

As shown on Table 14.8 (2), focusing on the repayability, the debt service coverage ratio (= Profit before interest and depreciation/debt services) could be secured at almost 1.5 in the period of 2004 - 2005 when the debt services is expected to reach the amount above Rs.1,640 million.

Here it should be noted that the repayability be attained only when the cost containment program be properly carried out and the tariff be allowed to increase annually to a reasonable level.

14.4.3 Integrated Repayment Schedule and Balance Sheets Projection

The integrated repayment schedule is shown in Figure 14.1, where the repayment schedule for Case I (Base Case) is incorporated into the current repayment schedule shown on Table 3.12. The integrated balance sheets up to 2010 is presented in Table 14.9.

The debt service in case of with-Project will reach the amount as high as Rs.1,631 million in 2004, being slightly above the 1993 revenue, while the debt service in case of without-Project as high as Rs.786 million in 2001. These figures are significantly higher than that figure in 1993 being Rs.248 million. In light of the future debt burden, the NWSDB is strongly advised to strengthen the financial management structure, focusing on the debt service management.

Table 14.7 Project Cost (Phase I Base Case - 1994 price)

Item	Stage 1		Stage 2		Phase I Total (Rs.'000)
	Foreign Portion (Rs.'000)	Local Portion (Rs.'000)	Foreign Portion (Rs.'000)	Local Portion (Rs.'000)	
100 Direct Cost					
101 General	84,687	181,000	60,094	43,600	369,381
102 Intake	413,938	101,971	87,262	9,530	612,700
103 Raw Water Transmission	641,801	303,855	0	0	945,656
104 Water Treatment Plant	1,293,241	379,410	554,134	98,540	2,325,325
105 Clear Water Transmission 1)	578,767	271,626	0	0	850,393
106 Clear Water Transmission 2)	559,666	264,970	1,404,383	664,901	2,893,920
107 Distribution	114,427	166,089	128,037	338,368	746,921
Sub-Total (101-106)	3,686,526	1,668,921	2,233,909	1,154,939	8,744,295
108 B.T.T.	0	264,695	0	167,577	432,272
Sub-Total (100)	3,686,526	1,933,616	2,233,909	1,322,516	9,176,567
200 Land Acquisition	0	58,685	0	0	58,685
300 General Administration	0	290,042	0	198,377	488,420
400 Engineering Service	449,611	112,403	284,514	71,129	917,657
450 Staff Training Cost	44,961	11,240	28,451	7,113	91,766
Sub-Total (200-450)	494,573	472,371	312,965	276,619	1,556,527
600 Physical Contingency	453,755	318,899	300,386	282,701	1,355,754
GRAND TOTAL (Rs.'000)	4,634,854	2,724,876	2,847,260	1,881,836	12,088,848
US\$ equivalent (US\$'000)	94,589	55,610	58,107	38,405	246,711
Stage Total (Rs.'000)		7,359,730		4,729,096	
Stage Total (US\$'000)		150,199		96,512	

Exchange rate US\$ = Yen 106 = Rs.49.0

Table 14.8 Financial Plan for the NWSDB up to 2010 (1 of 2 sheets)

(Unit: '000 Rs.)

1 Cashflow for THE NWSDB		without the KALU GANGA Project														TOTAL		
		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010		
Forecast Revenues		2,202,903	2,455,590	2,740,388	2,935,285	3,144,198	3,409,867	3,685,929	3,954,505	4,244,107	4,556,407	4,893,213	5,256,476	5,648,304	6,070,973	6,526,940		
Forecast O & M		1,105,806	1,218,977	1,353,406	1,441,771	1,535,015	1,633,330	1,730,438	1,816,960	2,003,198	2,103,358	2,208,526	2,318,952	2,434,900	2,434,900	2,556,645		
Gross profit		1,097,097	1,236,613	1,386,982	1,493,514	1,609,183	1,776,537	1,955,491	2,137,545	2,240,909	2,453,049	2,684,687	2,937,524	3,213,404	3,636,073	3,970,295		
Debt Services		518,492	587,277	695,224	716,940	731,968	785,978	758,492	730,926	703,400	675,874	648,348	620,823	593,297	565,771	538,245		
Interest		447,338	516,123	561,594	568,879	544,003	525,213	497,687	470,161	442,635	415,109	387,583	360,088	352,532	305,006	277,480		
Repayment		71,154	71,154	133,630	158,061	187,965	260,765	260,765	260,765	260,765	260,765	260,765	260,765	260,765	260,765	260,765		
Estimated cash at bank as of 1995.12		578,605	649,336	691,758	776,274	877,215	990,559	1,197,039	1,406,619	1,537,509	1,777,175	2,036,339	2,316,701	2,620,107	3,070,302	3,432,050		
Cash at bank		1,190,177	1,768,782	2,418,118	3,109,876	3,886,450	4,763,665	5,754,224	6,951,263	8,357,882	9,895,391	11,672,566	13,708,905	16,025,606	18,645,713	21,716,015	16,275,736	
2 FINANCING for the Kalu Ganga Project		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010		
1 Capital Expenditures		295,683	153,021	3,207,329	2,578,678	2,081,391	1,194,466	2,471,811	1,988,512	1,450,703	854,142						9,358,548	
2 Capital Grant from Treasury		170,018	87,987	1,844,214	1,482,740	1,196,800	686,818	1,421,291	1,143,394	834,154	491,131						6,917,188	
Capital Grant from External Agency		0	0	0	0	0	0	0	0	0	0						5,061,434	
3 Loan		125,665	65,034	1,363,115	1,095,938	884,591	507,648	1,050,520	845,117	616,549	363,010						14,419,982	
4 Working Capital (Board's own funds)		7,540	18,982	104,671	252,214	371,046	454,580	534,409	572,118	746,070	677,805	548,929	377,577	316,851	78,643	0		
to be required to make up for the cash shortage.																		
5 Mobilized Own Funds (2+4)		177,558	106,969	1,948,885	1,734,954	1,567,845	1,141,398	1,955,700	1,715,512	1,580,224	1,168,936	548,929	377,577	316,851	78,643	0		
3 Cashflow to proceed from KALU GANGA		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010		
Revenues		7,540	18,982	104,671	252,214	371,046	454,580	548,070	661,808	749,508	786,915	787,329	765,962	744,595	706,865	669,135		
O & M cost		7,540	18,982	104,671	252,214	371,046	454,580	534,409	572,118	746,070	677,805	548,929	377,577	316,851	78,643	0		
Gross profit		0	0	0	0	0	0	-5,992	-6,946	-9,713	-10,552	-10,879	-10,667	-12,301	-11,868	178,556		
Debt Services																		
Interest																		
Repayment																		
Working Capital (Board's own funds)																		
Net Cashflow		0	0	0	0	0	0	-5,992	-6,946	-9,713	-10,552	-10,879	-10,667	-12,301	-11,868	178,556		
4 Integrated Cashflow to proceed from NWSDB		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010		
Inclusive of the Kalu Ganga		2,202,903	2,455,590	2,740,388	2,935,285	3,144,198	3,409,867	3,685,929	3,954,505	4,244,107	4,556,407	4,893,213	5,256,476	5,648,304	6,070,973	6,526,940		
Revenues		1,105,806	1,218,977	1,353,406	1,441,771	1,535,015	1,633,330	1,734,032	1,854,179	2,077,394	2,218,156	2,370,277	2,532,086	2,704,151	2,765,345	2,953,842		
O & M cost		1,097,097	1,236,613	1,386,982	1,493,514	1,609,183	1,776,537	1,963,160	2,220,290	2,412,692	2,729,664	3,090,265	3,493,259	3,943,265	4,566,845	5,132,404		
Gross profit		526,032	606,259	799,895	969,154	1,103,014	1,240,558	1,306,522	1,392,734	1,630,965	1,640,846	1,613,734	1,564,842	1,652,310	1,587,054	1,521,798		
Debt Services		454,878	535,105	666,265	813,093	915,049	979,793	1,045,757	1,131,969	1,192,143	1,202,024	1,174,912	1,126,020	1,077,127	1,011,871	946,615		
Interest		71,154	71,154	133,630	156,061	187,965	260,765	260,765	260,765	260,765	260,765	260,765	260,765	260,765	260,765	260,765		
Repayment		571,065	630,354	587,087	524,360	506,169	535,979	656,638	827,555	781,726	1,088,818	1,476,531	1,928,457	2,290,955	2,979,791	3,610,606		
Net Cashflow		571,065	1,201,419	1,788,506	2,312,866	2,819,036	3,355,015	4,011,653	4,839,208	5,620,935	6,709,753	8,186,284	10,114,741	12,405,696	15,385,487	18,996,093		
Accu. Net Cashflow																		

Table 14.8 Financial Plan for the NWSDB up to 2010 (2 of 2 sheets)

DEBT SERVICE PROJECTION		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Operating Profit		1,097,097	1,236,613	1,386,982	1,493,514	1,609,183	1,776,537	1,963,160	2,220,390	2,412,692	2,729,664	3,090,265	3,493,299	3,943,265	4,566,845	5,132,404
Debt Services		526,032	606,259	799,895	969,154	1,103,014	1,240,558	1,396,522	1,592,734	1,630,965	1,640,846	1,613,734	1,564,842	1,652,310	1,587,054	1,521,798
Debt Service Coverage Ratio		2.09	2.04	1.73	1.54	1.46	1.43	1.50	1.59	1.48	1.66	1.91	2.23	2.39	2.88	3.37

Tariff Incremental rate 8%

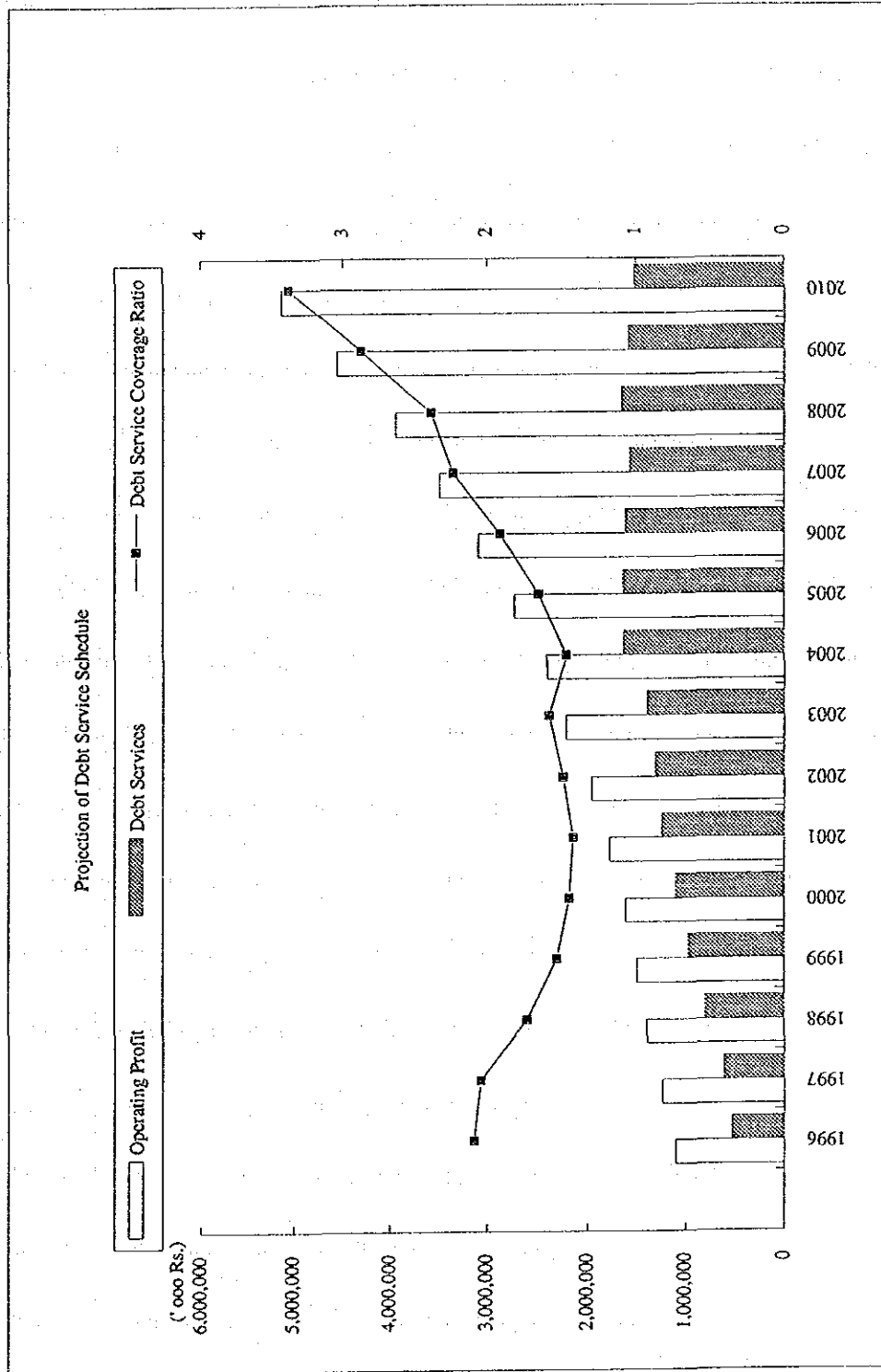
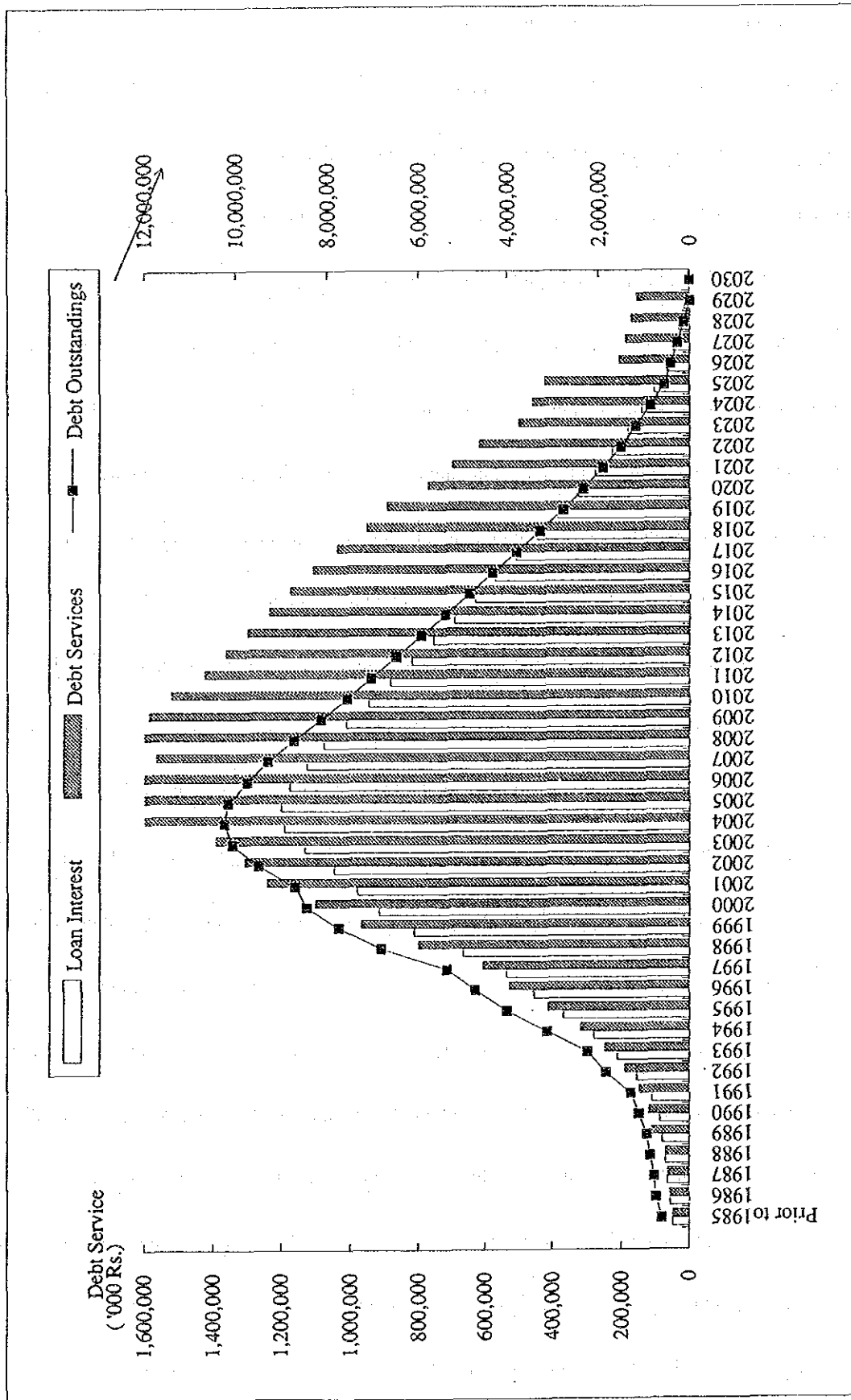


Table 14.9 Integrated Balance Sheets up to 2010

BALANCE SHEET UP TO 2010	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
SHAREHOLDERS' EQUITY	14,453,189	15,974,573	17,547,223	19,107,233	20,431,085	26,271,183	30,656,206	34,163,819	34,839,969	36,256,276	37,594,436	38,223,094	38,708,455	38,708,455	38,708,455	38,708,455	38,708,455	38,708,455
Add. Capital Grant	1,939,791	1,521,383	1,572,630	1,560,010	1,323,852	5,840,098	4,385,023	3,507,613	676,150	1,416,307	1,138,160	828,658	485,261	0	0	0	0	0
LONG-TERM LIABILITIES	3,761,393	4,654,905	5,532,083	6,301,979	6,974,813	9,242,602	10,331,994	12,040,230	12,579,086	13,993,257	15,078,490	15,622,884	15,761,292	15,325,708	14,890,124	14,321,158	13,752,192	13,183,226
Add/Foreign Loan from Treasury	3,309,957	912,830	943,590	841,050	743,988	2,401,419	1,745,453	1,396,201	799,631	1,674,936	1,345,998	979,978	573,992	0	0	0	0	0
Minus Capital Requirement	33,865	39,318	46,412	71,154	71,154	133,680	156,061	187,965	260,765	260,765	260,765	435,584	435,584	435,584	435,584	568,966	568,966	568,966
Debt Outstanding(Net)	2,224,468	3,097,920	3,995,098	4,764,994	5,437,828	7,705,617	9,295,069	10,503,245	11,042,121	12,486,272	13,541,505	14,085,889	14,224,307	13,788,723	13,531,173	12,784,173	12,215,207	11,646,624
Add. Capital Work in Progress	1,308,771	2,434,213	2,516,240	2,401,060	2,067,840	8,241,517	6,130,476	4,903,814	1,042,771	3,091,243	2,484,158	1,808,636	1,099,353	0	0	0	0	0
FIXED ASSETS	14,473,550	16,600,763	18,740,003	20,709,063	22,320,903	30,085,420	35,691,197	40,017,840	40,806,503	43,244,993	45,018,541	46,061,603	46,303,165	45,435,770	44,521,249	43,566,149	42,572,497	41,542,222
Fixed Assets Transferred	0	1,280,757	92,568	2,842,366	1,688,429	1,216,276	4,604,743	736,340	1,809,894	1,809,894	1,809,894	1,809,894	1,809,894	1,809,894	1,726,122	1,726,122	1,726,122	1,726,122
Net Fixed Assets (A)	4,431,560	5,405,317	5,120,885	7,531,251	8,763,680	9,502,956	13,582,999	13,742,169	13,055,061	14,212,202	15,311,486	16,355,806	17,347,909	18,290,408	19,102,010	19,873,031	20,605,502	21,301,349
Depreciation (B)	238,232	307,000	377,000	432,000	456,000	477,000	534,700	577,170	687,108	682,753	710,610	765,574	817,790	867,395	914,520	955,100	993,652	1,030,275
Rate of Depreciation (B/A)	5.2%	5.7%	7.4%	5.7%	5.2%	5.0%	3.9%	4.2%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
BALANCE SHEETS																		
Fixed Assets	4,431,560	5,405,317	5,120,885	7,531,251	8,763,680	9,502,956	13,582,999	13,742,169	13,055,061	14,212,202	15,311,486	16,355,806	17,347,909	18,290,408	19,102,010	19,873,031	20,605,502	21,301,349
Work in Progress	10,041,990	11,195,446	13,619,118	13,177,812	13,557,223	20,582,464	22,108,197	26,275,671	27,751,442	29,032,791	29,707,055	29,705,797	28,955,256	27,145,362	25,419,240	23,693,118	21,966,995	20,240,873
TOTAL FIXED ASSETS	14,473,550	16,600,763	18,740,003	20,709,063	22,320,903	30,085,420	35,691,197	40,017,840	40,806,503	43,244,993	45,018,541	46,061,603	46,303,165	45,435,770	44,521,249	43,566,149	42,572,497	41,542,222
DEFERRED COST	312,681	258,681	197,681	128,681	54,681	0	0	0	0	0	0	0	0	0	0	0	0	0
INVESTMENTS	1,115,543	1,513,543	1,913,543	2,313,543	2,713,543	3,113,543	3,513,543	3,913,543	4,313,543	4,713,543	5,113,543	5,513,543	5,913,543	6,313,543	6,713,543	7,113,543	7,513,543	7,913,543
TOTAL CURRENT ASSETS	2,900,423	2,400,423	2,500,423	2,600,423	2,700,423	2,800,423	2,900,423	3,000,423	3,100,423	3,200,423	3,300,423	3,400,423	3,500,423	3,600,423	3,700,423	3,800,423	3,900,423	4,000,423
TOTAL ASSETS	18,290,197	20,773,410	23,351,650	25,751,710	27,789,550	35,999,387	42,105,163	46,931,807	48,220,469	51,158,959	53,432,507	54,975,569	55,717,132	55,349,736	54,935,216	54,480,115	53,966,464	53,456,189
TOTAL CURRENT LIABILITIES	1,316,090	1,416,090	1,516,090	1,616,090	1,716,090	1,816,090	1,916,090	2,016,090	2,116,090	2,216,090	2,316,090	2,416,090	2,516,090	2,616,090	2,716,090	2,816,090	2,916,090	3,016,090
LONG-TERM LIABILITIES	3,761,393	4,654,905	5,532,083	6,301,979	6,974,813	9,242,602	10,331,994	12,040,230	12,579,086	13,993,257	15,078,490	15,622,884	15,761,292	15,325,708	14,890,124	14,321,158	13,752,192	13,183,226
SHAREHOLDERS' EQUITY	14,453,189	15,974,573	17,547,223	19,107,233	20,431,085	26,271,183	30,656,206	34,163,819	34,839,969	36,256,276	37,594,436	38,223,094	38,708,455	38,708,455	38,708,455	38,708,455	38,708,455	38,708,455
RETAINED EARNINGS	-1,330,475	-1,167,250	-1,029,692	-885,514	-704,461	-514,658	-414,327	-355,639	-236,718	-39,113	429,412	898,451	1,623,529	2,687,121	4,155,124	6,081,018	8,656,451	11,825,330
Adjustment	0	-84,907	-214,053	-388,077	-627,976	-815,830	-884,799	-932,693	-1,077,957	-1,345,776	-1,785,920	-2,184,920	-2,892,224	-3,987,637	-5,534,577	-7,446,605	-10,048,724	-13,276,912
LIABILITIES & SHAREHOLDERS' EQUITY	18,290,197	20,773,410	23,351,650	25,751,710	27,789,550	35,999,387	42,105,163	46,931,807	48,220,469	51,158,959	53,432,507	54,975,569	55,717,132	55,349,736	54,935,216	54,480,115	53,966,464	53,456,189

Figure 14.1 Integrated Repayment Schedule



CHAPTER 15
PROJECT EVALUATION

15. PROJECT EVALUATION

15.1 Financial Evaluation

The Project is planned to meet the water demand for the target year of 2010 in the Greater Colombo, the capital expenditure of which has been estimated at as high as US\$240 million at 1994 price, being equivalent to Rs.11,800 million. As discussed in the previous chapter, the debt service even without this Project will come to peak, around Rs.800 million in 2001, being above half of the revenue generated from the current water organization. In case that this Project be implemented, the debt service would rise up to as large as Rs.1,631 million in 2004, or six times as large as that of 1993.

In light of the this financial situation concerning debt burden and the depressed tariff structure, the reasonable tariff revision, will be indispensable, firstly to satisfactorily accomplish the corporate targets for up to the year 2000.

And secondly the tariff revision will be implemented as well as after 2000 within a reasonable level in due consideration of affordability.

Under such conditions and a strong intention of the Board as an executing agency, the Project will be viable in terms of Financial Internal Rate of Return (FIRR) provided that the tariff rate be allowed to increase within a reasonable level as shown below:

<u>Incremental rate of tariff</u>	<u>FIRR</u>
8 % (Base case)	10.0%
10 %	12.3%
12 %	14.6%

Note: Incremental rate of tariff means actual value including an inflation factor.

The study on the tariff revision is strongly recommended to be carried out by the NWSDB in more comprehensive manner in relation to the following items:

- 1) Debt service management
- 2) Inventory monitoring and fixed assets management
- 3) Cost containment strategy
- 4) Future investment programs

15.1.1 Approach to Financial Analysis

A conventional financial feasibility approach was undertaken involving the preparation of financial internal rate of return, cash flow and debt service projections under a series of stated assumptions and pre-conditions.

A cashflow table for FIRR and ROE calculation was prepared based on the estimated costs and revenue. The figure of ROE is more concern for the corporate entity. Because this figure shows an indication representing how effectively the Board's own funds and government grant are utilized.

15.1.2 Financial Internal Rate of Return (FIRR) and Return on Equity (ROE)

The FIRR and ROE are calculated under the conditions presented in the previous section 15.1.1.

The results of the financial analysis presented in Table 15.1 are as follows:

FIRR	10.0%
ROE	9.6%

Here, it should be noted that these figures are indicative, not decisive, for evaluation of the project.

The financial viability is much dependent on the tariff rate. The current tariff rate is still regarded to be under the proper value measured in terms of the affordability discussed in the previous chapter. Taking into account the current depressed tariff structure, the results of several cases studied with a parameter of incremental rate of tariff are given below.

Incremental rate of tariff	FIRR
8 % (Base case)	10.0 %
10 %	12.3 %
12 %	14.6 %

Note: Incremental rate of tariff means actual value including an inflation factor.

The Project will be viable if the tariff rate is allowed to be increased at 8 - 10 percent per annum, being likely within an expected inflation.

15.1.3 Sensitivity Analysis

Sensitivity analyses are also conducted to examine the impacts of major discrepancy from the assumed conditions.

Table 15.1 Financial Analysis for the Kalu Ganga Project

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2015	2045
1 INCOME STATEMENTS																	
Revenues	0	0	0	0	0	0	11,264	119,944	245,978	391,394	567,259	765,909	999,112	1,261,216	1,539,305	24,632,866	314,537,565
O & M Costs	0	0	0	0	0	0	3,594	37,219	74,196	114,778	161,751	211,134	269,231	330,445	397,197	2,190,944	39,270,250
Gross Profit	0	0	0	0	0	0	7,669	82,745	171,783	276,615	405,578	554,775	729,861	930,772	1,162,109	22,441,942	275,267,315
Depreciation	0	0	0	0	0	0	469,291	469,291	469,291	469,291	469,291	469,291	469,291	469,291	469,291	813,787	813,787
Interest	7,540	18,982	104,671	252,214	371,046	454,580	548,070	661,808	749,508	786,915	787,329	765,962	744,595	706,865	669,135	0	16,275,737
Profit after interest & depreciation	-7,540	-18,982	-104,671	-252,214	-371,046	-454,580	-1,009,692	-1,048,355	-1,047,017	-979,592	-1,195,538	-1,023,974	-828,521	-589,880	-320,813	22,441,942	245,689,313
Accru. Profit	-7,540	-26,532	-121,193	-283,407	-754,452	-1,209,032	-2,218,723	-3,267,080	-4,314,097	-5,293,689	-6,489,226	-7,513,300	-8,341,722	-8,931,662	-9,352,415	245,689,313	
2 CASHFLOW STATEMENTS																	
Plus: Depreciation	0	0	0	0	0	0	469,291	469,291	469,291	469,291	469,291	469,291	469,291	469,291	469,291	813,787	813,787
Minus: Repayment	0	0	0	0	0	0	0	0	178,057	178,057	178,057	178,057	178,057	178,057	178,057	314,418	314,418
Minus: Investment	268,193	132,186	2,638,677	2,020,462	1,402,246	784,031	1,673,019	1,281,813	890,606	499,399	0	0	0	0	0	0	11,590,631
Plus: Debt+Equity	268,193	132,186	2,638,677	2,020,462	1,402,246	784,031	1,673,019	1,281,813	890,606	499,399	0	0	0	0	0	0	11,590,631
Plus: Working Capital	7,540	18,982	104,671	252,214	371,046	454,580	540,401	579,064	755,783	688,357	559,808	388,244	329,152	90,511	0	5,140,352	
Minus: Replacement Cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Cashflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	178,556	22,441,942
Accumulated Net Cashflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	178,556	260,188,214
Mobilized Funds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capital Grant from Government	170,018	87,987	1,844,214	1,482,740	1,196,800	686,818	1,421,292	1,143,394	824,154	491,131	0	0	0	0	0	0	9,358,549
Capital Grant from Foreign Agency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
< Working Capital >	7,540	18,982	104,671	252,214	371,046	454,580	540,401	579,064	755,783	688,357	559,808	388,244	329,152	90,511	0	5,140,352	
Total	177,558	106,969	1,948,885	1,734,954	1,567,846	1,141,398	1,961,693	1,722,458	1,589,937	1,179,488	559,808	388,244	329,152	90,511	0	14,498,901	
3 CASHFLOW PROJECTION for FIRR Calculation																	
Capital Expenditures	295,683	153,021	3,207,329	2,578,678	2,081,391	1,194,466	2,471,812	1,988,512	1,450,703	854,142	0	0	0	0	0	16,275,737	
Revenue before interest & repayment	0	0	0	0	0	0	7,669	82,745	171,783	276,615	405,578	554,775	729,861	930,772	1,162,109	22,441,942	275,267,315
Net Cashflow	-295,683	-153,021	-3,207,329	-2,578,678	-2,081,391	-1,194,466	-2,464,142	-1,905,767	-1,278,920	-577,527	405,578	555,775	729,861	930,772	1,162,109	22,441,942	258,991,578
FIRR = 10.0%																	
4 CASHFLOW PROJECTION for ROE Calculation																	
EQUITY (excl. Capital Grant from Foreign Agency)	-177,558	-106,969	-1,948,885	-1,734,954	-1,567,846	-1,141,398	-1,961,693	-1,722,458	-1,589,937	-1,179,488	-559,808	-388,244	-329,152	-90,511	0	-14,498,901	
CASH GENERATION	0	0	0	0	0	0	0	0	0	0	0	0	0	0	178,556	22,441,942	260,188,214
(At the year of 1996)																	
(Working Capital included)	-177,558	-106,969	-1,948,885	-1,734,954	-1,567,846	-1,141,398	-1,961,693	-1,722,458	-1,589,937	-1,179,489	-559,808	-388,244	-329,152	-90,511	178,556	22,441,942	245,689,313
ROE = 9.6%																	
5 FINANCING																	
EQUITY PORTION	170,018	87,987	1,844,214	1,482,740	1,196,800	686,818	1,421,292	1,143,394	824,154	491,131	0	0	0	0	0	0	9,358,549
LOAN PORTION	125,665	65,034	1,363,115	1,095,938	884,591	507,648	1,050,520	845,118	616,549	363,010	0	0	0	0	0	0	6,917,188
Debt Outstanding(end of year)	125,665	190,699	1,553,814	2,649,752	3,524,343	4,041,992	5,092,512	5,937,629	6,376,121	6,561,074	6,383,017	6,204,960	5,890,543	5,576,125	5,261,707	0	0
Repayment	0	0	0	0	0	0	0	0	178,057	178,057	178,057	178,057	178,057	178,057	178,057	314,418	314,418
WORK IN PROGRESS	295,683	153,021	3,207,329	2,578,678	2,081,391	1,194,466	2,471,812	1,988,512	1,450,703	854,142	0	0	0	0	0	0	6,917,188
Accu. Work in Progress	295,683	153,021	3,360,350	5,939,028	8,020,419	9,214,886	2,471,812	4,460,324	5,911,027	6,765,168	6,765,168	6,765,168	6,765,168	6,765,168	6,765,168	6,765,168	6,765,168
NET FIXED ASSETS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12,006,023
Depreciation	0	0	0	0	0	0	469,291	469,291	469,291	469,291	469,291	469,291	469,291	469,291	469,291	813,787	813,787
ROE (at the year of 1996) =	9.6%																

The conditions for the case study are as follows;

	Capital Grant from External Agency	Re-lending Conditions	
		Repayment Period (years)	Interest
Case I (Base case)	0%	24	12%
Case II	0%	24	10%
Case III	30% *	24	12%

* In Case III, 30 % of the total project cost is assumed to be obtained by external grant.

Case I Base case

Case II More concessional condition applied for repayment (Interest 12% → 10%)

Case III ROE is dependent on the ratio of borrowing to the total fund required, while the figure of FIRR is not changed with the ratio of borrowing. In taking into this matter, the case for which an external grant be provided, say, 30 percent of the total project cost, is examined for the financial arrangement purpose. With provision of the grant portion, the debt burden will be eventually relaxed on the Board.

The figures of FIRR and ROE are presented below for the respective case.

Results of the Case Study

	FIRR	ROE
Case I (Base case)	10.0 %	9.6 %
Case II	10.0 %	9.9 %
Case III	10.0 %	11.5 %

15.2 Socio-Economic Evaluation

The implementation of the Project will bring to the society the following socio-economic benefits other than direct/quantitative benefits such as expansion of the area to be served and steady supply of safe water;

- 1) Increase of employment opportunity
- 2) Increase in consumer's satisfaction
- 3) Mitigation of fire damages
- 4) Increase in income of the business sectors
- 5) Increase in value-added of the land

It should be noted that the Kalu Ganga Water Supply Project was initiated to expand the water supply coverage not only to the southern Greater Colombo area but also to the northern one of which the development has been limited due to the insufficient water supply from the Ambatale Water Treatment Plant. The implementation of the Project will make it possible to supply water in the amount of 82,232 m³/d in 2010 and 140,234 m³/d in 2020, respectively, on

a daily average basis to the northern area for domestic and industrial purposes and to ensure its development in the future including those of the industrial estates.

The above 5) increase in value-added of the land in the area to be served by the Project will come true only when other infrastructures are implemented in cope with this water supply project. Therefore, it should be noted that the water supply project is an integral part of the infrastructure development in the area concerned.

Among several factors which hinders an economic growth in a developing country, the introduction of the fiscal budget allocation to remove such bottleneck in infrastructure, is expected to bring investment inducement effects as a whole more than its direct impact on the national economy, eventually assisting in facilitating the investment activities such as development of industrial estates, etc.

In this respect, the implementation of the Project aiming to augment the capacity of water supply in cope with development of other infrastructures, will be vital to secure an envisaged steady growth of economy. The implication of this Project should be made within the framework of the national economy, addition to the improvement in health of the population and the pursuit of the philosophy of "some for all, rather than more for some" as adopted at the New Delhi Global Consultation.

15.3 Financial Analysis for Alternative Scenario (I)

Alternative scenario is studied for the lower demand case in which the water demand may not increase as projected. This comparison is proposed to prepare an option for lower investment since the Kalu Ganga Project will be a huge project which will require the cost of thousands million rupees. In case such reduction in water demand projection is anticipated, this option will be useful for providing data for necessary financial issues.

Out of the parameters used in the water demand projection, water loss ratio in future is somewhat uncertain, and may be reduced than the assumed values if the maintenance and rehabilitation program work efficiently.

Assumption applied to this lower demand scenario is as follows:

- o Water consumption is same as the projection presented in Chapter 4.
- o Water loss ratio in the existing service area is reduced as shown below.
- o Water loss ratio in the new service area remains as assumed in Chapter 4.

In this option, the water loss ratio in the existing service area is assumed to further reduce in future by 5 percent in 2010. The figures are set as shown in Table 15.2 below.

Table 15.2 Water Loss Ratio for Lower Demand Scenario

	1995	2000	2005	2010	2020
Reduced Figures					
Colombo M.C.	40%	35%	32.5%	30 %	30 %
Other Area	30 %	25%	22.5%	20%	20%
Original Figures					
Colombo M.C.	40%	35%	35%	35%	30%
Other Area	30 %	25%	25%	25%	20%

The water demand is projected using these figures with other parameters remained as assumed in Chapter 4. The result of the water demand projection is as shown in Table 15.3 below.

Table 15.3 Summary of Lower Water Demand Projection

	1995	2000	2005	2010	2020
Water Demand including Water Loss					
Existing Area	415,927	442,530	466,857	496,275	566,436
New Area	13,945	41,712	100,702	152,769	842,448
(1) Total Demand (daily average)	429,872	484,242	567,558	649,044	842,448
(2) Total Demand (daily maximum)	494,352	556,879	652,692	746,401	968,815
(3) Required Capacity for Kalu Ganga Project (m ³ /d)	0	0	47,400 (10.4 mgd)	141,000 (31 mgd)	364,000 (80 mgd)

Note: (2) = (1) x Peak Factor (1.15)

(3) = (2) - 605,300 m³/d (Existing Production Capacity)

The cost estimated for the alternative scenario is shown on Table 15.4.

The results of the financial analysis are as follows;

FIRR 10.1 %

ROE 9.7 %

15.4 Financial Analysis for Alternative Scenario (II)

Under the ADB Loan Covenant¹, the Government of Sri Lanka is required to phase out grant financing and increase loan financing of NWSDB projects from 1994. If this new policy be applied for the Kalu Ganga Project, the conditions for financing the Project are assumed as follows:

1)	15% of the Project Cost	Government grant
2)	85% of the Project Cost	External loan
	20% of the external loan	Government grant
	80% of the external loan	Relending to the NWSDB
3)	Debt burden of the NWSDB	68% of the project cost
4)	Conditions of relending to the NWSDB	
	Interest	12%
	Repayment period	24 years
	(including a grace period of 2 years)	

Here, the loan agreement for this project is assumed to be signed in 1996.

Financial analysis on the basis of the conditions above shows that ROE be calculated at 9.2 percent while FIRR is 10.0 percent as same as the base case. As shown in Table 15.5, focusing on the repayability, the debt service coverage ratio could be marginally secured at 1.1, the lowest level in the year when the debt service reaches the amount above Rs.2,200 million. The loan repayability for implementation of the Kalu Ganga might be ensured even in case that the phase-out of the grant financing envisaged come into effect. However, it should be noted that this would be attained only when the cost containment program be executed in a proper manner and the tariff be allowed to increase annually to a reasonable level.

¹ Phase out of Grant financing

The Borrower shall phase out grant financing of capital works, including rehabilitation programs, in the Greater Colombo Region of the NWSDB over a five-year period ending in 1998. For this purpose, funds for capital works approved between 1994 and 1998 shall be provided by the Borrower to the NWSDB in the following mix of loan and grant financing:

Year	Mix (%)	
	Loan	Grant
1994	60	40
1995	70	30
1996	80	20
1997	90	10
1998	100	0

15.5 Financial Recommendations

To ensure the financial viability of the NWSDB, the corporate targets up to the year 2000 should be accomplished. To accomplish the corporate targets, it is advised that the NWSDB establish the financial management unit which is to be exclusively in charge of debt service management represented by the revenue projection, the debt service projection, the disbursement projection for the capital investment, etc.

The study on the tariff revision is strongly recommended to be carried out in more comprehensive manner in relation to the following items;

- 1) Debt service management
- 2) Inventory monitoring and fixed assets management
- 3) Cost containment strategy
- 4) Future investment programs

The model applied for this Study may be useful for this purpose, if modified and/or corrected regularly with latest data available.

15.6 Technical Evaluation

In the course of planning the Kalu Ganga Water Supply System, a variety of comparative studies with possible alternatives as to the location of facilities, structure of the system, construction method, material, process and so on were made. The outcome of the Study is aiming at energy- and cost-saving, easy operation and maintenance of the system and minimization of the impact on the surrounding environment during and after the construction based on the appropriate technology in due consideration of the current practice in Sri Lanka. The Project is therefore considered feasible from the technical point of view.

15.7 Institutional Evaluation

The NWSDB has prepared the Institutional Strengthening Plan. Although due consideration be given to the RSC (GC) which is obviously the most appropriate agency that will be in charge of the Kalu Ganga Water Supply Project during and after its implementation, and which is increasing its presence due to its largeness in scale and monetary contribution within the NWSDB, the NWSDB has the capability enough to cope with implementation of the Project with some addition to the existing organization. The Project is considered institutionally sound.

Table 15.4 Project Cost for Lower Demand Scenario (1994 Price)

Item	Stage 1 (Rs.'000)	Stage 2 (Rs.'000)	Total (Rs.'000)
100 Direct Cost			
101 General	200,000	50,000	250,000
102 Intake	420,000	76,000	496,000
103 Raw Water Transmission	688,800	0	688,800
104 Water Treatment Plant	1,322,000	504,000	1,826,000
105 Clear Water Transmission 1)	556,000	1,100,000	556,000
106 Clear Water Transmission 2)	1,496,300	424,266	2,596,300
107 Distribution	278,600	2,154,266	702,866
Sub-Total (101-107)	5,209,700	2,261,966	7,115,966
108 B.T.T.	248,000	107,700	355,700
Sub-Total (100)	5,209,700	2,261,966	7,471,666
200 Land Acquisition	58,685	0	58,685
300 General Administration	265,695	115,360	381,055
400 Engineering Service	520,970	226,197	747,167
450 Staff Training Cost	52,097	22,260	74,717
Sub-Total (200-450)	897,447	364,176	1,261,623
600 Physical Contingency	610,715	262,614	873,329
GRAND TOTAL (Rs.'000)	6,717,862	2,888,756	9,606,618
US\$ equivalent (US\$'000)	137,099	58,954	196,053

Exchange Rate US\$ = Yen 106 = Rs.49.0

Table 15.5 Financial Plan for NWSDB up to 2010 (1 of 2 sheets)

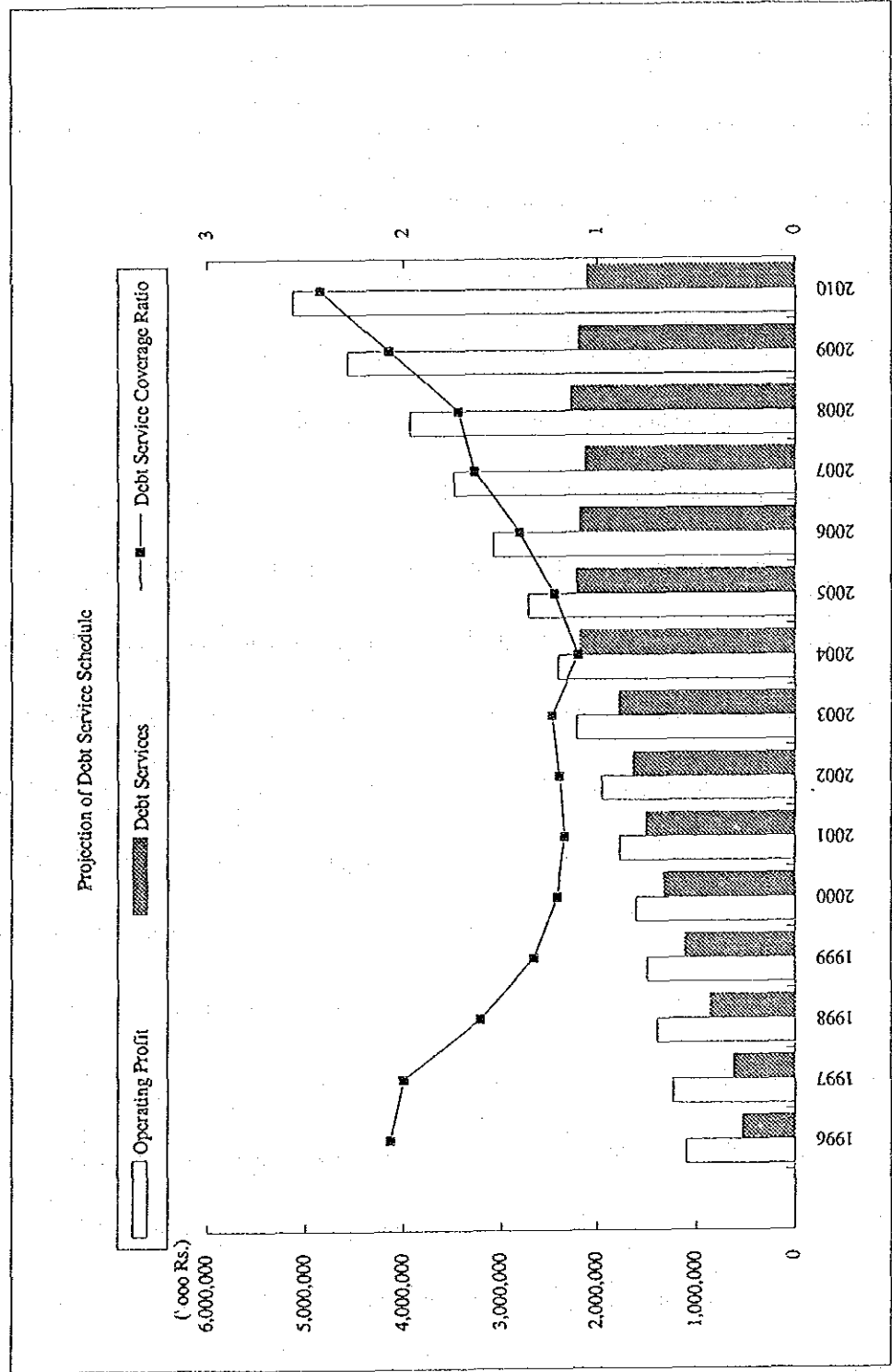
(Unit: '000 Rs.)

1 Cashflow for THE NWSDB		without the KALU GANGA Project													TOTAL		
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010		
Forecast Revenues	2,202,903	2,455,590	2,740,388	2,935,285	3,144,198	3,409,867	3,685,929	3,954,505	4,244,107	4,556,407	4,893,213	5,256,476	5,648,304	6,070,973	6,526,940		
Forecast O & M	1,105,806	1,218,977	1,353,406	1,441,771	1,535,015	1,633,330	1,730,438	1,816,960	2,003,198	2,103,358	2,208,526	2,318,952	2,434,900	2,434,900	2,536,645		
Gross profit	1,097,097	1,236,613	1,386,982	1,493,514	1,609,183	1,776,537	1,955,491	2,137,545	2,240,909	2,453,049	2,684,687	2,937,524	3,213,404	3,636,073	3,970,295		
Debt Services	518,492	587,277	695,224	716,940	731,968	785,978	758,452	730,926	703,400	675,874	648,348	620,823	593,297	565,771	538,245		
Interest	447,338	516,123	561,594	560,879	544,003	525,213	497,687	470,161	442,635	415,109	387,583	360,058	332,532	305,006	277,480		
Repayment	71,154	71,154	133,630	156,061	187,965	260,765	260,765	260,765	260,765	260,765	260,765	260,765	260,765	260,765	260,765		
Estimated cash at bank as of 1995.12																	
Net Cashflow	578,605	649,336	691,758	776,574	877,215	990,559	1,197,039	1,406,619	1,537,509	1,777,175	2,036,339	2,316,701	2,620,107	3,070,302	3,432,050		
Cash at bank	1,190,177	1,768,782	2,418,118	3,109,876	3,886,450	4,763,665	5,754,224	6,951,263	8,357,882	9,895,391	11,672,566	13,708,905	16,025,606	18,645,713	21,716,015	25,148,065	
2 FINANCING for the Kalu Ganga Project																	
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010		
1 Capital Expenditures	295,683	153,021	3,207,329	2,578,678	2,081,391	1,194,466	2,471,812	1,988,512	1,450,703	854,142							
2 Capital Grant from Treasury	94,619	48,967	1,026,345	825,177	666,045	382,229	790,980	636,324	464,225	273,325							
Capital Grant from External Agency	0	0	0	0	0	0	0	0	0	0							
3 Loan	201,064	104,055	2,180,984	1,753,501	1,415,346	812,237	1,680,832	1,352,188	986,478	580,816							
4 Working Capital (Board's own funds)	12,064	30,371	167,473	403,542	593,673	727,328	869,243	976,149	1,312,322	1,267,340	1,139,039	954,655	964,560	703,281	411,576		
to be required to make up for the cash shortage.																	
5 Mobilized Own Funds (2 + 4)	106,682	79,338	1,193,819	1,228,719	1,259,718	1,109,557	1,660,223	1,612,473	1,776,547	1,540,665	1,139,039	954,655	964,560	703,281	411,576		
3 Cashflow to proceed from KALU GANGA																	
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010		
Revenues	12,064	30,371	167,473	403,542	593,673	727,328	876,912	1,058,894	1,199,213	1,259,064	1,259,726	1,225,539	1,191,352	1,130,984	1,070,616		
O & M cost							11,264	119,964	245,978	391,594	567,329	768,909	999,112	1,261,216	1,559,305		
Gross profit							3,594	37,219	74,196	114,778	161,751	213,134	269,251	330,445	397,197		
Debt Services							7,669	82,745	171,783	276,615	405,578	555,775	729,861	930,772	1,162,109		
Interest																	
Repayment																	
Working Capital (Board's own funds)	12,064	30,371	167,473	403,542	593,673	727,328	869,243	976,149	1,312,322	1,267,340	1,139,039	954,655	964,560	703,281	411,576		
Net Cashflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
4 Integrated Cashflow to proceed from NWSDB																	
inclusive of the Kalu Ganga																	
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010		
Revenues	2,202,903	2,455,590	2,740,388	2,935,285	3,144,198	3,409,867	3,691,193	4,074,469	4,490,085	4,947,801	5,460,542	6,025,385	6,647,416	7,332,189	8,086,245		
O & M cost	1,105,806	1,218,977	1,353,406	1,441,771	1,535,015	1,633,330	1,734,032	1,854,179	2,077,394	2,218,136	2,370,277	2,532,086	2,704,151	2,765,345	2,953,842		
Gross profit	1,097,097	1,236,613	1,386,982	1,493,514	1,609,183	1,776,537	1,955,160	2,220,290	2,412,692	2,729,664	3,090,265	3,493,299	3,943,265	4,566,845	5,132,404		
Debt Services	530,256	617,648	862,697	1,120,482	1,325,641	1,513,306	1,635,364	1,789,320	2,187,505	2,219,829	2,192,965	2,131,253	2,287,718	2,199,823	2,111,929		
Interest	459,402	546,494	729,067	964,421	1,137,676	1,252,541	1,374,599	1,529,055	1,641,848	1,674,173	1,647,309	1,585,597	1,523,884	1,435,990	1,348,096		
Repayment	71,154	71,154	133,630	156,061	187,965	260,765	260,765	260,765	260,765	260,765	260,765	260,765	260,765	260,765	260,765		
Net Cashflow	566,541	618,965	524,285	373,032	283,542	263,231	327,796	430,470	225,187	509,835	897,500	1,362,046	1,655,547	2,567,021	3,020,474		
Accu. Net Cashflow	566,541	1,185,506	1,709,791	2,082,822	2,366,364	2,629,595	2,957,391	3,387,861	3,613,049	4,122,883	5,020,183	6,382,229	8,037,776	10,404,797	13,425,271		

Table 15.5 Financial Plan for NWSDB up to 2010 (2 of 2 sheets)

DEBT SERVICE PROJECTION	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Operating Profit	1,097,097	1,236,613	1,386,982	1,493,514	1,609,183	1,776,537	1,963,160	2,220,290	2,412,692	2,729,664	3,090,265	3,493,299	3,943,265	4,566,845	5,132,404
Debt Services	530,556	617,648	862,697	1,120,482	1,325,641	1,513,306	1,635,364	1,789,820	2,187,505	2,219,829	2,192,965	2,131,253	2,287,718	2,199,823	2,111,929
Debt Service Coverage Ratio	2.07	2.00	1.61	1.33	1.21	1.17	1.20	1.24	1.10	1.23	1.41	1.64	1.72	2.08	2.43

Tariff Incremental rate: 8%



CHAPTER 16
ENVIRONMENTAL PROTECTION CONSIDERATION

16. ENVIRONMENTAL PROTECTION CONSIDERATIONS

16.1 Legislation Related to Environmental Protection

Sri Lanka has many laws relating to environmental protection, the earliest dating from 1861. The most significant legislative document is undoubtedly the National Environmental Act No.47 of 1980.

16.2 Environmental Requirements in the Implementation of the Project

There are two legal requirements with respect to the project according to Sri Lankan environmental legislation:

- Consent must be obtained to construct the intake and treatment works.
- An environmental discharge license must be obtained to cover discharges from the treatment works.

Consent is required under the National Environmental (Procedure for Approval of Projects) Regulations No.1 of 1993. The need for a discharge license is contained in the National Environmental (Protection and Quality) Regulation No.1 of 1990.

16.3 Environmental Impact Assessment

- 1) The adverse effects on the environment during the construction phase will be relatively minor and of short duration. As such they should be considered to be acceptable.
- 2) The two adverse effects identified under the operation phase will only occur infrequently. Effects caused by reducing the flow in the Kalu Ganga during exceptional drought periods can be controlled by lowering the abstraction rate to the intake station. Water pollution events should be of short duration and have no lasting effects.

In general it may be concluded that the results of the Environmental Impact Assessment show that the project will not cause significant or lasting harm to the environment provided practical countermeasures are taken. Consequently environmental considerations should not rule against the implementation of the project.

CHAPTER 17

CONCLUSION AND RECOMMENDATION

17. CONCLUSION AND RECOMMENDATIONS

17.1 Conclusion

The financial viability of the Kalu Ganga Water Supply Project is much dependent on the tariff rate. The current tariff rate is regarded to be under the proper level in terms of the affordability and in comparison with other public utility charges. The results of the case study with a parameter of incremental rate of tariff, taking into account the current depressed tariff structure, indicates that the Project will be viable if the tariff rate is allowed to be increased at 8 - 10 percent per annum.

Further, the implementation of the Project will provide the Greater Colombo Water Supply System with two major water sources which will ensure more reliability for water supply in emergency or severe drought cases.

17.2 Recommendations

Recommendations towards the implementation of the Project are summarized in accordance with their importance and priorities as follows:

1) Taking necessary measures for ensuring the feasibility and financial viability of the Project

For the debt service management along with the implementation of the proposed projects and for clearing up the accumulated deficit by the year 2000, the routine efforts in the water supply management such as reduction in NRW, and implementation of the cost containment strategy will not be sufficient. The present depressed water tariff system will therefore need to be reviewed to set up a higher level of tariff structure at reasonable level considering the affordability of the consumers in the Greater Colombo Area. The viability of the proposed Kalu Ganga Project will then be assured with such measures to be taken.

In this connection, it is strongly recommended to establish in the NWSDB a financial management unit which will be fully in charge of debt service management, current and fixed assets management, cost containment strategy, future investment programming, etc.

2) Improvement of Non-Revenue Water (NRW)

Reduction in the amount of non-revenue water (unaccounted-for water) is a major subject to tackle in the management of the Greater Colombo Water Supply System. It will, if successfully implemented, result in increase in the revenue and reduction in the operation cost.

Most efficient and economical measures for reduction in NRW may be recommended as follows:

1. Provision of water meters to every consumer, repairing the defective water meters, and calibration of reading error.
2. Conducting efficient meter reading and billing collection
3. Controlling the illegal connection
4. Provision or repair of the bulk flow meters to monitor the amount of supply.

Reduction in the physical water loss will need more operational efforts and actual cost compared with the measures above but will much contribute to the system life. It will give an allowance in the production and transmission capacity of the existing and newly constructed facilities. The more allowance the water supply system will be given, the longer the expansion in future will be deferred. An alternative scenario for the case of smaller water loss in 5 percent is presented in Section 15.3 in Chapter 15. It shows a considerable reduction in project size and therefore the project cost.

3) Protection of Water Source

It is necessary for the government to establish a policy for protection of the water source in terms of quality and quantity of the raw water. For water quality, in particular, the following possible sources of contamination must be paid attention:

1. Discharge of a large amount of domestic sewage from large cities or communities upstream of the intake.
2. Toxic or harmful wastewater discharge from industries in the catchment area at upstream.

For quantity of the raw water, a comprehensive water utilization plan for the Kalu Ganga, including water supply, irrigation, power generation, flood control, industry etc., must be established as well as an organizational arrangement of controlling the water right.

4) Role of the Greater Colombo Regional Support Center

The Greater Colombo Regional Support Center of the NWSDB is considered as the obvious and most appropriate agency that will be in charge of the Project during and after its implementation. However, the RSC (GC) which is now the largest RSC in terms of the number of service connections and share of revenues in the NWSDB still remains one of the weakest centers in terms of organizational and managerial capability because it has not received due attention in the earlier institutional development activities. After implementation of the Project, water supply capacity in the Greater Colombo Area will be doubled and the RSC (GC) should be geared to fully meet the increased roles, functions and activities it will be charged with. The involvement of the RSC (GC), therefore, from the initial stage of the planning and design of the Project is quite significant to reflect the real needs and problems experienced by the RSC (GC).

5) Conduct of detailed analysis on salinity intrusion

The salinity intrusion analysis conducted in this study is based on the presently available data and information. If a study on the salinity barrier is to be conducted in future, it is recommended that the analysis be conducted by one-dimensional, two-layer, unsteady flow hydraulic model analysis based on the detailed river bed profiles and cross sections and the actual hourly changes in salinity.

6) Establishment of salinity intrusion monitoring system

The salinity intrusion analysis in this report shows that the salinity wedge might reach the proposed intake point under some circumstances. However, such a situation will be foreseeable to some extent by checking the water level of the Kalu Ganga if the saline water monitoring will be added to the water quality monitoring program. The key location to identify the salinity wedge is the area with shallow river bed immediately downstream of Narthupana bridge which act as a natural barrier for the salinity intrusion. When the salinity wedge goes upstream over this point, there will be a possibility that it will reach the intake point. Although the proposed structure of the intake mouth is carefully designed to enable the intake from the surface layer which will be free from saline water, it is recommended to monitor salinity at different depths at Narthupana bridge so that it will be possible to foresee the level of the saline water.

7) Timely Review of the Feasibility Study Prior to the Implementation

This Feasibility Study is prepared on the basis of the presently available data and information and most reasonable projection made from such information. In future, there may be more development or changes in socio-economic or natural conditions in the project area which are now unforeseeable but might affect, if they occur, the recommendations presented in the study. It is therefore recommended that the Feasibility Study be timely reviewed in future to take into account the situation at the time of the implementation of the Project.

8) Establishment of water quality monitoring system for the Kalu Ganga

There is unlikely any serious pollutant sources which discharge the hazardous or toxic wastewater for health upstream of the proposed intake point. However, the future development in the upper reach of the Kalu Gang is unforeseeable; or there will be a possibility that some factory might discharges wastewater into the river. Those who are concerned with water supply operation should therefore be required to carefully monitor the water quality of the source. It is recommended to establish the water quality monitoring system strategically connecting some points allotted in the river stretch downstream of the confluence of major tributaries, factory-concentrated area , problematic factory-located area, etc.

The purpose of the water quality monitoring is to predict the abnormality in the raw water quality before it will reach the intake point, and to identify the discharging source. For this purpose, the testing system should be highly upgraded including both the instrument and staff. In addition, it is necessary to collect the information on the location of existing and new factories and the movement of projects developed in the upper reach of the Kalu Ganga in cooperation with the agencies concerned such as the Central Environmental Authority.

9) Kalutara Water Supply System in Future

The existing Kalutara intake station has experienced the saline water during the 1991 drought. By a large intake from the Kalu Ganga for Greater Colombo upstream of the Kalutara intake station, it will be expected to be placed on the severer situation as for the salinity intrusion as described in Chapter 6 which also suggests that there is few proper place even though moving the Kalutara intake station upstream. One solution will be the integration of the Kalutara Water Supply System which presently covers a part of Panadura P.S. across the Kalu Ganga to the Kalu Ganga Water Supply System.

10) Provision of Sewerage Services

The expansion of the water supply capacity will bring the increase in the sewage to be discharged in the service area. At present, a sewer system is provided in C.M.C. and only the northern coastal part of Dehiwala but not in service. According to the "Wastewater and Sanitation Master Plan for Greater Colombo" prepared in 1993, Dehiwala-Mt.Lavinia M.C. and a northern part of Moratuwa U.C. will be covered by a sewer system by 2000 and only the remainder of Moratuwa U.C. and Panadura U.C. will be added to them at last in the high development scenario by 2020. Other remaining areas are expected to be served by the on-site facilities which mainly treat excreta and do not treat other wastewater. The pollutant load to be discharged into watercourses will accordingly increase in the unserved area steadily. In addition, although the maintenance of those facilities is left to the responsibility of owners, their neglect of proper maintenance of those facilities will lead to the pollution of the surface water and groundwater. The high priority should be given to the provision of a sewer system within the service area by water supply.

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