000	
Materials						
structural steel		t	140	230.0	32,200	(6,561,911)
cement		"	350	31.0	10,850	
gravel		m ³	1,150	16.9	19,435	
sand		"	770	10.0	7,700	
steel bars		t	130	233.0	30,290	
heavy oil		kl	57,100	94.3	5,384,530	
other oil	830kl/unit.yr.	l.s.	-	-	1,076,906	20% of heavy oil
Labor						
f.sk.l.		man-day	12,200	70.0	854,000	(1,006,204)
d.sk.l.		"	14,850	2.31	34,304	
d.unsk.l.		"	90,000	1.31	117,900	

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Table 1(3)-7

Unit: \$

Item	Specification	Unit	Quantity	Unit Cost	Amount	Remarks
Job Settlements						
Equipment						
unloader	20:00	sets	4	733,000	2,932,000	
telecommunication facilities between Dacca and base between right and left bases					(8,817,616)	
					(5,279,700)	
					2,932,000	
20linesx2places		"	1	-	55,000	
antenna		"	1	-	7,000	
goliath cranes		sets	3	140,000	420,000	
bar benders		nos.	4	1,300	5,200	
bar cutters		"	4	1,200	4,800	
stiff leg derrick cranes		sets	2	241,000	482,000	
buildings						
offices		m ²	2,120	120	254,400	
garages		"	2,100	60	126,000	
warehouses		"	7,930	80	634,400	
others		"	360	80	28,800	
apparutenance		l.s.	-	-	170,000	
water & power supply equipment		m ²	12,510	10	125,100	
					(2,475,331)	
Materials						
bats		m ³	133,600	16.2	2,164,320	(522+146) x 10 ³ m ²
brick		10 ³ pcs	900	53.8	48,420	x 0.2m
gravel		m ³	6,890	16.9	116,441	
sand		"	4,200	10.0	42,000	
asphalt		t	640	130.0	83,200	

Table 1(3)-8

Unit: \$

Item	Specification	Unit	Quantity	Unit cost	Amount	Remarks
cement		t	50	31.0	1,550	
steel bars		"	10	233.0	2,330	
structural steel		"	20	230.0	4,600	
timber		m ³	50	245.0	12,250	
Labor					(1,062,585)	
f.sk.l.		man-day	13,050	70.0	913,500	
d.sk.l.		"	13,500	2.31	31,185	
d.unsk.l.		"	90,000	1.31	117,900	

Table 1(3)-9

Unit: \$

Item	Specification	Unit	Quantity	Unit cost	Amount	Remarks
Dwelling Settlements					45,214,282	
Equipment					(42,196,700)	
family houses						
buildings	brick-made	m ²	91,800	75	6,885,000	
appurtenance		l.s.	-	-	6,800,000	for 1,700 families
water and power supply equipment		m ²	91,800	10	918,000	
houses for singles						
buildings	prefabricated	m ²	120,900	150	18,135,000	
appurtenance		l.s.	-	-	6,720,000	for 8,400 pers.
water & power supply equip.		m ²	120,900	8	967,200	
public facilities						
buildings	brick-made	m ²	16,900	75	1,267,500	
appurtenance		l.s.	-	-	335,000	
water & power equip.		m ²	16,900	10	169,000	
					(1,670,608)	
Materials						
brick		10 ³ pcs.	518	53.8	27,868	
cement		t	60	31.0	1,860	
gravel		m ³	200	16.9	3,380	
sand		"	130	10.0	1,300	
steel bars		t	10	233.0	2,330	
timber		m ³	50	245.0	12,250	
bats		"	100,000	16.2	1,621,620	
					(1,347,064)	
Labor						
f.sk.l.		man-day	15,400	70.0	1,078,000	
d.sk.l.		"	14,400	2.31	33,264	
d.unsk.l.		"	180,000	1.31	235,800	

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Table 1(3)-10

Unit: \$

Item	Specification	Unit	Quantity	Unit cost	Amount	Remarks
Sewage-Treatment Facilities						
Equipment	sewage treatment equipment	aeration type unit	19	27,000	513,000	
					(1,158,668)	
					(513,000)	
Materials						
	pipes, etc.	l.s.	-	-	167,000	
	cement	t	290	31.0	8,990	
	gravel	m ³	930	16.9	15,717	
	sand	"	650	10.0	6,500	
	steel bars	t	100	233.0	23,300	
	structural steel	"	30	230.0	6,900	
	tomber	m ³	40	245.0	9,800	
					(407,461)	
Labor						
	f.sk.l.	man-day	4,950	70.0	346,500	
	d.sk.l.	"	4,500	2.31	10,395	
	d.unsk.l.	"	38,600	1.31	50,566	

Table 1(3)-11

Unit: \$

Item	Specification	Unit	Quantity	Unit cost	Amount	Remarks
Motor Pools					(4,051,563)	
Equipment					(1,732,400)	
lathes		sets	2	9,270	18,540	
drilling machines		"	2	3,620	7,240	
milling machines		"	2	7,870	15,740	
band sawing machines for metal		"	2	7,670	15,340	
lift jacks		l.s.	-	-	45,300	for both bases
oil hydraulic presses		"	-	-	37,300	- do -
washing equipment		"	-	-	18,900	- do -
oil supply equipment		"	-	-	9,300	- do -
compressors		"	-	-	14,000	- do -
electric testing apparatus		"	-	-	13,300	- do -
electric tools		"	-	-	13,600	- do -
crack detectors		"	-	-	900	- do -
engine repair apparatus		"	-	-	4,400	- do -
brake & tyre service		"	-	-	3,400	- do -
testers & measures		"	-	-	2,100	- do -
tools		"	-	-	20,000	- do -
cutting & grinding tools		"	-	-	2,400	- do -
welding machines		"	-	-	19,100	- do -
water supply facilities		"	-	-	65,000	- do -
oil supply facilities		"	-	-	65,000	- do -
roof cranes		5 t sets	3	23,300	69,900	
goliath cranes		10 t "	2	140,100	280,200	
transformer facilities		l.s.	-	-	65,000	for both bases

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Table 1(3)-12

Unit: \$

Item	Specification	Unit	Quantity	Unit cost	Amount	Remarks
vehicles						
jeeps		nos.	3	6,500	(19,500)	
repairing cars		"	3	23,300	69,900	
trailers		"	112	20,000	40,000	
spareparts		l.s.	-	-	25,880	20% of vehicles
buildings						
offices, etc.	prefabricated	m	1,756	120	210,720	
work shops, etc.	- do -	"	4,388	130	570,440	
					(212,913)	
					16,200	
					10,985	
					4,500	
					16,310	
					157,500	
					197,848	
					19,570	20% of oil
					(2,106,250)	
					1,949,500	
					59,483	
					97,267	
Materials						
cement		t	200	31.0		
gravel		m	650	16.9		
sand		"	450	10.0		
steel bars		t	70	233.0		
structural steel		"	250	230.0		
light oil		kl.	1,080	90.6		
other oil		l.s.	-	-		
Labor						
f.sk.l.		man-day	27,850	70.0		
d.sk.l.		"	25,750	2.31		
d.unsk.l.		"	74,250	1.31		

Table 1(3)-13

Item	Specification	Unit	Quantity	Unit cost	Amount	Remarks
Unit: \$						
Heliport					(2,483,231)	
Equipment					(1,746,150)	
helicopter		mons.	96	14,500	1,392,000	12monsx8yrs
fixed charge		hrs.	2,880	85	244,800	hrs mons. yrs. 30 x 12 x 8
flyng charge		m ²	210	120	25,200	
buildings		l.s.	11	90	1,000	
lighting, etc.		"	11	75	83,150	5% of equipment
miscellaneous					(65,081)	
Materials						
asphalt		t	2.38	130	309	396m ² x0.10m x 0.06
gravel		m ³	25.4	16.9	429	" x 0.611 x 1.05
sand		"	14.8	10.0	148	" x 0.34 x 1.10
bricks		"	238	16.2	3,856	396m ² x0.06m
fuel for helicopter	Jet A-1	gal.	57,600	0.936	53,914	20gal x 2,880hrs.
mobile oil		"	115	4.38	504	0.04gal x 2,880hrs.
miscellaneous		l.s.	1	5,921	5,921	10% of materials.
Labor					(672,000)	
sk. l.		man-day	9,600	70	672,000	men days mons. yrs. 4 x 25 x 12 x 8

Table 1(3)-14

Unit: \$

Item	Specification	Unit	Quantity	Unit cost	Amount	Remarks
Medical facilities					(1,713,753)	
Equipment					(219,000)	
*buildings					100,000	
medical equipment from abroad		l.s.			40,000	5% of the above per yr.
spareparts for medical equipment		l.s.	8	5,000	15,000	
domestic facility					64,000	hire charge 3nosx8yrs.
cars		l.s.	8	8,000	(281,600)	
Materials						
medicine, etc.		men	96	2,000	192,000	12mons.x8yrs.
consumables		l.s.	8	4,500	36,000	
X-ray film, etc.		"	8	6,700	53,600	
					(927,111)	
Labor						
foreign staff		man-day	96	3,257	312,672	1 x 12 x 8 man mons. yrs.
doctors		"	192	2,057	394,944	2menx96mons.
nurses		"	288	123	35,424	3menx96mons.
domestic staff		"	384	61.5	23,616	4menx96mons.
doctors		"	1,632	57.8	94,330	17menx96mons.
nurses		"	2,016	32.8	66,125	21menx96mons.
skilled laborers		l.s.			(285,542)	20% of the above
unskilled laborers						
Miscellaneous						

APPENDIX B

* Buildings for medical facilities are included in "job settlements", Table 1(10).

Table 1(3)-15

Unit: \$

Item	Specification	Unit	Quantity	Unit cost	Amount	Remarks
Transportation Facilities in Bases						
Equipment						
buses	for 50 pers.	nos.	15	21,600	324,000	
trucks	8t, 20 pers.	"	10	10,200	102,000	
micro buses		"	5	7,830	39,150	
spare parts for the above		1.s.	-	-	93,030	
jeeps		nos.	100	6,530	653,000	
spareparts for the above		1.s.	-	-	13,060	
ferriery boats	for 300 pers.	nos.	2	1,000,000	2,000,000	
spare parts for the above		1.s.	-	-	500,000	
Materials						
light oil		Kl.	2,960	90.6	268,176	
heavy oil		"	1,200	94.3	113,160	
other oil		1.s.	-	-	76,267	
Labor						
f.sk.1.		man-day	14,400	70.0	1,008,000	
d.sk.1.		"	12,800	2.31	29,568	
d.unsk.1.		"	54,000	1.31	70,740	

Item	Specification	Unit	Quantity	Unit cost	Amount	Remarks
Equipment for Construction Base Works						
Equipment						
Bulldozers	swamp, 13t	nos.	6	55,000	330,000	
"	8t	"	5	16,700	83,500	
"	2t	"	5	10,900	54,500	
macadam rollers	12t	"	2	20,700	41,400	
asphalt finisher		"	1	29,000	29,000	
engine sprayer		"	1	8,100	8,100	
tractor shovels	1.2m ³	"	6	49,500	297,000	
trailers	40t	"	3	39,900	119,700	
dump trucks	11t	"	18	23,000	414,000	
"	8t	"	10	14,300	143,000	
"	4t	"	5	13,100	65,500	
trucks	11t	"	20	24,000	480,000	
"	8t	"	10	23,200	232,000	
"	4t	"	10	10,000	100,000	
trucks cranes	10t	"	10	39,200	392,000	
"	20t	"	5	56,100	280,500	
"	30t	"	2	111,800	223,600	
crawler cranes	955	"	5	275,000	1,375,000	
"	8t	"	5	70,000	350,000	
hydraulic backhoes	0.6m ³	"	4	10,300	41,200	
road sprinkler cars	8t	"	3	15,800	47,400	
concrete agitator cars	4.5m ³	"	15	28,100	421,500	
concrete buckets	1.1m ³	"	6	1,100	6,600	

Table 1(3)-17

Unit: \$

Item	Specification	Unit	Quantity	Unit cost	Amount	Remarks
soil compactors		nos.	5	890	4,450	
impact rollers		"	3	9,900	29,700	
vibration rollers	4t	"	3	8,000	24,000	
vibrators		"	30	430	12,900	
pile driving towers	30m	"	4	11,800	47,200	
diesel hummers	4.0t	"	3	50,800	152,400	
"	2.2t	"	3	27,000	81,000	
vibro hummers	90KW	"	2	37,800	75,600	
"	60KW	"	2	28,600	57,200	
"	40KW	"	2	23,500	47,000	
clam-shell buckets	0.6m ³	"	4	7,500	30,000	
electric generators	300KW	"	3	35,800	107,400	
"	125KW	"	20	17,100	342,000	
"	50KW	"	15	9,200	138,000	
welding machines	200A	"	15	260	3,900	
under water pumps	φ100	"	10	3,100	31,000	
"	φ150	"	10	5,000	50,000	
belt conveyers	λ=7m	"	20	1,430	28,600	
engine compressors	5m ³	"	2	810	1,620	
concrete breakers		"	10	950	9,500	
concrete pick hammers		"	10	920	9,200	
winch	30PS	"	10	7,200	72,000	
wood working machines		l's.	-	-	3,500	
miscellaneous		"	-	-	15,000	
spareparts for the above		"	-	-	1,381,734	20% of the above

APPENDIX B

Table 1(3)-18

Unit: \$

Item	Specification	Unit	Quantity	Unit cost	Amount	Remarks
floating cranes	1,000t	nos.	2	3,000,000	6,000,000	
tugboats	1,500PS	"	5	550,000	2,750,000	
"	500PS	"	2	166,700	333,400	
boats for communication	65PS	"	4	36,700	146,800	
anchor barges	500PS x 2, 35t	"	4	626,700	2,506,800	
survey boat	50PS	"	1	36,700	36,700	
instruments for surveying		l.s.	-	-	22,800	
instruments for soil survey		"	-	-	46,700	
spareparts for boats, etc.		"	-	-	2,910,800	
unloading facility for stone	pontoon-type	"	-	-	1,700,000	
Materials						
steel wire, etc.		t	100	930	93,000	
electric appliances		l.s.	-	-	100,000	
oxygen gas		m ³	67,200	0.67	45,024	7m ³ x5nosx0.8 x30daysx10mons.x8yrs.
acethylene gas		kg	48,000	2.50	120,000	15kgx5nosx0.8 x240days
gas cutters		nos.	400	66.7	26,680	50nos/yrx8yrs.
welding electrodes		t	80	830	66,400	10t/yrx8yrs.
light oil		kl	10,200	90.6	924,120	
heavy oil		"	12,100	94.3	1,141,030	
other oil		l.s.	-	-	413,030	
miscellaneous		"	-	-	100,000	
						(16,762,214)
Labor						
f.sk.l.		man-day	232,550	70.0	16,278,500	
d.sk.l.		"	209,400	2.31	483,714	

APPENDIX B

Table 2(1) Costs of Construction Base Works

Works: Construction Bases

Outline of works: Reclamation of land, temporary road and railway, camber and canal, job and dwelling settlement and facilities for them.

Year	Equipment		Materials		Labor		Total		
	D.C. (10 ³ Tk)	F.C. (10 ³ \$)	D.C. (10 ³ Tk)	F.C. (10 ³ \$)	Skilled D.C. (10 ³ Tk)	Unskilled D.C. (10 ³ Tk)		D.C. (10 ³ Tk)	F.C. (10 ³ \$)
1st.									
2nd.	30,341	1,511	314	434			655	1,945	
3rd.	31,095	35,417	5,119	195	601	544	328	37,143	
4th	199,427	40,597	25,034	4,783	532	2,489	710	225,703	
5th	34,726	18,913	75,703	2,436	2,634	5,703	6,880	119,943	
6th	1,147	4,779	36,323	1,177	2,566	4,723	5,173	45,209	
7th	137	222	6,743	1,230	1,556	3,320	1,652	10,088	
8th	137	222	6,456	1,134	1,638	3,518	1,952	10,183	
9th	137	222	12,012	1,223	1,775	3,254	1,979	15,903	
10th	137	222	7,835	1,187	1,529	2,118	1,201	10,702	
11th	123	221	7,248	958	1,529	2,118	1,201	10,101	
12th	123	221	7,139	940	1,010	1,446	1,201	9,473	
13th	123	221	3,099	770	1,010	1,372	1,188	5,425	
Total	267,653	102,768	193,025	16,467	16,380	30,605	23,465	500,523	149,840

Note: Including 5 % of miscellaneous.

Table 2(2) Costs of Main Works

Works: Substructures

Outline of works: Well foundations on land and in stream, piers and miscellaneous.

Year	Equipment		Materials		Labor		Total	
	D.C. (10 ³ Tk)	F.C. (10 ³ \$)	D.C. (10 ³ Tk)	F.C. (10 ³ \$)	Skilled D.C. (10 ³ Tk)	F.C. (10 ³ \$)	Unskilled D.C. (10 ³ Tk)	F.C. (10 ³ \$)
1st.								
2nd.								
3rd.								
4th								
5th	10,985	28,222	2,535	3,775			13,520	31,997
6th	3,952	11,192	8,881	5,783	320	571	1,280	17,546
7th	260	1,997	20,542	8,859	2,280	2,385	2,150	25,232
8th		1,334	21,608	8,515	2,860	3,302	2,900	27,368
9th	143	1,684	21,900	7,433	2,900	3,378	2,960	27,903
10th	247	1,770	21,904	8,934	2,860	3,292	2,900	27,911
11th	13	482	13,630	933	2,580	3,279	2,880	19,103
12th		41	630	45	80	176	330	1,040
13th			130	45	90	182	260	480
Total	15,600	46,722	111,760	44,322	13,970	16,565	15,660	107,609

Table 2(3)

Works: Superstructures

Outline of works: Manufacturing and erection, slab, painting, permanent way, pavement and miscellaneous.

Year	Equipment		Materials		Labor		Total	
	D.C. (10 ³ Tk)	F.C. (10 ³ \$)	D.C. (10 ³ Tk)	F.C. (10 ³ \$)	Skilled F.C. (10 ³ \$)	Unskilled D.C. (10 ³ Tk)	D.C. (10 ³ Tk)	F.C. (10 ³ \$)
1st.								
2nd.								
3rd.								
4th								
5th	1,430	9,369					1,430	9,396
6th		1,017	15,270	219	590	830	410	2,066
7th	3,315	20,922	8,353	16,629	660	1,774	440	39,325
8th	767	6,172	10,961	20,795	1,810	6,243	1,130	33,210
9th	325	3,679	10,863	22,515	2,140	7,385	1,420	33,579
10th	169	2,762	11,232	21,951	3,070	8,391	1,720	33,104
11th	351	3,432	9,738	18,105	3,070	8,391	1,720	29,928
12th		997	3,194	2,353	2,850	7,635	1,530	10,985
13th			7,460	714	2,210	2,657	860	3,371
Total	6,357	48,377	77,071	103,281	16,400	43,306	9,230	194,964

Table 2(4)

Works: Bridge Approaches

Outline of works: Embankment, stone pitching, slope protection
 permanent way, pavement and miscellaneous.

Year	Equipment		Materials		Labor		Total	
	D.C. (10 ³ Tk)	F.C. (10 ³ \$)	D.C. (10 ³ Tk)	F.C. (10 ³ \$)	Skilled D.C. (10 ³ Tk)	F.C. (10 ³ \$)	Unskilled D.C. (10 ³ Tk)	F.C. (10 ³ Tk)
1st.								
2nd.								
3rd.								
4th								
5th								
6th			943	486		1,516		2,002
7th	819	7,670	1,770		190	31	130	7,701
8th		348	1,901	1,000	270	2,075	180	3,423
9th	143	1,676	9,172	472	510	592	780	2,740
10th	4	442	12,501	1,071	400	806	1,310	2,319
11th	5	63	8,265	520	360	626	690	1,209
12th	15	121	8,993	38	80	140	1,120	299
13th			16,950	1,097	1,410	84	440	1,181
Total	984	10,320	60,495	4,684	3,220	5,870	4,650	69,349

Table 2(5)

Works: Guide Banks

Outline of works: Embankment, stone pitching, sodding, pavement and miscellaneous.

Year	Equipment		Materials		Labor		Total	
	D.C. (10 ³ Tk)	F.C. (10 ³ \$)	D.C. (10 ³ Tk)	F.C. (10 ³ \$)	Skilled D.C. (10 ³ Tk)	F.C. (10 ³ \$)		Unskilled D.C. (10 ³ Tk)
1st.								
2nd.								
3rd.								
4th								
5th								
6th	1,807	16,216	53,997	5,655	2,180	15,360	7,930	21,871
7th			60,850	5,733	630	1,016	7,790	21,093
8th			54,790	5,784				6,800
9th			60,820	5,729	2,210	15,394	8,190	21,123
10th			150	51	630	1,012	7,770	1,063
11th								
12th								
13th								
Total	1,807	16,216	230,607	22,952	5,650	32,782	31,680	71,950

Table 2(6)

Works: Dhaleswari New Channel
 outline of works: Dredging and miscellaneous.

Year	Equipment		Materials		Labor		Total
	D.C. (10 ³ Tk)	F.C. (10 ³ \$)	D.C. (10 ³ Tk)	F.C. (10 ³ \$)	Skilled D.C. (10 ³ Tk)	Unskilled D.C. (10 ³ Tk)	
1st.							
2nd.							
3rd.							
4th							
5th							
6th							
7th							
8th							
9th							
10th			1,050	201	200	1,569	1,250 1,770
11th			1,120	225	200	1,334	(1,320) (1,559)
12th			1,130	226	200	1,587	1,330 1,813
13th							
Total			3,300	652	600	4,490	3,900 5,142

Table 2(7)

Works: Railway Links

Outline of works: Formation, bridge(A), small bridge and spillway, permanent way, station and buildings, lighting and telecommunication, signalling and miscellaneous.

Year	Equipment		Materials		Labor		Unskilled		Total	
	D.C. (10 ³ Tk)	F.C. (10 ³ \$)	D.C. (10 ³ Tk)	F.C. (10 ³ \$)	D.C. (10 ³ Tk)	F.C. (10 ³ \$)	D.C. (10 ³ Tk)	F.C. (10 ³ \$)	D.C. (10 ³ Tk)	F.C. (10 ³ \$)
1st.										
2nd.	9,345	27	8,332	904	1,175	238	3,601		22,453	1,169
3rd.										
4th										
5th										
6th										
7th										
8th										
9th										
10th	23		315		126		753		1,217	
11th	55,829	168	29,399	3,353	4,976	1,370	19,699		109,903	4,891
12th	36,205	90	37,268	3,804	4,704	780	16,376		94,553	4,674
13th	1,797	162	85,171	7,084	32,264	316	16,133		133,365	7,562
Total	103,199	447	160,485	15,145	43,245	2,704	56,562		363,491	18,296

Source: (1953) Ministry of Railways

Table 2(8)

Works: Road Links

Outline of works: Embankment, slope protection, pavement, bridge (A), small bridge and spillway and miscellaneous.

Year	Equipment		Materials		Labor		Total	
	D.C. (10 ³ Tk)	F.C. (10 ³ \$)	D.C. (10 ³ Tk)	F.C. (10 ³ \$)	Skilled D.C. (10 ³ Tk)	F.C. (10 ³ \$)	Unskilled D.C. (10 ³ Tk)	F.C. (10 ³ \$)
1st.								
2nd.								
3rd.								
4th								
5th								
6th								
7th								
8th								
9th								
10th	280		5,921	352	556		2,036	8,793
11th	2,822		13,095	944	1,383	610	3,405	20,705
12th	2,616	14	17,472	653	1,612	113	2,681	24,381
13th								
Total	5,718	14	36,488	1,949	3,551	174	8,122	53,879
								2,137

Table 3 - Cost of Land Acquisitions

Item	Year										Total			
	1st.	2nd.	3rd.	4th	5th	6th	7th	8th	9th	10th		11th	12th	13th
Construction Bases	-	620	4,276	2,076	1,794	1,512	-	480	-	-	-	-	-	10,758
Bridge Approaches	-	-	-	-	5,800	-	6,612	-	-	-	-	-	-	12,412
Guide Banks	-	-	-	-	-	1,883	-	1,812	-	-	-	-	-	3,695
Dhaleswari New Channel	-	-	-	-	-	-	-	-	10,799	-	-	-	-	10,799
Railway Links	4,681	-	-	-	-	-	-	-	-	31,805	23,503	-	-	59,989
Road Links	-	-	-	-	-	-	-	-	8,930	-	-	-	-	8,930
Total	4,681	620	4,276	2,076	7,594	3,395	6,612	2,292	19,729	31,805	23,503	-	-	106,583

(36)

(10/12) (10/12) (10/12) (10/12) (10/12) (10/12) (10/12) (10/12) (10/12) (10/12) (10/12) (10/12) (10/12) (10/12)

10/12 10/12 10/12 10/12 10/12 10/12 10/12 10/12 10/12 10/12 10/12 10/12 10/12 10/12

সমস্ত প্রকল্পের ব্যয় পরিকল্পনা করা হয়েছে।
 প্রতিটি প্রকল্পের ব্যয় পরিকল্পনা করা হয়েছে।
 মোট ব্যয় ১০৬,৫৮৩ টকা।

Table 5 Maintenance Costs

Maintenance works	For 30 years		Annual average	
	D.C. (10 ³ Tk)	F.C. (10 ³ \$)	D.C. (10 ³ Tk)	F.C. (10 ³ \$)
1. BRIDGE AND RIVER CONTROL				
Expansion joints & slabs	5,570	228	185.7	7.6
Paintings of superstructure (190,000 m ² /yr)	140,220	3,243	4,674.0	108.1
Stone pitching for guide banks & pier protection (10,000 m ³ /yr)	60,510	2,130	2,017.0	71.0
Toe protection of bridge approaches (800 m/yr)	43,380	975	1,446.0	32.5
Dreging of Dhaleswari new channel & others (400,000 m ³ /yr)	46,500	-	1,550.0	-
Construction & repair of buildings	7,080	-	236.0	-
Purchase & maintenance costs of equipment	82,308	8,400	2,743.6	280.3
Personal expences including overhead	58,230	-	1,941.0	-
Miscellaneous	22,203	772	740.1	25.7
Sub-total	466,001	15,757	15,533.4	525.2
2. RAILWAY LINKS (128.9 Km)				
Embankment (earth works)	30,564	-	1,018.8	-
Bridges & spilways	17,292	-	576.4	-
Tracks	146,088	7,140	4,869.6	238.0
Stations & buildings	24,129	-	804.3	-
Power & telecommunication	26,946	-	898.2	-
Signalling & safety gears	46,020	660	1,534.0	22.0
Administration	9,681	-	322.7	-
Sub-total	300,720	7,800	10,024.0	260.0
3. ROAD LINKS (37.35 km)				
Surface painting (12 times/30yrs)	20,176	-	672.5	-
Surface dressing (3 times/30yrs)	17,384	-	579.5	-
Repaving (3 times/30yrs)	53,102	-	1,770.1	-
Miscellaneous	4,525	-	150.8	-
Sub-total	95,187	-	3,172.9	-
Total (1.+2.+3.)	861,908	23,557	28,730.3	785.2
4. CONTINGENCY (5% of the above)	43,095	1,178	1,436.5	39.3
Grand Total (1.+2.+3.+4.)	905,003	24,735	30,166.8	824.5

APPENDIX C

DATA FOR CHAPTER XI

Present Values
of
Economic Costs and Benefits

APPENDIX C
Table C-1

Unit: Thousand Taka

Shadow Rates: 1.75 for Foreign Exchange Component and 0.5 for Unskilled Labour
Discount rate: 2%

Year	Present Values of Costs				Present Values of Benefits				Net Present Value (11)=(10)-(5)	Benefit-Cost Ratio (12)=(11)/(5)		
	Construction costs		Maintenance costs		Salvage Values		Benefits					
	(1)	(2)= $\Sigma(1)$	(3)	(4)= $\Sigma(3)$	(6)	(7)= $\Sigma(6)$	(8)	(9)= $\Sigma(8)$				
	(1)	(2)= $\Sigma(1)$	(3)	(4)= $\Sigma(3)$	(5)	(6)	(7)= $\Sigma(6)$	(8)	(9)= $\Sigma(8)$	(10)=(7)+(9)	(11)	(12)
1	72672	72672	0	0	72672	0	0	0	0	0	-72672	0.0
2	176671	249342	0	0	249342	0	0	0	0	0	-249342	0.0
3	997741	1247083	0	0	1247083	0	0	0	0	0	-1247083	0.0
4	1431564	2678647	0	0	2678647	0	0	0	0	0	-2678647	0.0
5	1803603	4482250	0	0	4482250	0	0	0	0	0	-4482250	0.0
6	1486563	5968813	0	0	5968813	1050	1050	0	0	1050	-5967762	0.000176
7	2189191	8158003	0	0	8158003	5308	6358	0	0	6358	-8151645	0.000779
8	1590499	9748502	0	0	9748502	2019	8378	0	0	8378	-9740125	0.000859
9	1904783	11653285	0	0	11653285	99467	107844	0	0	107844	-11545441	0.009254
10	1412403	13065688	0	0	13065688	48172	156016	0	0	156016	-12909672	0.011941
11	1246014	14311702	0	0	14311702	321441	477457	0	0	477457	-13834245	0.033361
12	624262	14935964	0	0	14935964	114753	592211	0	0	592211	-14343753	0.039650
13	493407	15429371	48654	48654	15478024	340138	932349	0	0	932349	-14545675	0.060237
14	0	15429371	23883	72537	15501907	0	932349	861999	861999	1794349	-13707559	0.115750
15	0	15429371	22640	95176	15524547	0	932349	497478	1359478	2291827	-13232720	0.147626
16	0	15429371	21443	116619	15545990	0	932349	566396	1925873	2858222	-12687767	0.183856
17	0	15429371	21761	138380	15567750	0	932349	519439	2445312	3377661	-12190089	0.216965
18	0	15429371	31552	169932	15599302	0	932349	521024	2966336	3898685	-11700617	0.249927
19	0	15429371	20916	190847	15620218	0	932349	524594	3490879	4423228	-11196990	0.283173
20	0	15429371	19810	210657	15640027	0	932349	528397	4019276	4951625	-10638402	0.316599
21	0	15429371	20112	230769	15660139	0	932349	549151	4568427	5500776	-10159363	0.351260
22	0	15429371	19049	249817	15679188	0	932349	569645	5138072	6070421	-9608767	0.387164
23	0	15429371	61925	311743	15741113	0	932349	538912	5676984	6609333	-9131780	0.419877
24	0	15429371	18301	330044	15759414	0	932349	694954	6371938	7304287	-8455127	0.463487
25	0	15429371	18572	348616	15777987	0	932349	692328	6904266	7836615	-7941372	0.496680
26	0	15429371	17590	366206	15795577	0	932349	7441364	7441364	8373713	-7421864	0.530130
27	0	15429371	17851	384058	15813428	0	932349	8004536	8004536	8936835	-6876543	0.565145
28	0	15429371	31149	415207	15844578	0	932349	8541932	8541932	9474281	-6370296	0.597951
29	0	15429371	17158	432365	15861736	0	932349	613387	9155319	10087668	-5774068	0.635975
30	0	15429371	16251	448616	15877987	0	932349	548438	9703757	10636106	-5241880	0.669865
31	0	15429371	16498	465114	15894485	0	932349	574403	10278160	11210509	-4683976	0.705308
32	0	15429371	15627	480741	15910111	0	932349	592861	10871021	11803370	-4106742	0.741879
33	0	15429371	51687	532428	15961798	0	932349	557222	11428243	12360592	-3601206	0.774386
34	0	15429371	15013	547441	15976811	0	932349	604016	12032259	12964608	-3012203	0.811464
35	0	15429371	15236	562677	15992047	0	932349	569166	12601426	13533775	-2458273	0.846282
36	0	15429371	14430	577107	16006477	0	932349	564193	13165619	14097968	-1908510	0.880766
37	0	15429371	14644	591751	16021122	0	932349	562747	13728366	14660407	-1360407	0.915087
38	0	15429371	21240	612991	16042362	0	932349	561641	14290007	15222356	-820006	0.948885
39	0	15429371	14082	627073	16056443	0	932349	599401	14889408	15821757	-234687	0.985384
40	0	15429371	13337	640410	16069781	0	932349	583961	15473369	16405718	335998	1.020905
41	0	15429371	13540	653950	16083321	0	932349	558818	16032187	16964536	881216	1.054791
42	0	15429371	12824	666775	16096145	0	932349	615181	16647368	17579717	1483572	1.092169
43	0	15429371	18720	685494	16114865	0	932349	639803	17287171	18219520	2104653	1.130603
44	0	15429371	0	685494	16114865	0	932349	-385146	16902025	17834374	1719509	1.106703

Shadow Rates: 1.75 for Foreign Exchange Component, and 0.5 for Unskilled Labour
Discount Rate: 3%

Unit: Thousand Taka

Year	Present Values of Costs				Present Values of Benefits				Net Present Value (11)-(10)-(5)	Benefit-Cost Ratio (12)/(11)/(5)
	Construction costs (1) (2)=Σ(1)	Maintenance costs (3) (4)=Σ(3)	Sub-Total (5)=(2)+(4)	Salvage Values (6) (7)=Σ(6)	Benefits (8) (9)=Σ(8)	Sub-Total (10)=(7)+(9)				
1	71966	0	0	0	0	0	0	0	-71966	0.0
2	173257	0	0	245223	0	0	0	0	-245223	0.0
3	968962	0	0	1214185	0	0	0	0	-1214185	0.0
4	1376774	0	0	2590959	0	0	0	0	-2590959	0.0
5	1717733	0	0	4308691	0	0	0	0	-4308691	0.0
6	1402042	0	0	5710733	991	991	0	991	-5709742	0.000173
7	2044675	0	0	7755408	4957	5948	0	5948	-7749459	0.000767
8	1471082	0	0	9226490	1868	7816	0	7816	-9218674	0.000874
9	1744665	0	0	10971155	91105	98921	0	98921	-10872233	0.009016
10	1281115	0	0	12252269	43694	142615	0	142615	-12109654	0.011640
11	119220	0	0	13371489	288732	431347	0	431347	-12940142	0.032259
12	555293	0	0	13926782	102075	533422	0	533422	-13393360	0.038302
13	434634	42858	42858	14404274	299622	833044	0	833044	-13571230	0.057833
14	0	20834	20834	14425108	0	833044	751949	1584993	-12840115	0.109877
15	0	19538	19538	14444665	0	833044	429752	2014745	-12429920	0.139480
16	0	18344	18344	14463009	0	833044	484537	2492822	-11963727	0.172805
17	0	18435	18435	14481444	0	833044	440053	2939335	-11542109	0.202973
18	0	26470	26470	14507914	0	833044	437110	3376445	-11131469	0.232731
19	0	17377	17377	14525291	0	833044	435790	3812235	-10713036	0.262455
20	0	16298	16298	14541589	0	833044	434730	4246964	-10294625	0.292056
21	0	16386	16386	14557975	0	833044	447418	4694383	-9863592	0.322461
22	0	15369	15369	14573344	0	833044	459610	5153992	-9419352	0.353659
23	0	49478	49478	14622823	261407	833044	430592	5584584	-9038238	0.381909
24	0	14481	14481	14637303	275887	833044	549879	6134463	-8502840	0.419098
25	0	14553	14553	14651856	304089	833044	417112	6551575	-8100281	0.447150
26	0	13649	13649	14665505	317807	833044	416764	6968339	-7697166	0.475152
27	0	13717	13717	14679222	31807	833044	432753	7401092	-7278130	0.504188
28	0	23704	23704	14702926	341510	833044	408938	7810030	-6892896	0.531189
29	0	12930	12930	14715856	354440	833044	462232	8272262	-6443594	0.562133
30	0	12127	12127	14727983	366567	833044	409276	8681538	-6046445	0.589459
31	0	12192	12192	14740175	378760	833044	424490	9106028	-5634147	0.617769
32	0	11436	11436	14751612	390196	833044	433877	9539906	-5211706	0.646703
33	0	37459	37459	14789071	427635	833044	403837	9943742	-4845329	0.672371
34	0	10775	10775	14799846	438430	833044	433500	1037242	-4422604	0.701172
35	0	10829	10829	14810674	449238	833044	404522	10781764	-4028910	0.727973
36	0	10156	10156	14820830	459415	833044	397094	11178858	-3641972	0.754267
37	0	10207	10207	14831037	469622	833044	392232	11571090	-3259947	0.780194
38	0	14661	14661	14845698	484282	833044	387660	11958750	-2886948	0.805536
39	0	9625	9625	14855323	493907	833044	409706	12368456	-2486867	0.832594
40	0	9028	9028	14864351	502935	833044	395277	12763733	-2100618	0.858681
41	0	9076	9076	14873427	512011	833044	374586	13138319	-1735108	0.883342
42	0	8513	8513	14881940	520524	833044	408363	13546682	-1335277	0.910277
43	0	12306	12306	14894246	532830	833044	420584	13967266	-926980	0.937763
44	0	0	0	14894246	532830	833044	-250724	13716543	-1177703	0.920929

Shadow Rates: 1.75 for Foreign Exchange Component and 0.5 Unskilled Labour
Discount Rate: 4 %

APPENDIX C
Table C-3

Unit: Thousand Taka

Year	Present Values of Costs				Present Values of Benefits				Net Present Value (11)=(10)-(5)	Benefit-Cost Ratio (12)=(11)/(5)
	Construction costs (1) (2)= $\Sigma(1)$	Maintenance costs (3) (4)= $\Sigma(3)$	Sub-Total (5)=(2)+(4)	Salvage Values (6) (7)= $\Sigma(6)$	Benefits (8) (9)= $\Sigma(8)$	Sub-Total (10)=(7)+(9)				
1	71274	0	71274	0	0	0	0	0	-71274	0.0
2	169941	0	241215	0	241215	0	0	0	-241215	0.0
3	941279	0	1182494	0	1182494	0	0	0	-1182494	0.0
4	1324580	0	2507074	0	2507074	0	0	0	-2507074	0.0
5	1636722	0	4143796	0	4143796	0	0	0	-4143796	0.0
6	1323074	0	5466870	935	5466870	935	0	935	-5465935	0.000171
7	1910959	0	7377830	4633	7377830	4633	0	4633	-7372261	0.000755
8	1361658	0	8739488	1729	8739488	1729	0	1729	-8732191	0.000835
9	1599363	0	10338850	83518	10338850	83518	0	83518	-10248036	0.008784
10	1163126	0	11501977	39670	11501977	39670	0	39670	-11371492	0.011345
11	1006371	0	12508348	259619	12508348	259619	0	259619	-12118244	0.031187
12	494503	0	13002851	90901	13002851	90901	0	90901	-12521846	0.036992
13	383331	37800	13423981	37800	13423981	745260	0	745260	-12678721	0.055517
14	0	18198	13386181	18198	13386181	745260	656814	656814	-12040104	0.104304
15	0	16919	13386181	16919	13386181	745260	1028586	1028586	-11685251	0.131795
16	0	15716	13386181	15716	13386181	745260	1443721	1443721	-11285833	0.162450
17	0	15642	13386181	15642	13386181	745260	1817118	1817118	-10928078	0.189940
18	0	22245	13386181	22245	13386181	745260	2184451	2184451	-10582990	0.216812
19	0	14462	13386181	14462	13386181	745260	2547154	2547154	-10234749	0.243393
20	0	13434	13386181	13434	13386181	745260	2905495	2905495	-9889842	0.269616
21	0	13377	13386181	13377	13386181	745260	3270750	3270750	-9537965	0.296298
22	0	12426	13386181	12426	13386181	745260	3642349	3642349	-9178792	0.323417
23	0	39619	13386181	39619	13386181	745260	3987139	3987139	-8873620	0.347817
24	0	11484	13386181	11484	13386181	745260	4423213	4423213	-8449030	0.379546
25	0	11430	13386181	11430	13386181	745260	4750818	4750818	-8132856	0.403265
26	0	10617	13386181	10617	13386181	745260	5075002	5075002	-7819289	0.426719
27	0	10568	13386181	10568	13386181	745260	5408386	5408386	-7496472	0.450813
28	0	18085	13386181	18085	13386181	745260	5720394	5720394	-7202549	0.473043
29	0	9770	13386181	9770	13386181	745260	6069673	6069673	-6863040	0.498241
30	0	9076	13386181	9076	13386181	745260	6375963	6375963	-6565826	0.520289
31	0	9037	13386181	9037	13386181	745260	6690585	6690585	-6260241	0.542918
32	0	8395	13386181	8395	13386181	745260	7009071	7009071	-5950149	0.565825
33	0	27232	13386181	27232	13386181	745260	7302656	7302656	-5683796	0.586082
34	0	7758	13386181	7758	13386181	745260	7614776	7614776	-5379435	0.608469
35	0	7722	13386181	7722	13386181	745260	7903231	7903231	-5098701	0.629110
36	0	7173	13386181	7173	13386181	745260	8183667	8183667	-4825438	0.649170
37	0	7139	13386181	7139	13386181	745260	8458005	8458005	-4558239	0.668769
38	0	10155	13386181	10155	13386181	745260	8726539	8726539	-4289861	0.687775
39	0	6603	13386181	6603	13386181	745260	9007615	9007615	-4025388	0.707845
40	0	6134	13386181	6134	13386181	745260	9276185	9276185	-3762952	0.727014
41	0	6107	13386181	6107	13386181	745260	9528249	9528249	-3516996	0.744970
42	0	5673	13386181	5673	13386181	745260	9800399	9800399	-3250518	0.764390
43	0	8122	13386181	8122	13386181	745260	10078000	10078000	-2981040	0.784050
44	0	418119	13386181	418119	13386181	745260	9914104	9914104	-3144935	0.771177

APPENDIX C
Table C-4

Shadow Rates: 1.75 for Foreign Exchange Component and 0.5 for Unkilled Labour
Discount Rate: 5%

Unit: Thousand Taka

Year	Present Values of Costs				Present Values of Benefits				Net Present Value (11) = (10) - (5)	Benefit-Cost Ratio (12) = (11) / (5)
	Construction costs (1) = $\sum_{t=1}^T C_t / (1+r)^t$	Maintenance costs (3) = $\sum_{t=1}^T M_t / (1+r)^t$	Sub-Total (5) = (2) + (4)	Salvage Values (6) = $\sum_{t=1}^T S_t / (1+r)^t$	Benefits (8) = $\sum_{t=1}^T B_t / (1+r)^t$	Sub-Total (10) = (7) + (9)				
1	70595	0	0	0	0	0	0	0	-70595	0.0
2	166719	0	0	0	0	0	0	0	-237315	0.0
3	914641	0	0	0	0	0	0	0	-1151955	0.0
4	1274836	0	0	0	0	0	0	0	-2426791	0.0
5	1560254	0	0	0	0	0	0	0	-3987045	0.0
6	1249247	0	0	0	883	883	883	883	-5235409	0.000169
7	1787145	0	0	0	4333	5216	5216	5216	-7018221	0.000743
8	1261306	0	0	0	1601	6817	6817	6817	-8277925	0.000823
9	1467383	0	0	0	76626	83443	83443	83443	-9668682	0.008556
10	1056981	0	0	0	36050	119493	119493	119493	-10689614	0.011055
11	905821	0	0	0	233680	353173	353173	353173	-11361755	0.030147
12	440857	0	0	0	81039	434212	434212	434212	-11721572	0.035721
13	338490	33378	33378	12527653	233344	667556	667556	667556	-11860096	0.053287
14	0	15916	49294	12543569	0	667556	574459	574459	-11301553	0.099016
15	0	14657	53951	12558225	0	667556	322060	896519	-10994150	0.124546
16	0	13485	77436	12571710	0	667556	356200	1252719	-10651435	0.152746
17	0	13294	90730	12585004	0	667556	317336	1570055	-10347393	0.177800
18	0	18725	109455	12603729	0	667556	309210	1879265	-10058908	0.202069
19	0	12058	121513	12615787	0	667556	302404	2181669	-9766562	0.225846
20	0	11094	132607	12626881	0	667556	295922	2477592	-9481734	0.249083
21	0	10942	143548	12637823	0	667556	298758	2776350	-9193917	0.272508
22	0	10067	153616	12647890	0	667556	301054	3077404	-8902931	0.296094
23	0	31792	185408	12679682	0	667556	276674	3354077	-8658049	0.317171
24	0	9127	194535	12688809	0	667556	346591	3700668	-8320585	0.344258
25	0	8998	203533	12697807	0	667556	257900	3958568	-8071683	0.364325
26	0	8279	211811	12706086	0	667556	252776	4211344	-7827186	0.383981
27	0	8161	219973	12714247	0	667556	257475	4468819	-7577872	0.403986
28	0	13334	233807	12728081	0	667556	238671	4707489	-7353036	0.422298
29	0	7403	241209	12735484	0	667556	264637	4972126	-7095802	0.442832
30	0	6811	248020	12742295	0	667556	229855	5201981	-6872758	0.460634
31	0	6717	254737	12749012	0	667556	233859	5435840	-6645616	0.478735
32	0	6180	260918	12755192	0	667556	234477	5670317	-6417319	0.496886
33	0	19898	280776	12775050	0	667556	214085	5884402	-6223092	0.512871
34	0	5603	286379	12780654	0	667556	225433	6109836	-6003262	0.530285
35	0	5524	291903	12786178	0	667556	206357	6316193	-5802428	0.546195
36	0	5082	296985	12791260	0	667556	198710	6514903	-5608801	0.561513
37	0	5010	301996	12796270	0	667556	192538	6707440	-5421274	0.576340
38	0	7059	309055	12803330	0	667556	186669	6894109	-5241664	0.590601
39	0	4546	313602	12807876	0	667556	193527	7087636	-5052684	0.605502
40	0	4183	317785	12812059	0	667556	183155	7270791	-4873712	0.619600
41	0	4125	321910	12816185	0	667556	170261	7441053	-4707576	0.632685
42	0	3796	325706	12819980	0	667556	182079	7623131	-4529293	0.646700
43	0	5382	331088	12825363	0	667556	183956	7807087	-4350719	0.660772
44	0	0	331088	12825363	0	667556	-107573	7699514	-4458292	0.652385

APPENDIX C
Table C-5

Shadow Rates: 1.75 for Foreign Exchange Component and 0.5 for Unskilled Labour
Discount Rate: 6 %

Unit: Thousand Taka

Year	Present Values of Costs				Present Values of Benefits				Net Present Value (11) = (10) - (5)	Benefit-Cost Ratio (12) = (11) / (5)
	Construction costs (1) = (2) - (1)	Maintenance costs (3) = (4) - (3)	Sub-Total (5) = (2) + (4)	Salvage Values (6) = (7) - (6)	Benefits (8) = (9) - (8)	Sub-Total (10) = (7) + (9)				
1	69929	0	69929	0	0	0	0	0	-69929	0.0
2	163588	0	233518	0	0	0	0	0	-233518	0.0
3	888998	0	1122516	0	0	0	0	0	-1122516	0.0
4	1227405	0	2349921	0	0	0	0	0	-2349921	0.0
5	1488032	0	3837954	0	0	0	0	0	-3837954	0.0
6	1180182	0	5018136	834	834	834	834	834	-5017302	0.000166
7	1672414	0	6690550	4055	4889	4889	4889	4889	-6685661	0.000731
8	1169197	0	7859747	1484	6373	6373	6373	6373	-7853374	0.000811
9	1347393	0	9207140	70360	76733	76733	76733	76733	-9130406	0.008334
10	961394	0	10168534	32789	109523	109523	109523	109523	-10059011	0.010771
11	816132	0	10984666	210542	320065	320065	320065	320065	-10664601	0.029137
12	393458	0	11378124	72326	392392	392392	392392	392392	-10985733	0.034486
13	299248	29508	11706880	206292	598683	598683	598683	598683	-11108197	0.051139
14	0	13938	11720819	0	598683	598683	598683	598683	-10619067	0.094000
15	0	12714	11733533	0	598683	598683	598683	598683	-10352405	0.117708
16	0	11587	11745120	0	598683	598683	598683	598683	-10057917	0.143651
17	0	11315	11756435	0	598683	598683	598683	598683	-9799124	0.166489
18	0	15788	11772223	0	598683	598683	598683	598683	-9554204	0.188411
19	0	10071	11782294	0	598683	598683	598683	598683	-9311710	0.209686
20	0	9178	11791472	0	598683	598683	598683	598683	-9076068	0.230285
21	0	8967	11800439	0	598683	598683	598683	598683	-8840201	0.250858
22	0	8172	11808611	0	598683	598683	598683	598683	-8603985	0.271380
23	0	25565	11834176	0	598683	598683	598683	598683	-8407072	0.289594
24	0	7270	11841446	0	598683	598683	598683	598683	-8138272	0.312730
25	0	7099	11848545	0	598683	598683	598683	598683	-7941884	0.329717
26	0	6470	11855016	0	598683	598683	598683	598683	-7750791	0.346202
27	0	6319	11861334	0	598683	598683	598683	598683	-7557773	0.362823
28	0	10609	11871944	0	598683	598683	598683	598683	-7385347	0.377916
29	0	5623	11875567	0	598683	598683	598683	598683	-7189937	0.394663
30	0	5125	11882692	0	598683	598683	598683	598683	-7022097	0.409048
31	0	5007	11887699	0	598683	598683	598683	598683	-6852787	0.423540
32	0	4563	11892262	0	598683	598683	598683	598683	-6684221	0.437935
33	0	14524	11906787	0	598683	598683	598683	598683	-6542164	0.450552
34	0	4060	11910846	0	598683	598683	598683	598683	-6382897	0.464110
35	0	3964	11914810	0	598683	598683	598683	598683	-6238767	0.476386
36	0	3613	11918423	0	598683	598683	598683	598683	-6101119	0.488093
37	0	3528	11921952	0	598683	598683	598683	598683	-5969065	0.499322
38	0	4924	11926876	0	598683	598683	598683	598683	-5843780	0.510033
39	0	3141	11930017	0	598683	598683	598683	598683	-5713201	0.521107
40	0	2863	11932880	0	598683	598683	598683	598683	-5590705	0.531487
41	0	2797	11935677	0	598683	598683	598683	598683	-5478067	0.541034
42	0	2549	11938227	0	598683	598683	598683	598683	-5358334	0.551162
43	0	3581	11941807	0	598683	598683	598683	598683	-5239537	0.561244
44	0	0	11941807	0	598683	598683	598683	598683	-5310426	0.553308

APPENDIX C
Table C-6

Shadow Rates: 1.75 for Foreign Exchange Component, and 0.5 for Unskilled Labour
Discount Rate: 7% Unit: Thousand Taka

Year	Present Values of Costs			Present Values of Benefits			Net Present Value (11) = (10) - (5)	Benefit-Cost Ratio (12) = (11) / (5)
	Construction costs (1)	Maintenance costs (2) = $\Sigma(1)$	Sub-Total (3) = (1) + (2)	Salvage Values (4) = $\Sigma(3)$	Benefits (5) = (2) + (4)	Sub-Total (6) = (3) + (4)		
1	69276	0	69276	0	0	0	-69276	0.0
2	160545	229821	390366	0	229821	0	-229821	0.0
3	864305	1094126	1958431	0	1094126	0	-1094126	0.0
4	1182160	2276286	3458446	0	2276286	0	-2276286	0.0
5	1419786	3696072	5115858	0	3696072	0	-3696072	0.0
6	1115531	4811603	5927134	788	4811603	788	-4810815	0.000164
7	1566024	6377627	7943651	3797	6377627	4585	-6373041	0.000719
8	1084587	7462214	8546801	1377	7462214	5962	-7456252	0.000799
9	1238206	8700420	9938626	64658	8700420	70621	-8629800	0.008117
10	875231	9575651	10450882	29851	9575651	100471	-9475179	0.010492
11	736043	10311694	11047737	189881	10311694	290353	-10021341	0.028158
12	351531	10663225	11014756	64619	10663225	354972	-10308253	0.033289
13	264861	10928086	11192947	182586	10954204	537558	-10416645	0.049073
14	0	10928086	10928086	38339	10966425	537558	-978658	0.089241
15	0	10928086	10928086	11044	10977469	537558	-9756139	0.111258
16	0	10928086	10928086	9971	10987440	537558	-9502730	0.135128
17	0	10928086	10928086	9646	10997086	537558	-9282119	0.155947
18	0	10928086	10928086	13333	11010418	537558	-9075284	0.175755
19	0	10928086	10928086	8425	11018844	537558	-8872413	0.194796
20	0	10928086	10928086	7607	11026450	537558	-8677117	0.213063
21	0	10928086	10928086	7362	11033812	537558	-8483460	0.231140
22	0	10928086	10928086	6647	11040460	537558	-8291331	0.249005
23	0	10928086	10928086	20599	11061058	537558	-8132665	0.264748
24	0	10928086	10928086	5803	11066862	537558	-7918100	0.284522
25	0	10928086	10928086	5614	11072476	537558	-7762802	0.298910
26	0	10928086	10928086	5069	11077544	537558	-7613103	0.312745
27	0	10928086	10928086	4904	11082448	537558	-7463309	0.326565
28	0	10928086	10928086	8157	11090605	537558	-7330746	0.339013
29	0	10928086	10928086	4283	11094888	537558	-7181917	0.352682
30	0	10928086	10928086	3867	11098755	537558	-7055281	0.364318
31	0	10928086	10928086	3742	11102497	537558	-6928729	0.375931
32	0	10928086	10928086	3379	11105876	537558	-6803911	0.387359
33	0	10928086	10928086	10654	11116530	537558	-6699705	0.397320
34	0	10928086	10928086	2950	11119480	537558	-6583968	0.407889
35	0	10928086	10928086	2854	11122334	537558	-6480208	0.417370
36	0	10928086	10928086	2377	11124911	537558	-6382041	0.426329
37	0	10928086	10928086	2493	11127401	537558	-6288744	0.434842
38	0	10928086	10928086	3447	11130850	537558	-6201056	0.442895
39	0	10928086	10928086	2178	11133028	537558	-6110518	0.451136
40	0	10928086	10928086	1967	11134995	537558	-6026377	0.458789
41	0	10928086	10928086	1903	11136898	537558	-5949731	0.465764
42	0	10928086	10928086	1718	11138616	537558	-5869018	0.473093
43	0	10928086	10928086	2391	11141008	537558	-5789685	0.480327
44	0	10928086	10928086	0	11141008	537558	-5836582	0.476117

Shadow Rate: 1.75 for Foreign Exchange Component and 0.5 for Unskilled Labour
Discount Rate: 8 %

APPENDIX C
Table C-7

Unit: Thousand Taka

Year	Present Values of Costs					Present Values of Benefits					Net Present Value (11) = (10) - (5)	Benefit-Cost Ratio (12) = (11) / (5)
	Construction costs		Maintenance costs		Sub-Total (5) = (2) + (4)	Salvage Values		Benefits (9) = $\Sigma(8)$	Sub-Total (10) = (7) + (9)			
	(1)	(2) = $\Sigma(1)$	(3)	(4) = $\Sigma(3)$		(6)	(7) = $\Sigma(6)$					
1	68634	68634	0	0	68634	0	0	0	-68634	0	-68634	0.0
2	157586	226220	0	0	226220	0	0	0	-226220	0	-226220	0.0
3	840518	1066738	0	0	1066738	0	0	0	-1066738	0	-1066738	0.0
4	1138981	2205719	0	0	2205719	0	0	0	-2205719	0	-2205719	0.0
5	1352261	3560980	0	0	3560980	0	0	0	-3560980	0	-3560980	0.0
6	1054974	4615954	0	0	4615954	745	745	0	745	745	-4615209	0.000162
7	1467299	6083253	0	0	6083253	3558	4303	0	4303	4303	-6078950	0.000707
8	1006803	7090056	0	0	7090056	1278	5581	0	5581	5581	-7084475	0.000787
9	1138763	8228819	0	0	8228819	59466	65047	0	65047	65047	-8163772	0.007905
10	797485	9026304	0	0	9026304	27199	92246	0	92246	92246	-8934058	0.010220
11	664452	9690756	0	0	9690756	171412	263659	0	263659	263659	-9427098	0.027207
12	314401	10005157	0	0	10005157	57794	321453	0	321453	321453	-9683705	0.032129
13	234692	10239849	23143	23143	10262992	161789	483241	0	483241	483241	-9779750	0.047086
14	0	10239849	10729	33871	10273721	0	483241	387237	870478	1358515	-9403242	0.084729
15	0	10239849	9605	43477	10283326	0	483241	211067	1081545	1584812	-9201781	0.105175
16	0	10239849	8592	52069	10291918	0	483241	226957	1308502	1791249	-8983416	0.127139
17	0	10239849	8235	60304	10300153	0	483241	196577	1505079	1988327	-8795074	0.146122
18	0	10239849	11277	71581	10311430	0	483241	186223	1691302	1880525	-8620128	0.164022
19	0	10239849	7060	78642	10318491	0	483241	177065	1868367	1951608	-8450124	0.181070
20	0	10239849	6315	84957	10324806	0	483241	168457	2036824	2080381	-8287982	0.197275
21	0	10239849	6056	91013	10330862	0	483241	165347	2202171	2263233	-8128691	0.213164
22	0	10239849	5417	96430	10336279	0	483241	161989	2364160	2410490	-7972118	0.228725
23	0	10239849	16631	113061	10352910	0	483241	144736	2508896	2580627	-7844014	0.242337
24	0	10239849	4642	117703	1037552	0	483241	176275	2685171	2702924	-7672381	0.259248
25	0	10239849	4449	122152	10362001	0	483241	2329452	2812694	2841929	-7549307	0.271443
26	0	10239849	3980	126132	10365981	0	483241	2450970	2934212	2934212	-7431769	0.283062
27	0	10239849	3814	129946	10369795	0	483241	2571309	3054550	3054550	-7315245	0.294562
28	0	10239849	6286	136232	10376082	0	483241	108451	3163001	3163001	-7213080	0.304836
29	0	10239849	3270	139503	10379352	0	483241	116910	3279911	3279911	-7099441	0.316003
30	0	10239849	2925	142428	10382277	0	483241	98723	3378635	3378635	-7003643	0.325423
31	0	10239849	2805	145233	10385082	0	483241	97653	3476287	3476287	-6908795	0.334739
32	0	10239849	2509	147742	10387591	0	483241	95191	3571479	3571479	-6816112	0.343822
33	0	10239849	7838	155580	10395429	0	483241	84499	3655978	3655978	-6739451	0.351691
34	0	10239849	2150	157730	10397579	0	483241	86506	3742484	3742484	-6655095	0.359938
35	0	10239849	2061	159791	10399640	0	483241	76986	3819470	3819470	-6580170	0.367269
36	0	10239849	1843	161634	10401483	0	483241	72074	3891544	3891544	-6509939	0.374134
37	0	10239849	1767	163401	10403250	0	483241	67895	3959440	3959440	-6443811	0.380596
38	0	10239849	2420	165821	10405670	0	483241	63997	4023437	4023437	-6382233	0.386658
39	0	10239849	1515	167337	10407186	0	483241	64506	4087943	4087943	-6319243	0.392800
40	0	10239849	1356	168692	10408541	0	483241	59353	4147295	4147295	-6261246	0.398451
41	0	10239849	1300	169992	10409841	0	483241	53642	4200937	4200937	-6208904	0.403554
42	0	10239849	1163	171155	10411004	0	483241	57771	4256709	4256709	-6154295	0.408866
43	0	10239849	1603	172758	10412607	0	483241	54781	4311490	4311490	-6101117	0.414064
44	0	10239849	0	172758	10412607	0	483241	-31145	4280345	4280345	-6132262	0.411073

APPENDIX C
Table C-8

Shadow Rates: 1.75 for Foreign Exchange Component and 0.5 for Unskilled Labour
Discount Rate: 9%

Unit: Thousand Taka

Year	Present Values of Costs				Present Values of Benefits				Net Present Value (11)=(10)-(5)	Benefit-Cost Ratio (12)=(11)/(5)
	Construction costs (1)	(2)= $\frac{1}{1.75}$	Maintenance costs (3)	Sub-Total (4)= $\frac{2}{1.75}$	Salvage Values (6)	(7)= $\frac{5}{1.75}$	Benefits (8)	Sub-Total (9)= $\frac{7}{1.75}$		
1	68005	68005	0	68005	0	0	0	0	-68005	0.0
2	154708	222712	0	222712	0	0	0	0	-222712	0.0
3	817596	1040308	0	1040308	0	0	0	0	-1040308	0.0
4	1097755	2138064	0	2138064	0	0	0	0	-2138064	0.0
5	1294223	3432287	0	3432287	0	0	0	0	-3432287	0.0
6	998218	4430505	0	4430505	705	705	0	705	-4429799	0.000159
7	1375623	5806127	0	5806127	3335	4041	0	4041	-5802087	0.000696
8	935239	6741367	0	6741367	1187	5228	0	5228	-6736139	0.000776
9	1048114	7789481	0	7789481	54732	59960	0	59960	-7729521	0.007698
10	727269	8516750	0	8516750	24804	84764	0	84764	-8431986	0.009953
11	600390	9117140	0	9117140	154886	239650	0	239650	-8877490	0.026286
12	281482	9398622	0	9398622	51743	291393	0	291393	-9107229	0.031004
13	208191	9606814	20529	9627343	143520	434913	0	434913	-9192429	0.045175
14	0	9606814	9430	9636773	0	434913	340360	775273	-8861500	0.080449
15	0	9606814	8365	9645138	0	434913	183814	959088	-8686051	0.099437
16	0	9606814	7414	9652552	0	434913	195839	1154926	-8497626	0.119650
17	0	9606814	7041	9659593	0	434913	168069	888082	-8336598	0.136962
18	0	9606814	9553	9669146	0	434913	157755	1045837	-8188396	0.153142
19	0	9606814	5926	9675072	0	434913	148621	1629372	-8045701	0.168409
20	0	9606814	5252	9680325	0	434913	140099	1769470	-7910855	0.182790
21	0	9606814	4990	9685315	0	434913	138251	1905721	-7779594	0.196764
22	0	9606814	4423	9689737	0	434913	132259	2037980	-7651757	0.210324
23	0	9606814	13454	96378	0	434913	117088	2150668	-7548124	0.222099
24	0	9606814	3721	100099	0	434913	141294	2296362	-7410551	0.236570
25	0	9606814	3534	103633	0	434913	101279	1962728	-7312805	0.246914
26	0	9606814	3132	106764	0	434913	95625	2058353	-7220312	0.256678
27	0	9606814	2974	109739	0	434913	93827	2152180	-7129459	0.266256
28	0	9606814	4856	114595	0	434913	83783	2235963	-7050532	0.274742
29	0	9606814	2503	117098	0	434913	89489	2325453	-6963546	0.283874
30	0	9606814	2219	119317	0	434913	74875	2400328	-6890889	0.291508
31	0	9606814	2108	121425	0	434913	73384	2473712	-6819613	0.298988
32	0	9606814	1868	123293	0	434913	70878	2544589	-6750603	0.306215
33	0	9606814	5782	129075	0	434913	62339	2606928	-6694047	0.312436
34	0	9606814	1572	130647	0	434913	63234	2670163	-6632384	0.318879
35	0	9606814	1493	132140	0	434913	55759	2725922	-6578117	0.324556
36	0	9606814	1323	133462	0	434913	51723	2777645	-6527718	0.329822
37	0	9606814	1256	134719	0	434913	48277	2825922	-6480697	0.334735
38	0	9606814	1705	136424	0	434913	45088	2871009	-6437315	0.339304
39	0	9606814	1058	137482	0	434913	45029	2916038	-6393344	0.343889
40	0	9606814	938	138419	0	434913	41052	2957090	-6353229	0.348068
41	0	9606814	891	139310	0	434913	36761	2993851	-6317359	0.351808
42	0	9606814	789	140099	0	434913	37870	3031721	-6280278	0.355665
43	0	9606814	1078	141178	0	434913	36857	3068578	-6244500	0.359406
44	0	9606814	0	141178	0	434913	-20762	3047816	-6265262	0.357277

APPENDIX C
Table C-9

Shadow Rates: 1.75 for Foreign Exchange Component and 0.5 for Unskilled Labour
Discount Rate: 10 %

Unit: Thousand Taka

Year	Present Values of Costs				Present Values of Benefits				Net Present Value (11)=(10)-(5)	Benefit-Cost Ratio (12)=(11)/(5)		
	Construction costs		Maintenance costs		Salvage Values		Benefits					
	(1)	(2)= $\Sigma(1)$	(3)	(4)= $\Sigma(3)$	(6)	(7)= $\Sigma(6)$	(8)	(9)= $\Sigma(8)$				
	(1)	(2)= $\Sigma(1)$	(3)	(4)= $\Sigma(3)$	(5)=(2)+(4)	(6)	(7)= $\Sigma(6)$	(8)	(9)= $\Sigma(8)$	(10)=(7)+(9)	(11)=(10)-(5)	(12)=(11)/(5)
1	67386	67386	0	0	67386	0	0	0	0	0	-67386	0.0
2	151907	219294	0	0	219294	0	0	0	0	0	-219294	0.0
3	795500	1014794	0	0	1014794	0	0	0	0	0	-1014794	0.0
4	1058378	2073172	0	0	2073172	0	0	0	0	0	-2073172	0.0
5	1236655	3309627	0	0	3309627	0	0	0	0	0	-3309627	0.0
6	944992	4254619	0	0	4254619	668	668	0	668	668	-4253951	0.000157
7	1290435	5545054	0	0	5545054	3129	3796	0	3796	3796	-5541257	0.000685
8	869347	6414401	0	0	6414401	1104	4900	0	4900	4900	-6409501	0.000764
9	965412	7379813	0	0	7379813	50413	55314	0	55314	55314	-7374500	0.007495
10	663794	8043607	0	0	8043607	22639	77953	0	77953	77953	-7965654	0.009691
11	543007	8586614	0	0	8586614	140083	218036	0	218036	218036	-8368579	0.025393
12	252265	8838879	0	0	8838879	46372	264408	0	264408	264408	-8574471	0.029914
13	184885	9023764	18231	18231	9041995	127454	391861	0	391861	391861	-8650134	0.043338
14	0	9023764	8298	26530	9050294	0	391861	299510	299510	691372	-8358922	0.076392
15	0	9023764	7294	33824	9057588	0	391861	160283	459793	851654	-8205934	0.094027
16	0	9023764	6406	40230	9063994	0	391861	169215	629008	1020870	-8043125	0.112629
17	0	9023764	6028	46258	9070023	0	391861	143900	772909	1164770	-7905253	0.128420
18	0	9023764	8105	54363	9078128	0	391861	133842	906751	1298612	-7779516	0.143048
19	0	9023764	4982	59346	9083110	0	391861	124946	1031697	1423558	-7659552	0.156726
20	0	9023764	4375	63721	9087485	0	391861	116711	1148407	1540269	-7547217	0.169493
21	0	9023764	4119	67840	9091604	0	391861	112473	1260881	1652742	-7438863	0.181788
22	0	9023764	3618	71458	9095222	0	391861	108186	1369066	1760927	-7334295	0.193610
23	0	9023764	10905	82363	9106128	0	391861	94905	1463971	1855833	-7250295	0.203800
24	0	9023764	2989	85376	9109116	0	391861	113484	1577456	1969317	-7139799	0.216192
25	0	9023764	2812	88164	9111928	0	391861	80606	1658061	2049923	-7062006	0.224971
26	0	9023764	2470	90634	9114398	0	391861	75413	1733475	2125336	-6989062	0.233184
27	0	9023764	2324	92958	9116722	0	391861	73323	1806798	2198660	-6918063	0.241168
28	0	9023764	3761	96719	9120483	0	391861	64879	1871677	2263539	-6856944	0.248182
29	0	9023764	1921	98639	9122404	0	391861	68668	1940345	2322206	-6790198	0.255657
30	0	9023764	1687	100326	9124091	0	391861	56931	1997276	2389138	-6734953	0.261849
31	0	9023764	1588	101914	9125679	0	391861	53290	2052566	2444428	-6681251	0.267863
32	0	9023764	1395	103309	9127074	0	391861	52917	2105483	2497345	-6629729	0.273619
33	0	9023764	4278	107587	9131351	0	391861	46119	2151602	2543463	-6587888	0.278542
34	0	9023764	1152	108739	9132504	0	391861	46356	2197957	2589819	-6542685	0.283583
35	0	9023764	1084	109824	9133588	0	391861	40504	2238462	2630323	-6503265	0.287984
36	0	9023764	952	110776	9134540	0	391861	37230	2275692	2667553	-6466987	0.292029
37	0	9023764	896	111672	9135436	0	391861	34434	2310126	2701988	-6433448	0.295770
38	0	9023764	1205	112877	9136641	0	391861	31867	2341993	2733855	-6402796	0.299219
39	0	9023764	741	113618	9137382	0	391861	31536	2373530	2765391	-6371991	0.302646
40	0	9023764	651	114269	9138033	0	391861	28489	2402019	2793880	-6344152	0.305742
41	0	9023764	613	114881	9138645	0	391861	25280	2427299	2819160	-6319485	0.308488
42	0	9023764	538	115419	9139183	0	391861	25806	2453105	2844966	-6294217	0.311293
43	0	9023764	728	116147	9139911	0	391861	24887	2477992	2869853	-6270059	0.313991
44	0	9023764	0	116147	9139911	0	391861	-13892	2464100	2855961	-6283950	0.312471

Shadow Rates: 1.75 for Foreign Exchange Component and 0.5 for Unskilled Labour
Discount Rate: 11 %

Unit: Thousand Taka

Year	Present Values of Costs				Present Values of Benefits				Net Present Value (11) = (10) - (5)	Benefit-Cost Ratio (12) = (11) / (5)
	Construction costs (1) = $\Sigma(1)$	Maintenance cost (3)	Sub-Total (5) = (2) + (4)	Salvage Values (6)	Benefits (8)	Sub-Total (10) = (7) + (9)				
1	66779	0	66779	0	0	0	0	0	-66779	0.0
2	149183	0	215962	0	0	0	0	0	-215962	0.0
3	774193	0	990155	0	0	0	0	0	-990155	0.0
4	1020750	0	2010906	0	0	0	0	0	-2010906	0.0
5	1181753	0	3192659	0	0	0	0	0	-3192659	0.0
6	895048	0	4087707	632	632	632	632	632	-4087075	0.000155
7	1211223	0	5298930	2937	3569	3569	3569	3569	-5295361	0.000674
8	808632	0	6107562	1027	4596	4596	4596	4596	-6102966	0.000752
9	889898	0	6997460	46470	51066	51066	51066	51066	-6946394	0.007298
10	606360	0	7603820	20681	71746	71746	71746	71746	-7532073	0.009436
11	491555	0	8095375	126809	198556	198556	198556	198556	-7896819	0.024527
12	226304	0	8321679	41600	240156	240156	240156	240156	-8081524	0.028859
13	164365	16208	8502252	113308	353463	353463	353463	353463	-8148788	0.041573
14	0	7311	8509562	0	353463	263869	263869	263869	-7892231	0.072546
15	0	6368	8515931	0	353463	139937	403805	403805	-7758662	0.089924
16	0	5543	8521473	0	353463	146405	550210	550210	-7617800	0.106047
17	0	5169	8526642	0	353463	123381	673591	673591	-7499588	0.120452
18	0	6887	8533529	0	353463	113723	787313	787313	-7392752	0.133682
19	0	4195	8537724	0	353463	105208	892521	892521	-7291740	0.145939
20	0	3651	8541375	0	353463	97388	989909	989909	-7198003	0.157278
21	0	3406	8544781	0	353463	93006	1082915	1082915	-7108403	0.169100
22	0	2965	8547746	0	353463	88655	1171570	1171570	-7022713	0.178413
23	0	8856	8556602	0	353463	77071	1248641	1248641	-6954497	0.187236
24	0	2405	8559007	0	353463	91329	1339970	1339970	-6865573	0.197854
25	0	2243	8561250	0	353463	64285	1404255	1404255	-6803531	0.205311
26	0	1952	8563202	0	353463	59602	1463857	1463857	-6745881	0.212228
27	0	1820	8565022	0	353463	57428	1521286	1521286	-6690273	0.218884
28	0	2919	8567941	0	353463	50357	1571642	1571642	-6642836	0.224687
29	0	1477	8569418	0	353463	52817	1624459	1624459	-6591496	0.230812
30	0	1286	8570704	0	353463	43395	1667854	1667854	-6549387	0.235840
31	0	1200	8571904	0	353463	41765	1709619	1709619	-6508822	0.240680
32	0	1044	8572948	0	353463	39612	1749231	1749231	-6470254	0.245271
33	0	3173	8576121	0	353463	34212	1783443	1783443	-6439216	0.249169
34	0	847	8576968	0	353463	34078	1817520	1817520	-6405985	0.253118
35	0	790	8577758	0	353463	29508	1847029	1847029	-6377267	0.256535
36	0	687	8578446	0	353463	26879	1873907	1873907	-6351075	0.259647
37	0	641	8579087	0	353463	24636	1898543	1898543	-6327081	0.262500
38	0	854	8579941	0	353463	22594	1921137	1921137	-6305341	0.265107
39	0	521	8580462	0	353463	22158	1943295	1943295	-6283704	0.267673
40	0	453	8580915	0	353463	19837	1963132	1963132	-6264320	0.269971
41	0	423	8581338	0	353463	17444	1980575	1980575	-6247299	0.271990
42	0	368	8581705	0	353463	17646	1998221	1998221	-6230021	0.274035
43	0	493	8582199	0	353463	16864	2015085	2015085	-6213650	0.275984
44	0	96155	8582719	0	353463	-9329	2005757	2005757	-6229220	0.274897

APPENDIX C
Table C-11
Unit: Thousand Taka

Shadow Rates: 1.75 for Foreign Exchange Component and 0.5 for Unskilled Labour
Discount Rate: 12 %

Year	Present Values of Costs					Present Values of Benefits				Net Present Value (11)=(10)-(5)	Benefit-Cost Ratio (12)=(11)/(5)	
	Construction costs (1)	(2)=I(1)	Maintenance costs (3)	(4)=I(3)	Sub-Total (5)=(2)+(4)	Salvage Values (6)	(7)=Σ(6)	Benefits (8)	(9)=Σ(8)			Sub-Total (10)=(7)+(9)
1	66183	66183	0	0	66183	0	0	0	0	0	-66183	0.0
2	146531	212714	0	0	212714	0	0	0	0	0	-212714	0.0
3	753641	966354	0	0	966354	0	0	0	0	0	-966354	0.0
4	984780	1951135	0	0	1951135	0	0	0	0	0	-1951135	0.0
5	1129930	3081065	0	0	3081065	0	0	0	0	0	-3081065	0.0
6	848157	3929222	0	0	3929222	599	599	0	0	599	-3928622	0.000153
7	1137519	5066741	0	0	5066741	2758	3357	0	0	3357	-5063383	0.000663
8	752646	5819386	0	0	5819386	956	4313	0	0	4313	-5815073	0.000741
9	820890	6640276	0	0	6640276	42866	47179	0	0	47179	-6593097	0.007105
10	554345	7194621	0	0	7194621	18907	66086	0	0	66086	-7128535	0.009185
11	445376	7639997	0	0	7639997	114896	180982	0	0	180982	-7459015	0.023689
12	203214	7843210	0	0	7843210	37355	218337	0	0	218337	-7624873	0.027838
13	146276	7989486	14424	14424	8003910	100838	319175	0	0	319175	-7684735	0.039877
14	0	7989486	6448	20872	8010358	0	319175	232733	232733	551908	-7458451	0.068899
15	0	7989486	5567	26439	8015925	0	319175	122322	355055	674230	-7341695	0.084111
16	0	7989486	4802	31241	8020727	0	319175	126834	481889	801064	-7219663	0.099874
17	0	7989486	4438	35678	8025165	0	319175	105933	587822	906997	-7118168	0.113019
18	0	7989486	5860	41538	8031025	0	319175	96769	684591	1003766	-7027259	0.124986
19	0	7989486	3538	45076	8034562	0	319175	88724	773315	1092490	-6942073	0.135974
20	0	7989486	3052	48128	8037614	0	319175	81396	854711	1173886	-6863728	0.146049
21	0	7989486	2821	50949	8040435	0	319175	77040	931751	1250926	-6789510	0.155579
22	0	7989486	2434	53383	8042869	0	319175	72780	1004531	1323706	-6719163	0.164581
23	0	7989486	7205	60588	8050075	0	319175	62706	1067237	1386412	-6663663	0.172223
24	0	7989486	1939	62528	8052014	0	319175	73642	1140879	1460054	-6591960	0.181328
25	0	7989486	1792	64320	8053806	0	319175	51373	1192252	1511427	-6542380	0.187666
26	0	7989486	1546	65866	8055352	0	319175	4205	1239457	1558632	-6496720	0.193490
27	0	7989486	1429	67295	8056781	0	319175	45077	1284534	1603709	-6453072	0.199051
28	0	7989486	2271	69566	8059052	0	319175	39174	1323708	1642883	-6416169	0.203856
29	0	7989486	1139	70705	8060191	0	319175	40721	1364429	1683604	-6376587	0.208879
30	0	7989486	983	71687	8061173	0	319175	33158	1397597	1716762	-6344411	0.212967
31	0	7989486	908	72596	8062082	0	319175	31627	1429214	1748390	-6313692	0.216866
32	0	7989486	784	73379	8062865	0	319175	29729	1458944	1778119	-6284747	0.220532
33	0	7989486	2360	75740	8065226	0	319175	25447	1484391	1803566	-6261660	0.223622
34	0	7989486	624	76364	8065850	0	319175	25121	1509512	1828687	-6237163	0.226720
35	0	7989486	577	76941	8066427	0	319175	21558	1531070	1850245	-6216182	0.229376
36	0	7989486	498	77439	8066925	0	319175	19462	1550532	1869707	-6197218	0.231774
37	0	7989486	460	77899	8067385	0	319175	17679	1568211	1887386	-6179999	0.233953
38	0	7989486	608	78507	8067993	0	319175	16069	1584280	1903455	-6164538	0.235927
39	0	7989486	367	78873	8068360	0	319175	15618	1599898	1919073	-6149287	0.237852
40	0	7989486	316	79190	8068676	0	319175	13857	1613755	1932930	-6135747	0.239560
41	0	7989486	293	79483	8068969	0	319175	12076	1625831	1945006	-6123963	0.241048
42	0	7989486	252	79735	8069221	0	319175	12107	1637938	1957113	-6112108	0.242541
43	0	7989486	336	80071	8069557	0	319175	11468	1649406	1968581	-6100975	0.243952
44	0	7989486	0	80071	8069557	0	319175	-6287	1643119	1962294	-6107262	0.243173

Table C-12 Economic Cost and Benefits

Unit: Thousand Tk

Year	Costs			Benefits		
	Construction costs	Maintenance costs	Total	Benefits	Residual values	Total
1st 1977	66,390		66,390			
2nd 1978	163,398		163,398			
3rd 1979	915,993		915,993			
4th 1980	1,366,596		1,366,596			
5th 1981	1,729,893		1,729,893			
6th 1982	1,459,481		1,459,481		1,014	1,014
7th 1983	2,178,174		2,178,174		5,226	5,226
8th 1984	1,618,915		1,618,915		2,028	2,028
9th 1985	1,979,211		1,979,211		101,894	101,894
10th 1986	1,496,733		1,496,733		50,323	50,323
11th 1987	1,362,700		1,362,700		342,576	342,576
12th 1988	703,796		703,796		124,748	124,748
13th 1989	577,681	54,034	631,715		404,060	404,060
14th 1990		29,862	29,862	1,043,600		1,043,600
15th 1991		28,832	28,832	645,080		645,080
16th 1992		27,785	27,785	741,580		741,580
17th 1993		28,832	28,832	701,420		701,420
18th 1994		41,840	41,840	718,140		718,140
19th 1995		28,832	28,832	738,130		738,130
20th 1996		27,785	27,785	758,450		758,450
21st 1997		28,832	28,832	801,110		801,110
22nd 1998		27,798	27,798	845,910		845,910
23rd 1999		88,186	88,186	821,970		821,970
24th 2000		27,798	27,798	1,053,980		1,053,980
25th 2001		28,819	28,819	847,290		847,290
26th 2002		27,798	27,798	871,450		871,450
27th 2003		28,819	28,819	927,500		927,500
28th 2004		49,734	49,734	908,160		908,160
29th 2005		28,819	28,819	1,043,980		1,043,980
30th 2006		27,798	27,798	964,160		964,160
31st 2007		28,818	28,818	1,025,850		1,025,850
32nd 2008		27,798	27,798	1,076,170		1,076,170
33rd 2009		89,695	89,695	990,440		990,440
34th 2010		27,798	27,798	1,138,490		1,138,490
35th 2011		28,832	28,832	1,101,590		1,101,590
36th 2012		27,798	27,798	1,114,710		1,114,710
37th 2013		28,832	28,832	1,134,700		1,134,700
38th 2014		41,841	41,841	1,155,060		1,155,060
39th 2015		28,832	28,832	1,248,810		1,248,810
40th 2016		27,798	27,798	1,244,470		1,244,470
41st 2017		28,831	28,831	1,220,540		1,220,540
42nd 2018		27,797	27,797	1,357,020		1,357,020
43rd 2019		42,005	42,005	1,433,570		1,433,570
44th 2020				-789,020		-789,020
Total	15,618,961	1,088,878	16,707,839	28,884,310	1,031,869	29,916,179

Shadow rates: 1.50 for foreign exchange component and 0.5 for unskilled labour.

APPENDIX C
Table C-13

Shadow Rates: 1.50 for Foreign Exchange Component and 0.5 for Unskilled Labour
Discount Rate: 2 %

Unit: Thousand Taka

Year	Present Values of Costs				Present Values of Benefits				Net Present Value (11) = (10) - (5)	Benefit-Cost Ratio (12) = (11) / (5)
	Construction costs		Maintenance cost		Salvage Values		Benefits			
	(1)	(2) = $\Sigma(1)$	(3)	(4) = $\Sigma(3)$	(6)	(7) = $\Sigma(6)$	(8)	(9) = $\Sigma(8)$		
			Sub-Total (5) = (2) + (4)				Sub-Total (10) = (7) + (9)			
1	65088	65088	0	0	0	0	65088	0	-65088	0.0
2	157053	222141	0	0	0	0	222141	0	-222141	0.0
3	863161	1085302	0	0	0	0	1085302	0	-1085302	0.0
4	1262523	2347825	0	0	0	0	2347825	0	-2347825	0.0
5	1566817	3914643	0	0	0	0	3914643	0	-3914643	0.0
6	1295977	5210620	0	0	900	900	5210620	900	-5209720	0.000173
7	1896232	7106852	0	0	4550	5450	7106852	0	-7101402	0.000767
8	1381728	8488580	0	0	1731	7181	8488580	0	-8481399	0.000846
9	1656115	10144695	0	0	85260	92441	10144695	0	-10052254	0.009112
10	1227842	11372538	0	0	41282	133724	11372538	0	-11238814	0.011758
11	1095969	12468507	0	0	275521	409245	12468507	0	-12059262	0.032822
12	554938	13023445	0	0	98363	507608	13023445	0	-12515838	0.038976
13	446566	13470011	41770	41770	312352	819959	13511782	0	-12691822	0.060685
14	0	13470011	22632	64402	0	819959	13534413	790918	-11923536	0.119021
15	0	13470011	21423	85824	0	819959	13555836	479304	-11465654	0.154191
16	0	13470011	20240	106064	0	819959	13576076	540201	-10945693	0.193751
17	0	13470011	20591	126655	0	819959	13596666	500928	-10465356	0.230300
18	0	13470011	29295	155950	0	819959	13625961	502812	-9991838	0.266706
19	0	13470011	19791	175741	0	819959	13645752	506675	-9504954	0.303450
20	0	13470011	18699	194439	0	819959	13664451	510415	-9013238	0.340388
21	0	13470011	19023	213462	0	819959	13683473	528553	-8503707	0.378542
22	0	13470011	17981	231443	0	819959	13701454	547168	-7974521	0.417980
23	0	13470011	55924	287366	0	819959	13757378	521257	-7509187	0.454170
24	0	13470011	17283	304649	0	819959	13774660	6083514	-6871188	0.501172
25	0	13470011	17566	322215	0	819959	13792227	516449	-6372304	0.537979
26	0	13470011	16612	338827	0	819959	13808838	520760	-5868155	0.575044
27	0	13470011	16884	355711	0	819959	13825722	543387	-5341652	0.613644
28	0	13470011	28566	384277	0	819959	13854288	521624	-4848594	0.650029
29	0	13470011	16228	400505	0	819959	13870516	587878	-4276945	0.691652
30	0	13470011	15346	415851	0	819959	13885863	532285	-3760006	0.729221
31	0	13470011	15598	431449	0	819959	13901460	555237	-3220367	0.768343
32	0	13470011	14751	446199	0	819959	13916211	571052	-2664066	0.808564
33	0	13470011	46662	492861	0	819959	13962873	515255	-2195472	0.842764
34	0	13470011	14178	507039	0	819959	13977051	580662	-1628988	0.883453
35	0	13470011	14417	521456	0	819959	13991467	550825	-1092580	0.921911
36	0	13470011	13627	535083	0	819959	14005095	546457	-559750	0.960032
37	0	13470011	13857	548940	0	819959	14018952	545349	-28258	0.997984
38	0	13470011	19715	568655	0	819959	14038667	544249	496277	1.033351
39	0	13470011	13319	581974	0	819959	14051985	576886	1059843	1.075423
40	0	13470011	12589	594563	0	819959	14065475	563609	1610862	1.114533
41	0	13470011	12801	607365	0	819959	14077376	541932	2139993	1.152016
42	0	13470011	12100	619465	0	819959	14089476	590716	1680806	1.192953
43	0	13470011	17926	637391	0	819959	14107403	611803	3312486	1.234805
44	0	13470011	0	637391	0	819959	14107403	-330127	2982360	1.211404

APPENDIX C
Table C-14

Shadow Rates: 1.50 for Foreign Exchange Component and 0.5 for Unskilled Labour
Discount Rate: 3%

Unit: Thousand Taka

Year	Present Values of Costs					Present Values of Benefits				Net Present Value (11)=(10)-(5)	Benefit-Cost Ratio (12)=(11)/(5)
	Construction costs (1) (2)=E(1)	Maintenance costs (3) (4)=E(3)	Sub-Total (5)=(2)+(4)	Salvage Values (6) (7)=E(6)	Benefits (8) (9)=E(8)	Sub-Total (10)=(7)+(9)					
1	64456	0	0	64456	0	0	0	0	0	-64456	0.0
2	154018	0	0	218475	0	0	0	0	0	-218475	0.0
3	838263	0	0	1056738	0	0	0	0	0	-1056738	0.0
4	1214203	0	0	2270941	0	0	0	0	0	-2270941	0.0
5	1492221	0	0	3763162	0	0	0	0	0	-3763162	0.0
6	1222292	0	0	4985454	849	849	0	0	849	-4984605	0.000170
7	1771055	0	0	6756509	4249	5098	0	0	5098	-6751410	0.000755
8	1277986	0	0	8034495	1601	6699	0	0	6699	-8027796	0.000834
9	1516900	0	0	9551396	78093	84793	0	0	84793	-9466603	0.008878
10	1113710	0	0	10665106	37445	122238	0	0	122238	-10542868	0.011461
11	984443	0	0	11649549	247484	369722	0	0	369722	-11279827	0.031737
12	493628	0	0	12143177	87496	457218	0	0	457218	-11685960	0.037652
13	393373	36795	36795	12573345	275145	732363	0	0	732363	-11840982	0.058247
14	0	19742	56537	12593087	0	732363	689943	689943	1422305	-11170782	0.112943
15	0	18506	75043	12611593	0	732363	1103995	1103995	1836358	-10775235	0.145609
16	0	17315	92358	12628908	0	732363	1566123	1566123	2298486	-10330422	0.182002
17	0	17444	109802	12646352	0	732363	1990494	1990494	2722856	-9923495	0.215308
18	0	174378	134378	12670928	0	732363	2421832	2421832	3144688	-9526240	0.248181
19	0	16442	15821	12687371	0	732363	420945	2833270	3565633	-9121738	0.281038
20	0	166204	166204	12702755	0	732363	419935	3253206	3985569	-8717186	0.313756
21	0	181703	181703	12718253	0	732363	430636	3683842	4416205	-8302049	0.347234
22	0	196211	196211	12732761	0	732363	441474	4125316	4857679	-7875082	0.381510
23	0	240894	240894	12777444	0	732363	416485	4541801	5274164	-7503280	0.412771
24	0	13675	254569	12791119	0	732363	518488	5060290	5792652	-6998466	0.452865
25	0	13764	268333	12804883	0	732363	404670	5464960	6197323	-6607560	0.483981
26	0	12890	281222	12817773	0	732363	404087	5869047	6601410	-6216363	0.515020
27	0	294196	12830747	12830747	0	732363	417550	6286597	7018960	-5811787	0.547042
28	0	315934	12852484	12852484	0	732363	396936	6683533	7415896	-5436588	0.577001
29	0	328163	12864713	12864713	0	732363	443009	7126542	7858905	-5005809	0.610888
30	0	339616	12876166	12876166	0	732363	397221	7523763	8256126	-4620040	0.641194
31	0	351143	12887693	12887693	0	732363	410327	7934090	8666453	-4221240	0.672460
32	0	361937	12898488	12898488	0	732363	417917	8352007	9084369	-3814118	0.704297
33	0	38175	395755	12932305	0	732363	373422	8725428	9457791	-3474514	0.731331
34	0	10175	405930	12942480	0	732363	416738	9142167	9874510	-3067951	0.762955
35	0	10246	416177	12952757	0	732363	391487	9533654	10266017	-2686710	0.792576
36	0	425768	425768	12962318	0	732363	384611	9918265	10650628	-2311690	0.821661
37	0	435426	12971976	12971976	0	732363	380105	10298370	11030733	-1941243	0.850351
38	0	449034	12985584	12985584	0	732363	375636	10674026	11406388	-1579195	0.878389
39	0	458138	12994688	12994688	0	732363	394316	11068342	11800705	-1193983	0.908118
40	0	466659	13003209	13003209	0	732363	381501	11449843	12182205	-821004	0.936861
41	0	475240	13011790	13011790	0	732363	363267	11813110	12545472	-466318	0.964162
42	0	483272	13019823	13019823	0	732363	392123	12205233	12937596	-82227	0.993684
43	0	495057	13031607	13031607	0	732363	402178	12607411	13397774	308167	1.023648
44	0	495057	13031607	13031607	0	732363	-214907	12392504	13124867	93260	1.007156

APPENDIX C
Table C-15

Shadow Rates: 1.50 for Foreign Exchange Component and 0.5 for Unskilled Labour
Discount Rate: 4 %

Unit: Thousand Taka

Year	Present Values of Costs					Present Values of Benefits					Net Present Value (11)=(10)-(5)	Benefit-Cost Ratio (12)=(11)/(5)
	Construction costs		Maintenance costs		Sub-Total (5)=(2)+(4)	Salvage Values (6)	Benefits		Sub-Total (10)=(7)+(9)			
	(1)	(2)=E(1)	(3)	(4)=E(3)			(7)=E(6)	(8)		(9)=E(8)		
1	63837	63837	0	0	63837	0	0	0	0	0	-63837	0.0
2	151071	214907	0	0	214907	0	0	0	0	0	-214907	0.0
3	814314	1029222	0	0	1029222	0	0	0	0	0	-1029222	0.0
4	1168172	2197394	0	0	2197394	0	0	0	0	0	-2197394	0.0
5	1421846	3619240	0	0	3619240	0	0	0	0	0	-3619240	0.0
6	1153449	4772689	0	0	4772689	801	801	0	801	801	-4771887	0.000168
7	1655233	6427922	0	0	6427922	3971	4773	0	4773	4773	-6423149	0.000742
8	1182925	7610847	0	0	7610847	1482	6255	0	6255	6255	-7604593	0.000822
9	1390567	9001415	0	0	9001415	71589	77944	0	77844	77844	-8923571	0.008648
10	1011139	10012554	0	0	10012554	33996	111840	0	111840	111840	-9900713	0.011170
11	885184	10897738	0	0	10897738	222531	334371	0	334371	334371	-10563366	0.030683
12	439589	11337327	0	0	11337327	77917	412288	0	412288	412288	-10925038	0.036366
13	346940	11684267	32451	32451	11716718	242668	654956	0	654956	654956	-11061762	0.055899
14	0	11684267	17245	49696	11733963	0	654956	602653	602653	1257609	-10476353	0.107177
15	0	11684267	16009	65705	11749972	0	654956	358190	1615799	1615799	-10134173	0.137515
16	0	11684267	14835	80540	11764807	0	654956	395936	2011735	2011735	-9753072	0.170996
17	0	11684267	14802	95342	11779608	0	654956	360090	2371825	2371825	-9407783	0.201350
18	0	11684267	20653	115995	11800262	0	654956	354494	2726319	2726319	-9073942	0.231039
19	0	11684267	13685	129680	11813947	0	654956	3076667	3076667	3076667	-8737270	0.260427
20	0	11684267	12681	142361	11828627	0	654956	346247	3422814	3422814	-8403814	0.289416
21	0	11684267	12652	155013	11839280	0	654956	351554	3119411	3119411	-8064912	0.318800
22	0	11684267	11730	166743	11851009	0	654956	356936	4131304	4131304	-7719705	0.348604
23	0	11684267	35779	202522	11886789	0	654956	333495	4464799	4464799	-7421990	0.375610
24	0	11684267	10845	213367	11897633	0	654956	411180	4875979	4875979	-7021654	0.409828
25	0	11684267	10810	224177	11908444	0	654956	317833	4538856	5193812	-6714632	0.436145
26	0	11684267	10026	234203	11918470	0	654956	314323	4853178	5508135	-6410336	0.462151
27	0	11684267	9995	244198	11928465	0	654956	321672	5174851	5829807	-6098658	0.488731
28	0	11684267	16585	260784	11945050	0	654956	302851	5477701	6132658	-5812392	0.513406
29	0	11684267	9241	270024	11954291	0	654956	334754	5812455	6467412	-5486880	0.541012
30	0	11684267	8571	278595	11962862	0	654956	297269	6109724	6764680	-5198182	0.565473
31	0	11684267	8543	287138	11971405	0	654956	304124	6413847	7068804	-4902601	0.590474
32	0	11684267	7924	295062	11979329	0	654956	306771	6720618	7375575	-4603755	0.615692
33	0	11684267	24585	319647	12003914	0	654956	271474	6992092	7647048	-4356866	0.637046
34	0	11684267	7326	326974	12011240	0	654956	300051	7292143	7947100	-4064141	0.661639
35	0	11684267	7306	334280	12018547	0	654956	279160	7571303	8226260	-3792287	0.684464
36	0	11684267	6774	341054	12025320	0	654956	271620	7842923	8497880	-3527441	0.706666
37	0	11684267	6755	347809	12032076	0	654956	265857	8108780	8763736	-3268339	0.728364
38	0	11684267	9426	357235	12041502	0	654956	260218	8368998	9023955	-3017547	0.749404
39	0	11684267	6246	363481	12047747	0	654956	270518	8639516	9294473	-2753275	0.771470
40	0	11684267	5790	369271	12053537	0	654956	259209	8898726	9553682	-2499855	0.792604
41	0	11684267	5774	375045	12059312	0	654956	244447	9143173	9798129	-2261182	0.812495
42	0	11684267	5353	380398	12064665	0	654956	261328	9404501	10059457	-2005207	0.833795
43	0	11684267	7778	388176	12072443	0	654956	265452	9669953	10324909	-1747534	0.855246
44	0	11684267	0	388176	12072443	0	654956	-140482	9529470	10184427	-1888016	0.843609

Unit: Thousand Taka

Shadow Rate: 1.5 for Foreign Exchange Component and 0.5 for Unskilled Labour
Discount Rate: 6 %

Year	Present Values of Costs					Present Values of Benefits					Net Present Value (11)=(10)-(5)	Benefit-Cost Ratio (12)=(11)/(5)
	Construction costs		Maintenance costs		Sub-Total (5)=(2)+(4)	Salvage Values (6)	Benefits		Sub-Total (10)=(7)+(9)			
	(1)	(2)=Σ(1)	(3)	(4)=Σ(3)			(7)=Σ(6)	(8)		(9)=Σ(8)		
1	62632	62632	0	0	62632	0	0	0	0	0	-62632	0.0
2	145424	208056	0	0	208056	0	0	0	0	0	-208056	0.0
3	769085	977141	0	0	977141	0	0	0	0	0	-977141	0.0
4	1082472	2059613	0	0	2059613	0	0	0	0	0	-2059613	0.0
5	1292677	3352290	0	0	3352290	0	0	0	0	0	-3352290	0.0
6	1028877	4381166	0	0	4381166	715	0	0	715	0	-4380451	0.000163
7	1448610	5829776	0	0	5829776	3476	4190	0	4190	0	-5825586	0.000719
8	1015727	6845504	0	0	6845504	1272	5463	0	5463	0	-6840041	0.000798
9	1171492	8016996	0	0	8016996	60311	65774	0	65774	0	-7951222	0.008204
10	835768	8852764	0	0	8852764	28100	93874	0	93874	0	-8758890	0.010604
11	717853	9570617	0	0	9570617	180465	274339	0	274339	0	-9296278	0.028665
12	349765	9920382	0	0	9920382	61996	336335	0	336335	0	-9584047	0.033903
13	270839	10191221	25333	25333	10216555	189439	525774	0	525774	0	-9690781	0.051463
14	0	10191221	13208	38541	10229763	0	525774	461585	987359	0	-9242404	0.096518
15	0	10191221	12031	50572	10241793	0	525774	269169	1256528	0	-8985265	0.122686
16	0	10191221	10937	61509	10252731	0	525774	291920	1548448	0	-8704282	0.151028
17	0	10191221	10707	72216	10263438	0	525774	260482	1808931	0	-8454507	0.176250
18	0	10191221	14658	86875	10278096	0	525774	251596	2060527	0	-8217569	0.200477
19	0	10191221	9529	96404	10287626	0	525774	243962	2304488	0	-7983137	0.224006
20	0	10191221	8663	105068	10296289	0	525774	236488	2540977	0	-7755312	0.246786
21	0	10191221	8481	113549	10304770	0	525774	235651	2776627	0	-7528143	0.269451
22	0	10191221	7714	121263	10312484	0	525774	234744	2485598	0	-7301112	0.292012
23	0	10191221	23087	144350	10335571	0	525774	215189	2700788	0	-7109010	0.312180
24	0	10191221	6866	151215	10342437	0	525774	260310	3486872	0	-6855565	0.337142
25	0	10191221	6715	157930	10349151	0	525774	197417	3158516	0	-6664862	0.355999
26	0	10191221	6110	164040	10355262	0	525774	191553	3350069	0	-6479419	0.374287
27	0	10191221	5976	170016	10361238	0	525774	192334	3542403	0	-6293061	0.392634
28	0	10191221	9729	179746	10370967	0	525774	177663	3720066	0	-6125127	0.409397
29	0	10191221	5319	185065	10376286	0	525774	192674	3912740	0	-5937773	0.427755
30	0	10191221	4840	189905	10381126	0	525774	167870	4080610	0	-5774743	0.443727
31	0	10191221	4733	194638	10385859	0	525774	168501	4249111	0	-5610975	0.459749
32	0	10191221	4308	198946	10390167	0	525774	166761	4415871	0	-5448522	0.475608
33	0	10191221	13112	212058	10403279	0	525774	144789	4560660	0	-5316846	0.488926
34	0	10191221	3834	215891	10407113	0	525774	157011	4717671	0	-5163668	0.503833
35	0	10191221	3751	219643	10410864	0	525774	143323	4860993	0	-5024097	0.517418
36	0	10191221	3412	223055	10414276	0	525774	136820	4997814	0	-4890689	0.530386
37	0	10191221	3339	226393	10417614	0	525774	131391	5129204	0	-4762637	0.542828
38	0	10191221	4571	230964	10422185	0	525774	126177	5255382	0	-4641030	0.554697
39	0	10191221	2971	233935	10425156	0	525774	128697	5384078	0	-4515304	0.566884
40	0	10191221	3703	236638	10427859	0	525774	120990	5505069	0	-4397017	0.578339
41	0	10191221	2644	239282	10430503	0	525774	111947	5617015	0	-4287714	0.588925
42	0	10191221	2405	241687	10432909	0	525774	117419	5734435	0	-4172700	0.600044
43	0	10191221	3429	245116	10436337	0	525774	117022	5851456	0	-4059107	0.611060
44	0	10191221	0	245116	10436337	0	525774	-60762	5790695	0	-4119869	0.605238

Shadow Rates: 1.50 for Foreign Exchange Component and 0.5 for Unskilled Labour
Discount Rate: 12 %

Unit: Thousand Taka

Year	Present Values of Costs				Present Values of Benefits				Net Present Value (11)=(10)-(5)	Benefit-Cost Ratio (12)=(11)/(5)
	Construction costs (1) (2)=Σ(1)	Maintenance costs (3) (4)=Σ(3)	Sub-Total (5)=(2)+(4)	Salvage Values (6) (7)=Σ(6)	Benefits (8) (9)=Σ(8)	Sub-Total (10)=(7)+(9)				
1	59277	0	59277	0	0	0	0	0	-59277	0.0
2	130260	0	189537	0	0	0	0	0	-189537	0.0
3	651986	0	841522	0	0	0	0	0	-841522	0.0
4	868496	0	1710019	0	0	0	0	0	-1710019	0.0
5	981588	0	2691607	0	0	0	0	0	-2691607	0.0
6	739418	0	3431025	514	514	0	0	514	-3430511	0.000150
7	985295	0	4416320	2364	2878	0	0	2878	-4413443	0.000652
8	653853	0	5070173	819	3697	0	0	3697	-5066476	0.000729
9	713723	0	5783896	36744	40441	0	0	40441	-5743456	0.006992
10	481908	0	6265804	16203	56643	0	0	56643	-6209161	0.009040
11	391744	0	6657548	98482	155126	0	0	155126	-6502422	0.023301
12	180647	0	6838195	32020	187146	0	0	187146	-6651049	0.027368
13	132390	12383	6970584	92600	279746	0	0	279746	-6703222	0.040061
14	0	6110	6970584	0	279746	213541	0	213541	-6495791	0.070580
15	0	5267	6970584	0	279746	117854	331395	452363	-6383205	0.087376
16	0	4532	6970584	0	279746	120968	452363	732108	-6266769	0.104604
17	0	4199	6970584	0	279746	102158	554521	834266	-6168811	0.119129
18	0	5441	6970584	0	279746	93387	647907	927653	-6080865	0.132361
19	0	3348	6970584	0	279746	85702	733609	1013355	-5998511	0.144520
20	0	2880	6970584	0	279746	78626	812235	1091981	-5922765	0.155669
21	0	2669	6970584	46830	279746	74150	886386	1166131	-5851283	0.166177
22	0	2297	6970584	49127	279746	69908	956294	1236039	-5783673	0.176081
23	0	6507	6970584	55634	279746	60651	1016945	1296691	-5729528	0.184550
24	0	1831	6970584	57466	279746	69438	1086384	1366129	-5661921	0.194382
25	0	1695	6970584	59161	279746	49840	1136224	1415970	-5613776	0.201425
26	0	1460	6970584	60621	279746	45769	1181993	1461739	-5569467	0.207893
27	0	1351	6970584	61972	279746	43494	1225487	1505233	-5527324	0.214038
28	0	2082	6970584	64055	279746	38024	1263511	1543257	-5491383	0.219380
29	0	1077	6970584	65132	279746	39027	1302538	1582284	-5453433	0.224893
30	0	928	6970584	66060	279746	32182	1334720	1614466	-5422179	0.229437
31	0	859	6970584	66919	279746	30572	1365292	1645038	-5392465	0.233753
32	0	740	6970584	67659	279746	28635	1393928	1673673	-5364570	0.237797
33	0	2131	6970584	69789	279746	23531	1417458	1697204	-5343170	0.241067
34	0	590	6970584	70379	279746	24150	1441608	1721354	-5319610	0.244477
35	0	546	6970584	70925	279746	20864	1462472	1742218	-5299292	0.247421
36	0	470	6970584	71395	279746	18850	1481322	1761068	-5280912	0.250081
37	0	435	6970584	71831	279746	17132	1498454	1778200	-5264215	0.252499
38	0	564	6970584	72395	279746	15571	1514025	1793771	-5249208	0.254689
39	0	347	6970584	72742	279746	15031	1529056	1808802	-5234524	0.256811
40	0	299	6970584	73040	279746	13374	1542431	1822176	-5221449	0.258699
41	0	277	6970584	73317	279746	11712	1554142	1833888	-5210014	0.260351
42	0	238	6970584	73555	279746	11626	1565768	1845514	-5198626	0.261993
43	0	321	6970584	73876	279746	10966	1576734	1856480	-5187981	0.263537
44	0	0	6970584	73876	279746	-5389	1571345	1851091	-5193370	0.262773

Table C-18 Economic Cost and Benefits

Unit: Thousand Tk

Year	Costs			Benefits		
	Construction costs	Maintenance costs	Total	Benefits	Residual values	Total
1st 1977	50,972		50,972			
2nd 1978	122,474		122,474			
3rd 1979	630,318		630,318			
4th 1980	1,000,620		1,000,620			
5th 1981	1,206,994		1,206,994			
6th 1982	1,030,026		1,030,026		676	676
7th 1983	1,505,593		1,505,593		3,484	3,484
8th 1984	1,129,569		1,129,569		1,352	1,352
9th 1985	1,384,812		1,384,812		67,925	67,925
10th 1986	1,046,634		1,046,634		33,553	33,553
11th 1987	989,509		989,509		288,384	288,384
12th 1988	527,841		527,841		83,161	83,161
13th 1989	456,456	36,250	492,706		332,157	332,157
14th 1990		26,573	26,573	856,010		856,010
15th 1991		25,530	25,530	596,170		596,170
16th 1992		24,496	24,496	669,660		669,660
17th 1993		25,530	25,530	649,580		649,580
18th 1994		35,392	35,392	666,120		666,120
19th 1995		25,530	25,530	686,060		686,060
20th 1996		24,496	24,496	705,000		705,000
21st 1997		25,530	25,530	738,660		738,660
22nd 1998		24,496	24,496	776,420		776,420
23rd 1999		69,297	69,297	766,300		766,300
24th 2000		24,496	24,496	926,360		926,360
25th 2001		25,530	25,530	795,180		795,180
26th 2002		24,496	24,496	816,760		816,760
27th 2003		25,530	25,530	859,960		859,960
28th 2004		40,673	40,673	853,240		853,240
29th 2005		25,530	25,530	953,390		953,390
30th 2006		24,496	24,496	905,650		905,650
31st 2007		25,529	25,529	955,020		955,020
32nd 2008		24,496	24,496	993,960		993,960
33rd 2009		70,403	70,403	974,300		974,300
34th 2010		24,496	24,496	1,046,900		1,046,900
35th 2011		25,530	25,530	1,028,220		1,028,220
36th 2012		24,496	24,496	1,042,360		1,042,360
37th 2013		25,530	25,530	1,062,300		1,062,300
38th 2014		35,393	35,393	1,081,240		1,081,240
39th 2015		25,530	25,530	1,151,320		1,151,320
40th 2016		24,496	24,496	1,154,600		1,154,600
41st 2017		25,529	25,529	1,144,480		1,144,480
42nd 2018		24,495	24,495	1,244,630		1,244,630
43rd 2019		38,313	38,313	1,302,350		1,302,350
44th 2020				-526,010		-526,010
Total	11,081,818	928,107	12,009,925	26,876,190	810,692	27,686,882

Shadow rate: 0.5 for unskilled labour.

APPENDIX C
Table C-19

Shadow Rate: 0.5 for Unskilled Labour
Discount Rate: 2%

Unit: Thousand Taka

Year	Present Values of Costs				Present Values of Benefits				Net Present Value (11)=(10)-(5)	Benefit-Cost Ratio (12)=(11)/(5)
	Construction costs (1) (2)=Σ(1)	Maintenance costs (3) (4)=Σ(3)	Sub-Total (5)=(2)+(4)	Salvage Values (6) (7)=Σ(6)	Benefits (8) (9)=Σ(8)	Sub-Total (10)=(7)+(9)				
1	4973	0	4973	0	0	0	0	0	-4973	0.0
2	117718	0	167691	0	0	0	0	0	-167691	0.0
3	593963	0	761653	0	0	0	0	0	-761653	0.0
4	924418	0	1686072	0	0	0	0	0	-1686072	0.0
5	1093212	0	2779283	0	0	0	0	0	-2779283	0.0
6	914634	0	3693917	600	600	0	0	600	-3693317	0.000163
7	1310709	0	5004626	3033	3633	0	0	3633	-5000993	0.000726
8	964076	0	5968703	1154	4787	0	0	4787	-5963915	0.000802
9	1158749	0	7127451	56837	61264	0	0	61624	-7065827	0.008646
10	858604	0	7986056	27525	89149	0	0	89149	-7896907	0.011163
11	795826	0	8781881	231937	321086	0	0	321086	-8460796	0.036562
12	416199	0	9198080	65572	386657	0	0	386657	-8811423	0.042037
13	352655	28022	9578958	256768	643426	0	0	643426	-8935532	0.067171
14	0	20139	9590997	0	643426	648749	0	1292174	-8306923	0.134614
15	0	18969	9618066	0	643426	442963	1091712	1735137	-7882929	0.180404
16	0	17844	9635910	0	643426	487811	1579523	2222948	-7412962	0.230694
17	0	18233	103207	0	643426	463906	2043428	2686854	-6967289	0.278311
18	0	24780	127987	0	643426	466990	2509819	3153244	-6525679	0.325785
19	0	17525	145512	0	643426	470933	2980751	3624177	-6072270	0.373763
20	0	16485	161997	0	643426	474445	3455196	4098622	-3614311	0.421976
21	0	16844	178841	0	643426	487350	3942546	4585972	-5143805	0.471334
22	0	15845	194686	0	643426	502219	4444765	5088190	-4657431	0.522100
23	0	43945	238631	0	643426	485954	4930719	5574144	-4215422	0.569396
24	0	15230	253861	0	643426	575938	5506656	6150082	-3654714	0.627252
25	0	15561	269422	0	643426	484687	5991343	6634769	-3185589	0.675614
26	0	14638	284060	0	643426	488079	6479422	7122848	-2712148	0.724235
27	0	14957	299017	0	643426	503818	6983240	7626666	-2223287	0.774284
28	0	23362	322379	0	643426	490079	7473319	8116745	-1756570	0.822089
29	0	14376	336755	0	643426	536866	8010185	8653611	-1234080	0.875190
30	0	13524	350279	0	643426	499983	8510168	9153594	-747621	0.924492
31	0	13817	364096	0	643426	516901	9027069	9670494	-244537	0.975337
32	0	12998	377095	0	643426	527428	9554497	10197923	269892	1.027185
33	0	36626	413720	0	643426	506859	10061356	10704781	740126	1.074275
34	0	12494	426214	0	643426	533948	10595304	11238730	1261580	1.126447
35	0	12766	438980	0	643426	514138	11109443	11762953	1762953	1.176473
36	0	12009	450988	0	643426	510989	11620432	12263857	2261934	1.226150
37	0	12270	463258	0	643426	510553	12130985	12774410	2760217	1.275630
38	0	16677	479935	0	643426	509466	12640451	13283877	3253006	1.324300
39	0	11794	491728	0	643426	531850	13172301	13815727	3773063	1.375703
40	0	11094	502822	0	643426	522907	13695209	14338634	4284876	1.426196
41	0	11335	514158	0	643426	508161	14203369	14846795	4781702	1.475078
42	0	10663	524820	0	643426	541793	14745162	15388588	5312832	1.527289
43	0	16351	541171	0	643426	555802	15300964	15944390	5852283	1.579887
44	0	0	541171	0	643426	-220083	15080881	15724307	5632200	1.558080

APPENDIX C
Table C-20

Shadow Rate: 0.5 for Unskilled Labour
Discount Rate: 3 %

Unit: Thousand Take

Year	Present Values of Costs				Present Values of Benefits				Net Present Value (11) = (10) - (5)	Benefit-Cost Ratio (12) = (11) / (5)
	Construction costs (1)	Maintenance costs (3)	Sub-Total (5) = (2) + (4)	Salvage Values (6) = (7) - (8)	Benefits (8)	Sub-Total (10) = (7) + (9)				
1	49487	0	49487	0	0	0	0	0	-49487	0.0
2	115443	0	164931	0	0	0	0	0	-164931	0.0
3	57830	0	741761	0	0	0	0	0	-741761	0.0
4	889038	0	1630799	0	0	0	0	0	-1630799	0.0
5	1041164	0	2671963	0	0	0	0	0	-2671963	0.0
6	862631	0	3534593	566	566	0	0	566	-3534027	0.000160
7	1224185	0	4758778	2833	3399	0	0	3399	-4755379	0.000714
8	891692	0	5650470	1067	4466	0	0	4466	-5646004	0.000790
9	1061343	0	6711813	52059	56525	0	0	56525	-6655288	0.008422
10	778794	0	7490607	24967	81492	0	0	81492	-7409116	0.010879
11	714842	0	8205450	208335	289826	0	0	289826	-7915623	0.035321
12	370217	0	8575667	58327	348154	0	0	348154	-8227513	0.040598
13	310824	24684	8911176	226183	574337	0	0	574337	-8336839	0.064451
14	0	17568	8928743	0	574337	565923	565923	1140260	-7788483	0.127707
15	0	16387	8945130	42252	574337	382659	948582	1522919	-7422211	0.170251
16	0	15265	8960395	73904	574337	417310	1365892	1940229	-7020166	0.216534
17	0	15446	8975841	89350	574337	393007	1758899	2333235	-6642606	0.259946
18	0	20789	8996630	110139	574337	391275	2150174	2724511	-6272120	0.302837
19	0	14559	9011190	124699	574337	391250	2541425	3115761	-5895429	0.345766
20	0	13563	9024753	138262	574337	390341	2931766	3506103	-5518650	0.388498
21	0	13724	9038476	151985	574337	397066	3328832	3903169	-5135308	0.431839
22	0	12784	9051261	164769	574337	405208	3734040	4308377	-4742884	0.475997
23	0	35112	9086373	199882	574337	388278	4122318	4696654	-4389718	0.516890
24	0	12050	9098423	211932	574337	455708	4578026	5152362	-3946061	0.566292
25	0	12193	9110617	224125	574337	379782	4957808	5532145	-3578472	0.607220
26	0	11359	9121975	235484	574337	378727	5336535	5910872	-3211103	0.647982
27	0	11493	9133469	246977	574337	387145	5723680	6298016	-2835452	0.689554
28	0	17777	9151246	264755	574337	372931	6096611	6670948	-2480298	0.728966
29	0	10834	9162079	275588	574337	404568	6501179	7075515	-2086564	0.772261
30	0	10092	9172171	285680	574337	373116	6874295	7448631	-1723540	0.812090
31	0	10211	9182383	295891	574337	381996	7256290	7830627	-1351756	0.852788
32	0	9513	9191895	305404	574337	385991	6742282	8216618	-975277	0.893898
33	0	26544	9218439	331948	574337	367337	8009618	8583955	-634484	0.931172
34	0	8967	9227406	340915	574337	383212	8392831	8967167	-260238	0.971797
35	0	9073	9236479	349988	574337	365412	8758243	9332580	96101	1.010405
36	0	8452	9244931	358439	574337	359648	9117891	9692228	447297	1.048383
37	0	8552	9253483	366992	574337	355852	9473744	10048080	794597	1.085870
38	0	11511	9264993	378502	574337	351648	9825391	10399728	1134734	1.122475
39	0	8061	9273055	386563	574337	363533	10188924	10763261	1490206	1.160703
40	0	7509	9280564	394073	574337	353951	10542875	11117212	1836648	1.197903
41	0	7598	9288162	401671	574337	340629	10883504	11457841	2169679	1.233596
42	0	7078	9295240	408749	574337	359647	11243152	11817488	2522248	1.271348
43	0	10748	9305989	419498	574337	365365	11608517	12182853	2876865	1.309141
44	0	0	9305989	419498	574337	-143270	11465246	12039583	2733594	1.293746

APPENDIX C
Table C-21

Unit: Thousand Taka

Shadow Rate: 0.5 for Unskilled Labour
Discount Rate: 4 %

Year	Present Values of Costs				Present Values of Benefits				Net Present Value (11)=(10)-(5)	Benefit-Cost Ratio (12)=(11)/(5)		
	Construction costs		Maintenance costs		Salvage Values		Benefits					
	(1)	(2)=E(1)	(3)	(4)=E(3)	(6)	(7)=E(6)	(8)	(9)=E(8)				
	(1)	(2)=E(1)	(3)	(4)=E(3)	(5)=(2)+(4)	(6)	(7)=E(6)	(8)	(9)=E(8)	(10)=(7)+(9)	(11)=(10)-(5)	(12)=(11)/(5)
1	49012	49012	0	0	49012	0	0	0	0	0	-49012	0.0
2	113234	162246	0	0	162246	0	0	0	0	0	-162246	0.0
3	560350	722596	0	0	722596	0	0	0	0	0	-722596	0.0
4	855334	1577930	0	0	1577930	0	0	0	0	0	-1577930	0.0
5	992061	2569991	0	0	2569991	0	0	0	0	0	-2569991	0.0
6	814045	3384036	0	0	3384036	534	534	0	0	534	-3383502	0.000158
7	1144127	4528163	0	0	4528163	2648	3182	0	0	3182	-4524981	0.000703
8	825365	5353528	0	0	5353528	988	4170	0	0	4170	-5349358	0.000779
9	972951	6326478	0	0	6326478	47723	51893	0	0	51893	-6274585	0.008202
10	707068	7033547	0	0	7033547	22667	74560	0	0	74560	-6958987	0.010601
11	642766	7676313	0	0	7676313	187329	261889	0	0	261889	-7414424	0.034116
12	329688	8006001	0	0	8006001	51942	313831	0	0	313831	-7692170	0.039199
13	274136	8280136	21771	21771	8301907	199485	513316	0	0	513316	-7788591	0.061831
14	0	8280136	15345	37116	8317253	0	513316	494324	494324	1007640	-7309612	0.121151
15	0	8280136	14176	51292	8331428	0	513316	331032	825356	1338672	-6992756	0.160677
16	0	8280136	13079	64371	8344507	0	513316	357537	1182893	1696209	-6648298	0.203273
17	0	8280136	13106	77477	8357613	0	513316	333477	1516370	2029686	-6327927	0.242855
18	0	8280136	12118	94947	8375084	0	513316	328816	1845186	2358502	-6016582	0.281609
19	0	8280136	11180	107065	8387202	0	513316	325633	2170819	2684135	-5703067	0.320027
20	0	8280136	11203	118245	8398381	0	513316	321753	2492572	3005888	-5392493	0.357913
21	0	8280136	10336	129448	8409585	0	513316	324149	2816721	3330037	-5079548	0.395981
22	0	8280136	9556	139784	8419921	0	513316	327615	3144335	3657651	-4762270	0.434404
23	0	8280136	8835	147456	8448036	0	513316	310908	3455243	3968559	-4479477	0.469761
24	0	8280136	8186	157456	8457593	0	513316	361393	3816636	4329952	-4127641	0.511960
25	0	8280136	7553	167900	8467170	0	513316	298285	4114922	4628238	-3838932	0.546610
26	0	8280136	6983	177456	8476005	0	513316	294597	4409518	4922834	-3553171	0.580797
27	0	8280136	6456	187033	8484859	0	513316	298248	4707767	5221083	-3263777	0.615341
28	0	8280136	5969	195869	8498423	0	513316	284536	4992303	5505619	-2992804	0.647840
29	0	8280136	5530	204723	8506609	0	513316	305706	5298009	5811325	-2695284	0.683154
30	0	8280136	5102	218286	8514162	0	513316	279229	5577238	6090554	-2423608	0.715344
31	0	8280136	4717	226473	8521730	0	513316	283125	5860363	6373679	-2148051	0.747933
32	0	8280136	4302	234025	8528713	0	513316	283336	6143699	6657015	-1871698	0.780542
33	0	8280136	3887	241593	8548010	0	513316	267050	6410749	6924065	-1623945	0.810021
34	0	8280136	3472	248576	8554466	0	513316	275913	6686662	7199978	-1354488	0.841663
35	0	8280136	3057	256999	8560935	0	513316	260567	6947229	7460545	-1100391	0.871464
36	0	8280136	2642	266768	8566904	0	513316	253991	7201219	7714535	-852369	0.900504
37	0	8280136	2227	272750	8572886	0	513316	248894	7450113	7963429	-609457	0.928909
38	0	8280136	1812	300723	8580860	0	513316	243588	7693701	8207016	-373843	0.956433
39	0	8280136	1397	306253	8586390	0	513316	249400	7943100	8456416	-129974	0.984863
40	0	8280136	982	311356	8591492	0	513316	240491	8183591	8696907	105414	1.012270
41	0	8280136	567	316469	8596605	0	513316	229214	8412805	8926121	329516	1.038331
42	0	8280136	152	321186	8601322	0	513316	239685	8652489	9165805	564483	1.065627
43	0	8280136	70	328280	8608416	0	513316	241154	8893643	9406959	798543	1.092763
44	0	8280136	0	328280	8608416	0	513316	-93654	8799989	9313305	704888	1.081884

APPENDIX C
Table C-22

Unit: Thousand Taka

Shadow Rate: 0.5 for Unskilled Labour
Discount Rate: 5 %

Year	Present Values of Costs				Present Values of Benefits				Net Present Value (11)-(10)-(5)	Benefit-Cost Ratio (12)-(11)/(5)
	Construction costs (1) (2)=I(1)	Maintenance costs (3) (4)=I(3)	Sub-Total (5)=(2)+(4)	Salvage Values (6) (7)=I(6)	Benefits (8) (9)=I(8)	Sub-Total (10)=(7)+(9)				
1	48545	0	48545	0	0	0	0	0	-48545	0.0
2	111088	0	159632	0	0	0	0	0	-159632	0.0
3	544492	0	704125	0	0	0	0	0	-704125	0.0
4	823213	0	1527337	0	0	0	0	0	-1527337	0.0
5	945711	0	2473049	0	0	0	0	0	-2473049	0.0
6	768621	0	3241670	504	504	0	0	504	-3241165	0.000156
7	1069997	0	4311667	2476	2980	0	0	2980	-4308686	0.000691
8	764537	0	5076203	915	3896	0	0	3896	-5072308	0.000767
9	892862	0	5968866	43785	47681	0	0	47681	-5921185	0.0007988
10	642542	0	6611408	20599	68279	0	0	68279	-6543129	0.010327
11	578545	0	7189954	168612	236891	0	0	236891	-6953062	0.032948
12	293922	0	7483875	46307	283199	0	0	283199	-7200677	0.037841
13	242068	19224	7745168	176150	459348	0	0	459348	-7285819	0.059308
14	0	13421	7725944	32645	459348	432343	0	432343	-6866897	0.114930
15	0	12280	7725944	44926	459348	286768	0	1178460	-6592410	0.151651
16	0	11222	7725944	56148	459348	306779	0	1485239	-6296852	0.190853
17	0	11139	7725944	67286	459348	283410	0	1768648	-6024582	0.226947
18	0	14706	7725944	81992	459348	276787	0	2045435	-5762501	0.261969
19	0	10103	7725944	92095	459348	271497	0	2316932	-5501107	0.296357
20	0	9232	7725944	101328	459348	265707	0	2582639	-5244632	0.329954
21	0	9164	7725944	110492	459348	265136	0	2847776	-4988659	0.363402
22	0	8374	7725944	118865	459348	265419	0	3113195	-4731614	0.396848
23	0	22561	7725944	141427	459348	249485	0	3362680	-4504690	0.427421
24	0	7595	7725944	149022	459348	287235	0	3649914	-4225051	0.463483
25	0	7539	7725944	156561	459348	234819	0	3884733	-3997771	0.492830
26	0	6889	7725944	163450	459348	229706	0	4114439	-3774954	0.521515
27	0	6838	7725944	170289	459348	230339	0	4344778	-3551454	0.550234
28	0	10375	7725944	180664	459348	217656	0	4562434	-3344173	0.577041
29	0	6202	7725944	186866	459348	231623	0	4794057	-3118753	0.605860
30	0	5668	7725944	192534	459348	209547	0	5003604	-2914874	0.631890
31	0	5626	7725944	198160	459348	210448	0	5214052	-2710052	0.657999
32	0	5141	7725944	203301	459348	208599	0	5422650	-2506594	0.683880
33	0	14072	7725944	217372	459348	194736	0	5617386	-2325930	0.707184
34	0	4663	7725944	222035	459348	199282	0	5816669	-2131310	0.731842
35	0	4628	7725944	226664	459348	186406	0	6003075	-1949532	0.754856
36	0	4229	7725944	230893	459348	179971	0	6183046	-1773790	0.777073
37	0	4198	7725944	235091	459348	174680	0	6357726	-1603309	0.798606
38	0	5543	7725944	240634	459348	169328	0	6527054	-1439523	0.819305
39	0	3808	7725944	244441	459348	171717	0	6698771	-1271614	0.840458
40	0	3480	7725944	247921	459348	164006	0	6862777	-1111088	0.860659
41	0	3454	7725944	251375	459348	154827	0	7017604	-959714	0.879695
42	0	3156	7725944	254531	459348	160358	0	7177962	-802512	0.899441
43	0	4701	7725944	259232	459348	159804	0	7337766	-647409	0.918924
44	0	0	7725944	259232	459348	-61470	0	7276296	-708680	0.911226

APPENDIX C
Table C-23

Shadow Rate: 0.5 for Unskilled Labour
Discount Rate: 6 %

Unit: Thousand Taka

Year	Present Values of Costs				Present Values of Benefits				Net Present Value (11)=(10)-(5)	Benefit-Cost Ratio (12)=(11)/(5)
	Construction costs (1) (2)=Σ(1)	Maintenance costs (3) (4)=Σ(3)	Sub-Total (5)=(2)+(4)	Salvage Values (6) (7)=Σ(6)	Benefits (8) (9)=Σ(8)	Sub-Total (10)=(7)+(9)				
1	48087	0	48087	0	0	0	0	0	-48087	0.0
2	109001	0	157088	0	0	0	0	0	-157088	0.0
3	529227	0	686315	0	0	0	0	0	-686315	0.0
4	792585	0	1478900	0	0	0	0	0	-1478900	0.0
5	901936	0	2380836	0	0	0	0	0	-2380836	0.0
6	726128	0	3106964	477	477	0	0	477	-3106487	0.000153
7	1001305	0	4108269	2317	2794	0	0	2794	-4105476	0.000680
8	708706	0	4816975	848	3642	0	0	3642	-4813333	0.000756
9	819668	0	5636643	40205	43847	0	0	43847	-5592796	0.007779
10	584435	0	6221078	18736	62582	0	0	62582	-6158495	0.010060
11	521261	0	6742339	151917	214499	0	0	214499	-6527839	0.031814
12	262321	0	7004660	41328	255828	0	0	255828	-6748832	0.036523
13	214004	16995	7235659	155728	411556	0	0	411556	-6824103	0.056879
14	0	11753	28749	0	411556	378614	0	378614	-6457243	0.109028
15	0	10653	39401	0	411556	248761	627375	1038931	-6219134	0.143142
16	0	9643	49044	0	411556	263609	890984	1302540	-5965168	0.179223
17	0	9481	58525	0	411556	241231	1132215	1543771	-5733418	0.212138
18	0	12399	70925	0	411556	233371	1365586	1771142	-5512446	0.243792
19	0	8438	79363	0	411556	226752	1592338	2003894	-5294133	0.274580
20	0	7638	87000	0	411556	219822	1812160	2223716	-5081948	0.304382
21	0	7510	94510	0	411556	217281	2029441	2440997	-4872177	0.333781
22	0	6798	101308	0	411556	215461	2244901	2656458	-4663515	0.362905
23	0	18142	119450	0	411556	200615	2445517	2857073	-4481041	0.389347
24	0	6050	125500	0	411556	2674308	2674308	3085864	-4258300	0.420179
25	0	5948	131448	0	411556	185276	2859584	3271140	-4078973	0.445046
26	0	5384	136833	0	411556	179532	3039116	3450672	-3904825	0.469128
27	0	5294	142127	0	411556	178328	3217444	3629000	-3731791	0.493018
28	0	7957	150084	0	411556	166919	3384363	3795919	-3572828	0.515138
29	0	4712	154795	0	411556	175955	3560318	3971874	-3401586	0.538672
30	0	4265	159060	0	411556	157683	3718001	4129557	-3248168	0.559733
31	0	4193	163254	0	411556	156867	3874867	4286423	-3095494	0.580665
32	0	3796	167050	0	411556	154021	4028889	4440445	-2945269	0.601221
33	0	10292	177341	0	411556	142429	4171318	4582874	-2813131	0.619642
34	0	3378	180720	0	411556	144380	4315698	4727254	-2672130	0.638871
35	0	3322	184041	0	411556	133777	4449474	4861030	-2541675	0.656656
36	0	3007	187048	0	411556	127940	4577414	4988971	-2416742	0.673665
37	0	2956	190004	0	411556	123007	4700422	5111978	-2296691	0.690000
38	0	3866	193870	0	411556	118113	4818535	5230091	-2162443	0.705574
39	0	2631	196501	0	411556	118650	4937185	5348741	-2066425	0.721325
40	0	2382	198883	0	411556	112253	5049438	5460994	-1956553	0.736226
41	0	2341	201225	0	411556	104971	5154408	5569964	-1853924	0.750141
42	0	2119	203344	0	411556	107695	5262103	5673659	-1748349	0.764437
43	0	3127	206471	0	411556	106310	5368413	5779969	-1645166	0.778433
44	0	0	206471	0	411556	-40508	5327906	5739462	-1685674	0.772977

APPENDIX C
Table C-24

Unit: Thousand Taka

Shadow Rate: 0.5 for Unskilled Labour
Discount Rate: 12 %

Year	Present Values of Costs				Present Values of Benefits				Net Present Value (11) = (10) - (5)	Benefit-Cost Ratio (12) = (11) / (5)
	Construction costs (1) = $\sum(1)$	Maintenance costs (3) = $\sum(3)$	Sub-Total (5) = (2) + (4)	Salvage Values (6) = $\sum(6)$	Benefits (8) = $\sum(8)$	Sub-Total (10) = (7) + (9)				
1	45511	0	45511	0	0	45511	0	0	-45511	0.0
2	97636	0	143146	0	0	143146	0	0	-143146	0.0
3	448648	0	591794	0	0	591794	0	0	-591794	0.0
4	635912	0	1227706	0	0	1227706	0	0	-1227706	0.0
5	684881	0	1912587	0	0	1912587	0	0	-1912587	0.0
6	521843	0	2434430	342	342	2434430	342	0	-2434088	0.000141
7	681054	0	3115484	1576	1918	3115484	1918	0	-3113566	0.000616
8	456214	0	3571698	546	2465	3571698	2465	0	-3569234	0.000650
9	499377	0	4071075	24494	26959	4071075	26959	0	-4044116	0.006622
10	336988	0	4408063	10803	37762	4408063	37762	0	-4370301	0.008567
11	284460	0	4692523	82904	120666	4692523	120666	0	-4571858	0.025714
12	135484	0	4828007	21345	142011	4828007	142011	0	-4685996	0.029414
13	104608	8308	4940923	76122	218133	4940923	218133	0	-4722790	0.044148
14	0	5437	4932615	0	218133	4946360	218133	175157	-4553071	0.079511
15	0	4932615	4932615	4664	218133	4951024	218133	108918	-4448817	0.101435
16	0	4932615	4932615	3996	22405	4955020	218133	393311	-4343577	0.123399
17	0	4932615	4932615	3718	26123	4958738	218133	94608	-4252687	0.142385
18	0	4932615	4932615	4602	30726	4963341	218133	86622	-4170668	0.159706
19	0	4932615	4932615	33690	36229	4966305	218133	79656	-4093976	0.175650
20	0	4932615	4932615	2539	36229	4968844	218133	73085	-4023430	0.190268
21	0	4932615	4932615	2363	38592	4971207	218133	68370	-3957423	0.203931
22	0	4932615	4932615	2024	40617	4973232	218133	64165	-3895282	0.216750
23	0	4932615	4932615	5113	45730	4978345	218133	56544	-3843852	0.227886
24	0	4932615	4932615	1614	47344	4979959	218133	61031	-3784435	0.240067
25	0	4932615	4932615	1502	48846	4981461	218133	66775	-3739162	0.249385
26	0	4932615	4932615	1287	50132	4982747	218133	42897	-3697551	0.257929
27	0	4932615	4932615	1197	51329	4983944	218133	40327	-3658422	0.265959
28	0	4932615	4932615	1703	53032	4985647	218133	35725	-3624400	0.273033
29	0	4932615	4932615	954	53987	4986602	218133	35641	-3589714	0.280128
30	0	4932615	4932615	818	54804	4987419	218133	30229	-3560303	0.286143
31	0	4932615	4932615	761	55565	4988180	218133	28461	-3532602	0.291805
32	0	4932615	4932615	652	56217	4988832	218133	26448	-3506806	0.297069
33	0	4932615	4932615	1673	57890	4990505	218133	23147	-3485332	0.301607
34	0	4932615	4932615	520	58409	4991024	218133	22207	-3463644	0.306025
35	0	4932615	4932615	484	58893	4991508	218133	19474	-3444654	0.309897
36	0	4932615	4932615	414	59307	4991922	218133	17627	-3427441	0.313403
37	0	4932615	4932615	385	59692	4992307	218133	16039	-3411787	0.316591
38	0	4932615	4932615	477	60170	4992785	218133	14576	-3397689	0.319480
39	0	4932615	4932615	307	60477	4993092	218133	13858	-3384138	0.322236
40	0	4932615	4932615	263	60740	4993355	218133	12408	-3371993	0.324704
41	0	4932615	4932615	245	60985	4993600	218133	10982	-3361256	0.326887
42	0	4932615	4932615	210	61195	4993810	218133	10663	-3350803	0.329009
43	0	4932615	4932615	293	61488	4994103	218133	9962	-3341134	0.330984
44	0	4932615	4932615	0	61488	4994403	218133	-3593	-3344727	0.330265

