The number of connection for the domestic sector and its consumption pattern by area are shown in Table 14.5, indicating that 27 percent of the domestic consumers use not more than 10 m^3 per month and 55 percent not more than 20 m^3 per month.

As recognized in most of the developing countries, it is quite difficult to get the exact figures of the quantity of water produced. The main reason is that reliable records of flow measurement are not available at water treatment plants to monitor the quantity of water produced. According to the data on production cost shown in the regional performance of KEY MANAGEMENT INFORMATION, the production cost in terms of Rupee per m^3 is reported in a wide range, say, Rs.2 to 20/m^3. This appears to be due to inadequate metering, a lack of reliable data on flow measurement at each plant, and so on.

In light of the above-mentioned operation, the first priority is advised to be placed on more reliable measurement of water produced. Based on reliable data about unit production cost, collected from each water treatment plant, RSCs first monitor the activities of operation and maintenance and make a monthly report with comments and opinions to the Head Office. The top management of the NWSDB could monitor the operation activities, as a part of the cost containment programs, based on the sequential records of water production and operation and maintenance costs.

Cost containment measures had better be taken, first focusing on reliable measurement of water production which is expected to bring favorable effects to the operation as a whole.

Through implementation of the adequate metering of water production, the following favorable direct/in direct impact could be expected:

- Reduction in operation and maintenance cost
- Awareness of the inventory control (monitoring of the adequate level of stocks), resulting in the effective management of inventory control.
- Mitigation of futile water consumption by continuous activities with a mixture of public awareness campaigns, health education programs, etc.

The unit production cost is calculated by the total operating cost plus administrative overheads divided by the water produced. Based on the past performance for these three years, the unit production cost is assumed at Rs.3.6/m^3 for 1993 as shown in Table 14.6, where the cost allocation is depicted as well.

14.1.2 Present Financial Situation related to Debt Service

The loan repayment schedule is forecasted, taking into account the past disbursed amount and the disbursement schedule for the on-going projects and the loan committed projects listed in Table 3.12 in Chapter 3. As discussed in the previous chapter, the NWSDB's responsibility for the debt service is

principally assumed to be for 50 percent of the external loan amount, payable at previously established terms for re-lending to the NWSDB through the Treasury.

The debt to debt plus equity or total assets ratio for the NWSDB has been marginally declining to about 20 percent as of 31 December 1993, a very low figure even in taking into consideration the effect due to the Board's debt service responsibilities for only 50 percent of external loan proceeds.

In addition, the debt service coverage ratio indicated for these years is rather strong, averaging about 3 or 4 to 1, in spite of a low level of total asset turnover (revenue divided by total assets). This is notably attributable to the strong financial support of the Government in a form of capital grant. However, the implication of long-term liabilities' management is cause for concern.

The outstanding of the long-term liabilities represented by "Foreign Loan through Treasury" is Rs.3,564 million in the balance sheet as of 31 December 1993. On the other hand, the debt outstanding as of 31 December 1993 is estimated at Rs.2,240 million according to "Repayment Schedule" in Table 14.7. The difference of Rs.1,324 million is said to be transferred from "A/C of Long-term Liabilities" to "Capital Grants-Central Government", the journal entry of which is considered to be as follows:

Cash	1,324	
Capital Grants - Central Government		1,324
Long-term Liabilities	1,324	
Cash		1,324

The timing of this transfer is said to be discussed among the authorities concerned. Unless this kind of transfer to mitigate the debt burden of the NWSDB be applied, the profit after depreciation and interest for 1993 would have gone into the red. Even so the debt service coverage ratio could be secured to be more than 1.2.

In addition, no interest is said to be imposed on the major current liabilities consisting of "Loan Interest Payable" and "Loan Capital Payable", the amount of which is Rs.579 million and Rs.512 million, respectively. These could be regarded as subsidies from the government.

The financial management of the NWSDB is reported to have improved in several aspects such as billing and collection and general ledger functions, resulting in a high level of financial consciousness among the NWSDB managers. However, the financial management is recommended to be further strengthened, first of all, focusing on the debt service management.

It is advised that the NWSDB make further efforts in cost reduction and in inventory and fixed assets management in pursuit of sound financial management, in order to become a self-sustainable and financially independent utility entity less free of the government support/participation.

14.1.3 Loan Repayment Schedule

The projection of the loan repayment schedule is schematically presented in Figure 14.2 while the details are tabulated in Table 14.7. The calculation consists of the following data for the projects assisted by the foreign financing agencies;

- Disbursed and disbursement schedule by year
  (The projects proposed for outside the Greater Colombo area shown on Table 14.8 are included.)
- Debt outstanding
- Debt service projection (interest and repayment)

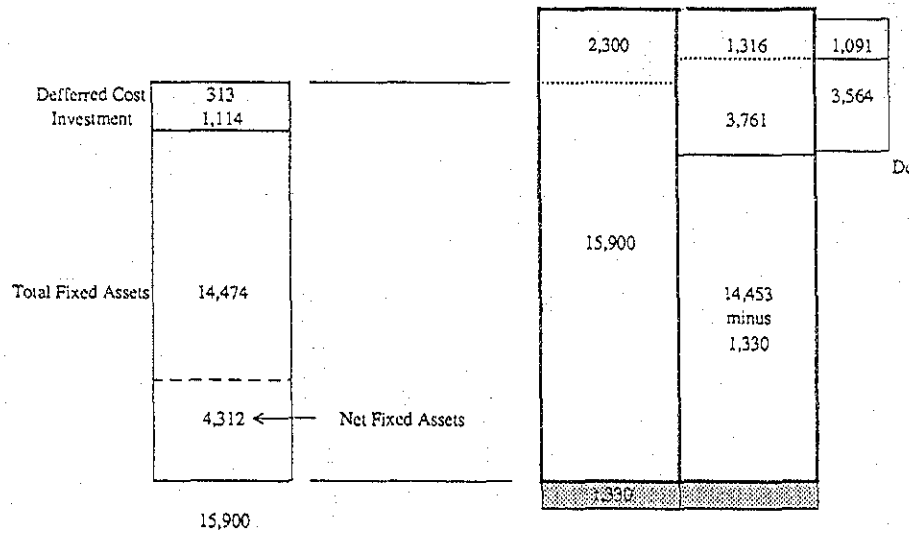
It should be noted that the project listed are limited to on-going and committed ones, ad any projects which are planned but not yet committed by the external financing agencies early in 1994 are not included in the loan repayment schedule.

Table 14.1 Current Financial Status of NWSDB

FINANCIAL STATEMENTS 1993.12.31 (Unit : Million Rs.)

Total Current Assets	13%	2,300	1,316	7%	Total Current Liabilities
Deferred Cost	2%	313	3,761	21%	Long-term Liabilities
Investment	6%	1,114	14,453	79%	Shareholders'equity
Total Fixed Assets	80%	14,474	-1,330	-7%	Retained Earnings/(Deficit)
TOTAL ASSETS	100%	18,200	18,200	100%	Total Liabilities & Equity

Loan Interest Payable	579	
Loan Capital Payable	512	
Foreign Loan Thr. Treasury	3,564	
Capital Grants-Central Govern.	9,834	68%
Capital Grants-Foreign Agencies	3,711	26%
Equity to Total Assets	72%	



REVENUES 1,489

Breakdown of Cost

O & M Cost	55.4%
Depreciation	19.0%
Interest	13.6%
Surplus	12.1%

Profit bef. depreciation & interest	665
Depreciation,etc.	283
Loan interest	202
Surplus for the year	180
Capital Repayment	34
Loan Interest	202
Debt Services	236
Debt Services Coverage Ratio (Profit bef. depre. & interest) / Debt Services	2.82
Turnover ratio of Revenues to Total Assets	8.2%
Investments for 1993	407
(% of debt services	173%)
Return on Net Fixed Assets	4.2%

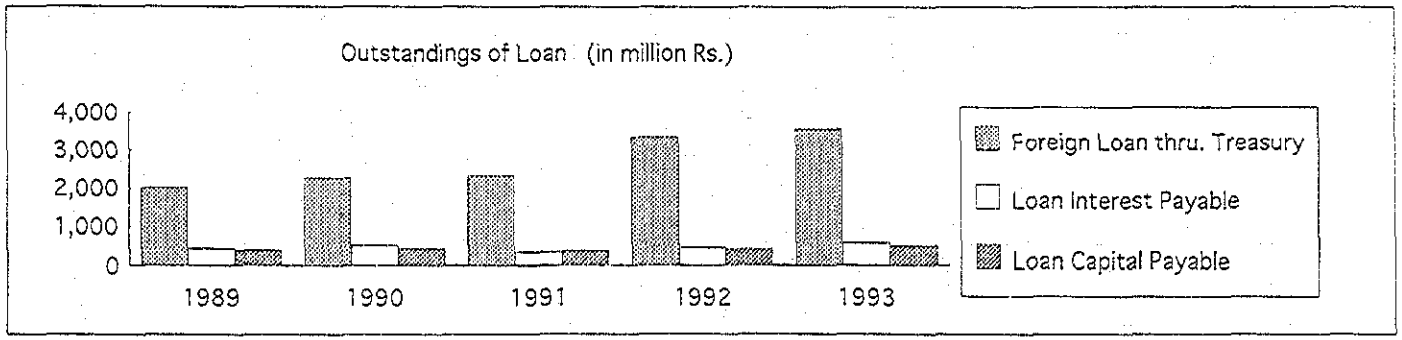


Table 14.2 Billing Collection (1993)

1993 Billing & Collection		Water Consumed (m3/year)		Water Sales (Rs.)		Collection (Rs.)	Collection rate	No. of Connections	MonthlyWater Served per connection	Unitary Rate (Rs./m3)	Consumption per Connection
1 DOMESTIC											
	Domestic	57,304,937		255,499,092		252,264,495	99%	228,680	20.9	4.46	251
	Religious Institutions	1,559,544		2,997,595		2,644,736	88%	1,867	69.6	1.92	835
	Sub-total	58,864,481	47.0%	258,496,687	22.6%	254,909,231	99%	230,547	21.3	4.39	255
Service charges											
Rs./month per connection	6			1,383,282							
2 NON-DOMESTIC											
	Government School	1,265,590		23,985,131		26,214,395	109%	915	115.3	18.95	1,383
	Government Quarters	812,004		4,889,671		3,316,787	68%	4,405	15.4	6.02	184
	Government	15,411,647		324,874,453		307,840,983	95%	3,820	336.2	21.08	4,034
	Commercial	12,497,177		266,371,613		247,164,230	93%	19,253	54.1	21.31	649
	GECE	3,286,753		52,598,488		55,091,870	105%	4	68474.0	16.00	821,688
	Institutions	708,709		14,214,527		9,618,006	68%	629	93.9	20.06	1,127
	Board Premise	107,752		748,552		406,077	54%	130	69.1	6.95	829
	Sub-Total	34,089,632	27.2%	687,682,435	60.1%	649,652,348	94%	29,156	97.4	20.17	1,169
Service charges											
Rs./month per connection	10			291,560							
3 OTHERS											
	Tourist Hotels	1,494,806		40,216,821		38,444,426	96%	226	551.2	26.90	6,614
	Industries	2,279,554		57,140,163		56,685,452	99%	725	262.0	25.07	3,144
	Shipping	250,589		20,045,790		20,387,758	102%	8	2610.3	79.99	31,324
	Sub-Total	4,024,949	3.2%	117,402,774	10.3%	115,517,636	98%	959	349.8	29.17	4,197
Service charges											
Rs./month per connection	10			9,590							
4 CMC STD/POST(G.C.)		11,143,910		16,595,865		16,595,865	100%	2,753	337.3	1.49	4,048
STD/POST(REGIONS)		5,537,343		8,130,142		4,665,116	57%	4,556	97.6	1.52	1,171
	Sub-total	16,481,253	13.2%	24,726,007	2.2%	21,260,981	86%	7,309	187.9	1.50	2,255
5 BULK BILLING		11,708,000	9.4%	56,199,000	4.9%	46,798,000	83%			4.80	
	TOTAL	125,168,315	100.0%	1,144,506,903	100.0%	1,088,138,196	95%	260,662	40.0	9.14	480

(MIS TOTAL Regional Area)

* The service charges are assumed to be included in the water sales bill.

Average Allocation Water Served for the last 3 years		
Domestic	158,632,349	44.4%
Non-domestic	94,810,629	26.6%
Others	13,770,876	3.9%
STD/Post	47,496,775	13.3%
Bulk Billing	42,382,000	11.9%
TOTAL	357,092,629	

UNITARY TARIFF RATE For 1993			
	CATEGORY	Unitary Rate (Rs./m3)	Allocation of Water Served %
1	Domestic	4.39	47.0%
2	Non-domestic	20.17	27.2%
3	Others	29.17	3.2%
4	STD/Post	1.50	13.2%
5	Bulk Billing	4.80	9.4%
	Average	9.14	

Table 14.3 Billing Collection (1992)

1992 Billing & Collection		Water Consumed (m3/year)		Water Sales (Rs.)		Collection (Rs.)	Collection rate	No. of Connections	Monthly Water Served per connection	Unitary Rate (Rs./m3)	Consumption per Connection
1 DOMESTIC											
	Domestic	51,704,077		194,162,006		208,584,024	107%	201,908	21.3	3.76	256
	Religious Institutions	0		0		0		0			
	Sub-total	51,704,077	43.7%	194,162,006	19.7%	208,584,024	107%	201,908	21.3	3.76	256
Service charges											
Rs./month per connection	5			1,009,540							
2 NON-DOMESTIC											
	Government School	1,259,403		18,037,362		9,942,162	55%	911	115.2	14.32	1,382
	Government Quarters	0		0		0		0			
	Government	14,684,201		289,773,064		281,800,552	97%	3,585	341.3	19.73	4,096
	Commercial	11,075,881		225,481,397		205,994,939	91%	17,813	51.8	20.36	622
	GECE	0		0		0		0			
	Institutions	2,996,522		27,539,027		25,077,307	91%	2,194	113.8	9.19	1,366
	Board Premise	0		0		0		0			
	Sub-Total	30,016,007	25.4%	560,830,850	56.9%	522,814,960	93%	24,503	102.1	18.68	1,225
Service charges											
Rs./month per connection	5			122,515							
3 OTHERS											
	Tourist Hotels	1,377,097		37,197,944		36,231,011	97%	210	546.5	27.01	6,558
	Industries	4,356,221		90,656,745		89,607,142	99%	611	594.1	20.81	7,130
	Shipping	309,502		24,749,410		22,931,442	93%	8	3224.0	79.97	38,688
	Sub-Total	6,042,820	5.1%	152,604,099	15.5%	148,769,595	97%	829	607.4	25.25	7,289
Service charges											
Rs./month per connection	5			4,145							
4 CMC STD/POST(G.C.)		11,032,560		12,899,676		12,221,029	95%	2,466	372.8	1.17	4,474
STD/POST(REGIONS)		4,841,879		6,078,304		2,129,695	35%	3,022	133.5	1.26	1,602
	Sub-total	15,874,439	13.4%	18,977,980	1.9%	14,350,724	76%	5,488	241.0	1.20	2,893
5 BULK BILLING		14,637,000	12.4%	58,547,000	5.9%	43,821,000	75%			4.00	
	TOTAL	118,274,343	100.0%	985,121,935	100.0%	938,340,303	95%	232,728	42.4	8.33	508

UNITARY TARIFF RATE			
	CATEGORY	Unitary Ra (Rs./m3)	Allocation of Water Served %
1	Domestic	3.76	43.7%
2	Non-domestic	18.68	25.4%
3	Others	25.25	5.1%
4	STD/Post	1.20	13.4%
5	Bulk Billing	4.00	12.4%
	Average	8.33	

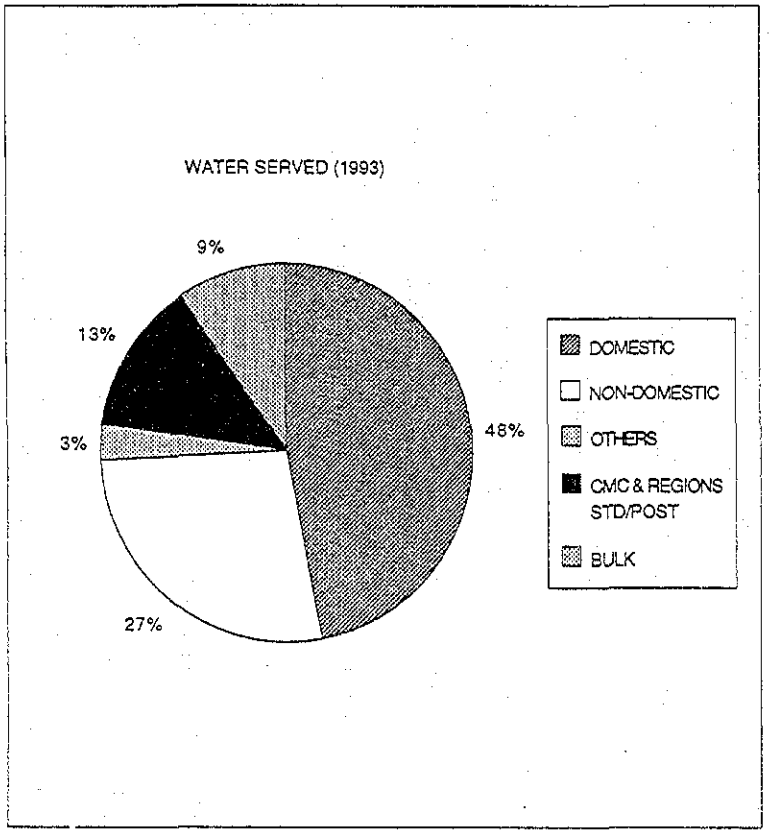
Table 14.4 Billing Collection (1991)

1991 Billing & Collection		Water served (m3/year)		Water Sales (Rs.)		Collection (Rs.)	Collection rate	No. of Connections	Monthly Water Served per connection	Unitary Rate (Rs./m3)	Consumption per Connection
1 DOMESTIC											
	Domestic	48,063,791		193,097,089		142,003,531	74%	177,432	22.6	4.02	271
	Religious Institutions	0		0		0		0			
	Sub-total	48,063,791	42.3%	193,097,089	20.5%	142,003,531	74%	177,432	22.6	4.02	271
Service charges											
Rs./month per connection	5			887,160							
2 NON-DOMESTIC											
	Government School	932,421		15,785,962		8,044,347	51%	747	104.0	16.93	1,248
	Government Quarters	0		0		0					
	Government	15,342,688		294,939,823		234,301,750	79%	3,181	401.9	19.22	4,823
	Commercial	11,818,581		231,518,236		172,616,701	75%	15,880	62.0	19.59	744
	GECE	0		0		0					
	Institutions	2,611,300		22,735,574		20,291,450	89%	1,887	115.3	8.71	1,384
	Board Premise	0		0		0					
	Sub-Total	30,704,990	27.0%	564,979,595	60.0%	435,254,248	77%	21,695	117.9	18.40	1,415
Service charges											
Rs./month per connection	5			108,475							
3 OTHERS											
	Tourist Hotels	1,214,017		30,602,314		27,548,112	90%	190	532.5	25.21	6,390
	Industries	2,205,529		54,894,408		47,409,457	86%	452	406.6	24.89	4,879
	Shipping	283,561		21,255,950		20,035,572	94%	17	1390.0	74.96	16,680
	Sub-Total	3,703,107	3.3%	106,752,672	11.3%	94,993,141	89%	659	468.3	28.83	5,619
Service charges											
Rs./month per connection	5			3,295							
4 CMC STD/POST(G.C.)		10,585,440		10,585,440		7,668,798	72%	2,484	355.1	1.00	4,261
STD/POST(REGIONS)		4,555,643		5,205,788		2,475,237	48%	1,962	193.5	1.14	2,322
	Sub-total	15,141,083	13.3%	15,791,228	1.7%	10,144,035	64%	4,446	283.8	1.04	3,406
5 BULK BILLING		16,037,000	14.1%	60,941,000	6.5%	35,800,000	59%			3.80	
	TOTAL	113,649,971	100.0%	941,561,584	100.0%	718,194,955	76%	204,232	46.4	8.28	556

UNITARY TARIFF RATE			
	CATEGORY	Initary Ra (Rs./m3)	Allocation of Water Served %
1	Domestic	4.02	42.3%
2	Non-domestic	18.40	27.0%
3	Others	28.83	3.3%
4	STD/Post	1.04	13.3%
5	Bulk Billing	3.80	14.1%
	Average	8.28	

WATER SERVED (1993)		
DOMESTIC	58,864,481	47.0%
NON-DOMESTIC	34,089,632	27.2%
OTHERS	4,024,949	3.2%
CMC & REGIONS STD/POST	16,481,253	13.2%
BULK	11,708,000	9.4%
	125,168,315	100.0%

WATER SALES (1993)		
DOMESTIC	258,496,687	22.6%
NON-DOMESTIC	687,682,435	60.1%
OTHERS	117,402,774	10.3%
CMC & REGIONS STD/POST	24,726,007	2.2%
BULK	56,199,000	4.9%
	1,144,506,903	100.0%



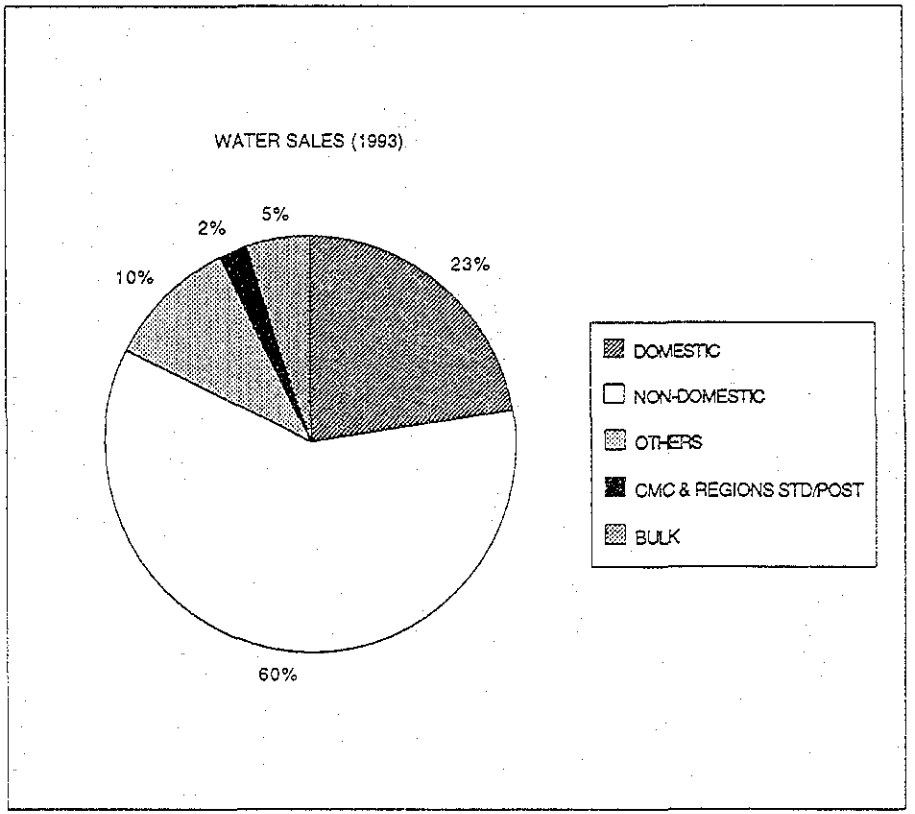


Figure 14.1 Billing Collection (1993)

Table 14.5 Summary of Domestic Consumption

CONNECTIONS FOR DOMESTIC 1 TOTAL BOARD
2 GREATER COLOMBO AS OF DECEMBER 1993

AREA	TOTAL CONSUMERS	CU M 1 to 10	%	CU M 11 to 20	%	CU M 21 to 30	%	CU M 31 to 50	%	CU M 51 to 100	%	CU M 101 to 150	%	CU M 151 to 300	CU M 301 to 500	CU M 501 to 750	CU M 751 to 1000	CU M > 1000 (m3/month)	Total
GREATER COLOMBO	124,454	29,448	24%	30,320	48%	31,030	73%	23,667	92%	8,633	99%	865	100%	396	70	16	3	6	124,454
KALUTARA	8,529	2,300	27%	3,131	64%	1,796	85%	1,056	97%	222	100%	15	100%	8	1	0	0	0	8,529
KURUNEGARA	16,329	3,587	22%	4,707	51%	5,785	86%	1,751	97%	458	100%	22	100%	10	4	5	0	0	16,329
MATARA	17,669	5,846	33%	6,781	71%	3,272	90%	1,408	98%	324	100%	22	100%	16	0	0	0	0	17,669
HAMBANTOTA	7,810	2,878	37%	2,813	73%	1,308	90%	641	98%	144	100%	12	100%	10	1	1	2	0	7,810
ANURADHAPURA	8,366	2,565	31%	2,946	66%	1,775	87%	880	98%	170	100%	16	100%	11	2	0	0	1	8,366
KANDY	20,253	7,086	35%	7,434	72%	3,703	90%	1,688	98%	319	100%	17	100%	5	0	0	0	1	20,253
BANDARAWELA	8,887	2,762	31%	2,203	56%	2,984	89%	661	97%	234	100%	33	100%	7	3	0	0	0	8,887
RATNAPURA	9,152	2,895	32%	2,851	63%	1,808	83%	1,155	95%	380	99%	36	100%	20	4	3	0	0	9,152
AMPARA	3,817	967	25%	836	47%	1,649	90%	275	98%	74	100%	11	100%	4	1	0	0	0	3,817
TRINCOMALEE	3,414	1,191	35%	1,228	71%	619	89%	291	98%	70	100%	7	100%	3	4	1	0	0	3,414
TOTAL	228,680	61,525	27%	65,250	55%	55,729	80%	33,473	94%	11,028	99%	1,056	100%	490	90	26	5	8	228,680

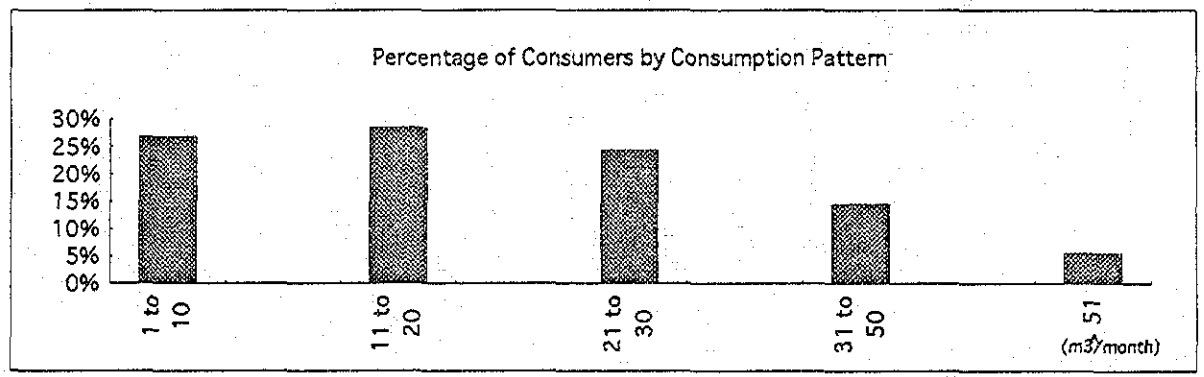
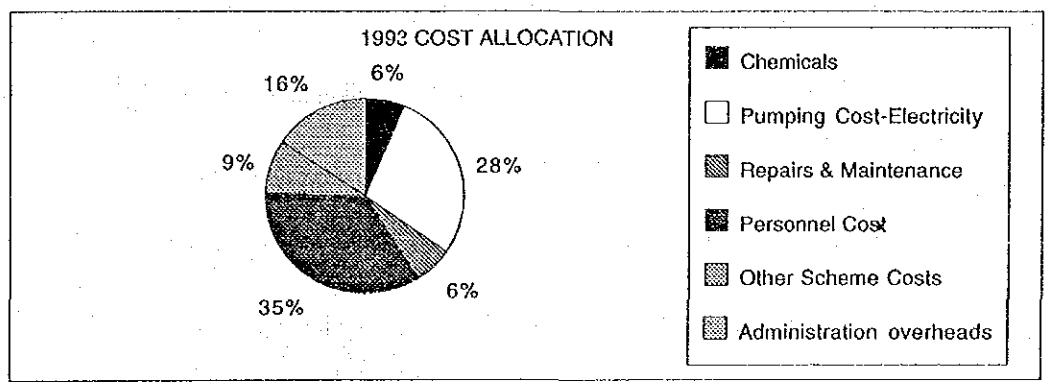
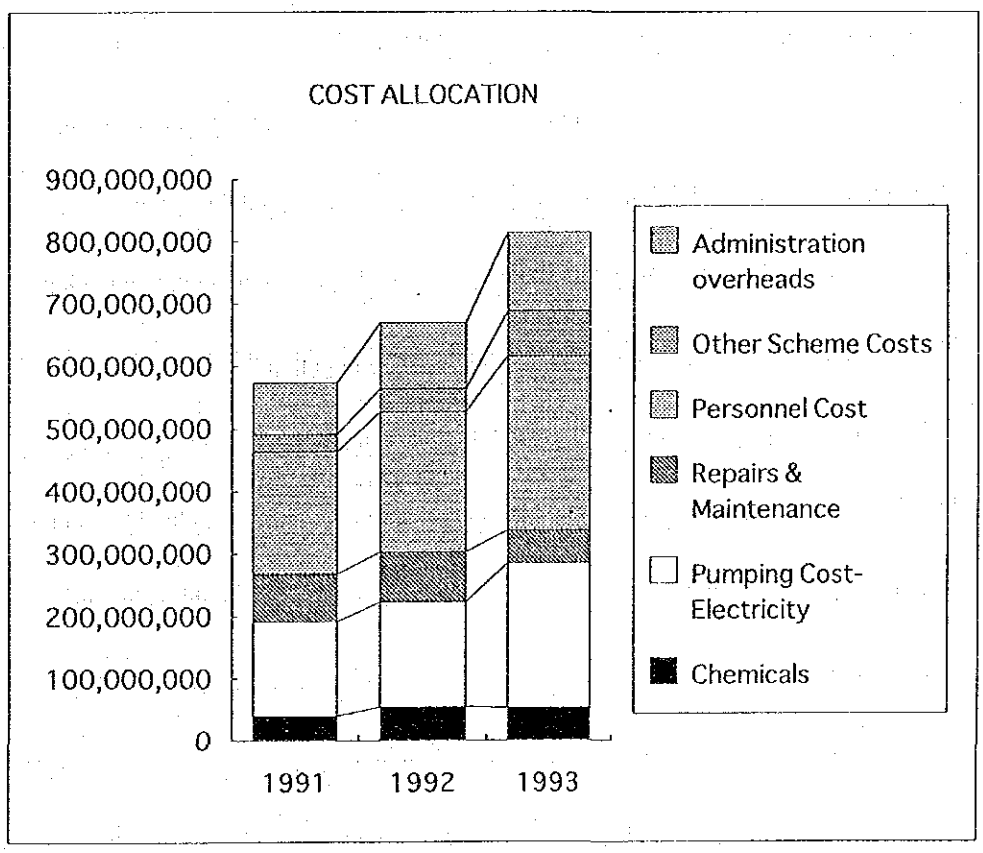


Table 14.6 Unit Production Cost and Cost Allocation

Operation & maintenance Cost

	1991	1992	1993	Rate of growth (1991-1993)
Chemicals	39,742,056	54,463,269	52,741,602	15%
Pumping Cost-Electricity	152,299,179	168,549,168	231,973,364	23%
Repairs & Maintenance	75,630,448	79,613,674	51,947,575	-17%
Personnel Cost	195,755,358	224,446,486	279,002,700	19%
Other Scheme Costs	27,904,989	36,215,421	72,534,224	61%
Administration overheads	82,895,727	107,017,088	126,291,577	23%
TOTAL	574,227,757	670,305,106	814,491,042	19%
Water produced ('000 m3/year)	192,000	216,000	228,000	9%
Unit production cost(Rs./m3)	2.99	3.10	3.57	9%





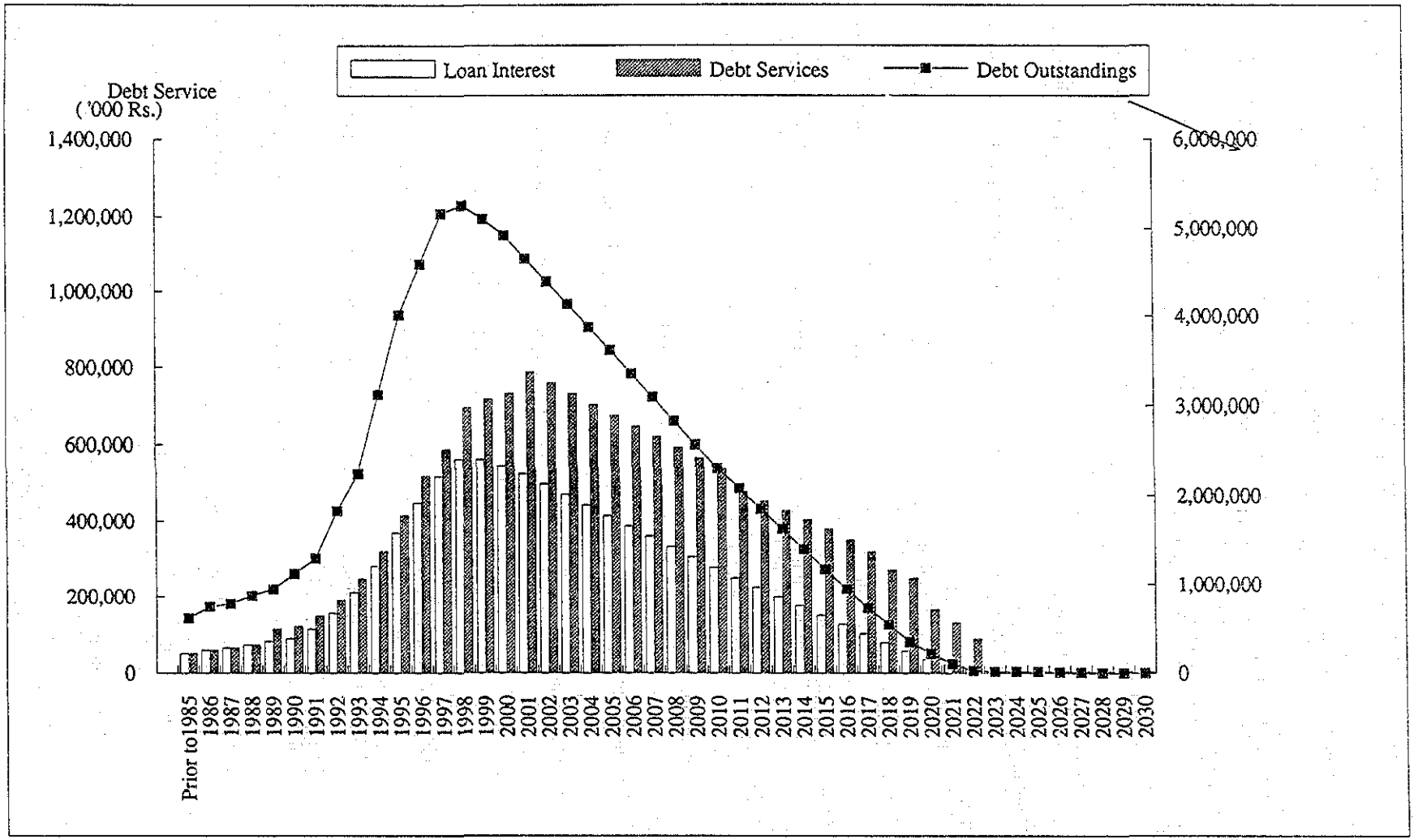


Figure 14.2 Loan Repayment Schedule (without the Kalu Ganga Project)

Table 14.7 Loan Repayment Schedule (without the Kalu Ganga Project) (1 of 2 sheets)

No.	Project	Currency Unit	Loan Amount			Disbursement & Repayment Schedule: Prior to 1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	IDA 1700	SDR	32.1 mn.		Re-lending to NWSDB			21,828	22,846	32,633	24,160	58,291	98,369	102,166	174,000	122,500								
	Loan Amount (Rs.)	Interest	12.0%		Interest			1,310	3,990	7,319	10,726	15,673	25,073	37,105	53,675	71,465	78,815	78,815	78,815	75,233	71,650	68,068	64,485	60,903
	from Treasury	Period	24	years	Repayment												0	0	29,854	29,854	29,854	29,854	29,854	29,854
	656,793	(Grace	2	years)	Debt outstandings(end)			21,828	44,674	77,307	101,467	159,757	258,126	360,292	534,292	656,792	656,792	656,792	626,938	597,084	567,229	537,375	507,521	477,667
2	ADB 817	SDR	24.6 mn.		Re-lending to NWSDB			6,178	6,852	11,111	11,062	7,686	101,998	246,455	240,800	86,430								
	Loan Amount (Rs.)	Interest	12.0%		Interest			371	1,152	2,230	3,561	4,686	11,213	32,066	61,301	80,935	86,121	86,121	86,121	82,206	78,292	74,377	70,462	66,548
	from Treasury	Period	24	years	Repayment												0	0	32,622	32,622	32,622	32,622	32,622	32,622
	717,674	(Grace	2	years)	Debt outstandings(end)			6,178	13,030	24,141	35,203	42,889	143,988	390,442	631,242	717,672	717,672	717,672	685,051	652,429	619,808	587,186	554,565	521,943
3	ODA	St.Pounds	3,954,768		Re-lending to NWSDB					56,413	21,787	1,639												
	Loan Amount (Rs.)	Interest	12.0%		Interest					3,385	8,077	9,482	9,581	9,581	9,581	9,145	8,710	8,274	7,839	7,403	6,968	6,532	6,097	5,661
	from Treasury	Period	24	years	Repayment								0	0	3,629	3,629	3,629	3,629	3,629	3,629	3,629	3,629	3,629	3,629
	79,842	(Grace	2	years)	Debt outstandings(end)					56,413	78,200	79,839	79,839	79,839	76,210	72,581	68,952	65,323	61,693	58,064	54,435	50,806	47,177	43,547
4	OECF / TE	Yen	1,977 mn.		Re-lending to NWSDB									21,492	200,000	225,000	47,000							
	Loan Amount (Rs.)	Interest	2.5%		Interest									269	3,037	8,350	11,750	12,337	12,337	12,337	11,777	11,216	10,655	10,094
	from Treasury	Period	24	years	Repayment													0	0	22,432	22,432	22,432	22,432	22,432
	493,496	(Grace	2	years)	Debt outstandings(end)									21,492	221,492	446,492	493,492	493,492	493,492	471,060	448,628	426,197	403,765	381,334
5	IDA - 1041	US$	30 mn.		Re-lending to NWSDB	331,868	51,566																	
	Loan Amount (Rs.)	Interest	9.0%		Interest	29,868	34,509	34,509	34,509	34,509	32,940	31,372	29,803	28,235	26,666	25,097	23,529	21,960	20,392	18,823	17,254	15,686	14,117	12,548
	from Treasury	Period	24	years	Repayment			0	0	17,429	17,429	17,429	17,429	17,429	17,429	17,429	17,429	17,429	17,429	17,429	17,429	17,429	17,429	17,429
	383,439	(Grace	2	years)	Debt outstandings(end)	331,868	383,434	383,434	383,434	366,005	348,576	331,147	313,718	296,289	278,860	261,430	244,001	226,572	209,143	191,714	174,285	156,856	139,427	121,998
6	USAID	US$	30 mn.		Re-lending to NWSDB				30,607	7,850	13,370	21,891	3,221	0	0	0	0	0	0	0	0	0	0	0
	Loan Amount (Rs.)	Interest	2.0%		Interest				306	691	903	1,255	1,507	1,539	1,539	1,539	1,469	1,399	1,329	1,259	1,189	1,119	1,049	979
	from Treasury	Period	24	years	Repayment									0	0	3,497	3,497	3,497	3,497	3,497	3,497	3,497	3,497	3,497
	76,945	(Grace	2	years)	Debt outstandings(end)				30,607	38,457	51,827	73,718	76,939	76,939	76,939	73,441	69,944	66,446	62,949	59,451	55,954	52,456	48,959	45,461
7	FRENCH - TRINCO	FF	112.47 mn.		Re-lending to NWSDB	210,166	16,170																	
	Loan Amount (Rs.)	Interest	6.0%		Interest	12,610	13,095	13,580	13,580	13,580	12,963	12,346	11,728	11,111	10,494	9,876	9,259	8,642	8,024	7,407	6,790	6,173	5,555	4,938
	from Treasury	Period	24	years	Repayment			0	0	10,288	10,288	10,288	10,288	10,288	10,288	10,288	10,288	10,288	10,288	10,288	10,288	10,288	10,288	10,288
	226,343	(Grace	2	years)	Debt outstandings(end)	210,166	226,336	226,336	226,336	216,048	205,760	195,471	185,183	174,895	164,606	154,318	144,030	133,741	123,453	113,165	102,876	92,588	82,300	72,011
8	FRENCH - NEGOMBO I	US$	3.753 mn.		Re-lending to NWSDB	45,329	10,138																	
		FF	35 mn.		Interest	4,986	5,544	6,101	6,101	6,101	5,824	5,547	5,269	4,992	4,715	4,437	4,160	3,882	3,605	3,328	3,050	2,773	2,495	2,218
	Loan Amount (Rs.)	Interest	11.0%		Repayment			0	0	2,522	2,522	2,522	2,522	2,522	2,522	2,522	2,522	2,522	2,522	2,522	2,522	2,522	2,522	2,522
	from Treasury	Period	24	years	Debt outstandings(end)	45,329	55,467	55,467	55,467	52,945	50,424	47,902	45,381	42,859	40,338	37,816	35,294	32,773	30,251	27,730	25,208	22,686	20,165	17,643
	55,475	(Grace	2	years)				130,511																
9	FRENCH - NEGOMBO II	FF	35 mn.		Re-lending to NWSDB	6,630	41,525																	
	Loan Amount (Rs.)	Interest	11.0%		Interest	729	3,013	5,297	5,297	5,297	5,056	4,815	4,575	4,334	4,093	3,852	3,611	3,370	3,130	2,889	2,648	2,407	2,166	1,926
	from Treasury	Period	24	years	Repayment			0	0	2,189	2,189	2,189	2,189	2,189	2,189	2,189	2,189	2,189	2,189	2,189	2,189	2,189	2,189	2,189
	48,164	(Grace	2	years)	Debt outstandings(end)	6,630	48,155	48,155	48,155	45,965	43,776	41,587	39,398	37,208	35,019	32,830	30,641	28,451	26,262	24,073	21,884	19,694	17,505	15,316
10	FRENCH - KURUNEGARA	FF	14.724 mn.		Re-lending to NWSDB	15,306	10,002	1,557	0	0	0	6,619	687											
	Loan Amount (Rs.)	Interest	12.0%		Interest	1,837	2,437	3,130	3,224	3,224	3,224	3,621	4,059	4,100	4,100	4,100	3,914	3,727	3,541	3,355	3,168	2,982	2,795	2,609
	from Treasury	Period	24	years	Repayment			0	0	0	0	0	0	0	0	1,554	1,554	1,554	1,554	1,554	1,554	1,554	1,554	1,554
	34,179	(Grace	2	years)	Debt outstandings(end)	15,306	25,307	26,864	26,864	26,864	26,864	33,483	34,169	34,169	34,169	32,616	31,062	29,509	27,955	26,401	24,848	23,294	21,741	20,187
11	FRENCH - BADULLA	FF	15 mn.		Re-lending to NWSDB			6,642	32,377	0	0	0	5,950											
	Loan Amount (Rs.)	Interest	12.0%		Interest			399	2,740	4,682	4,682	4,682	5,039	5,396	5,396	5,396	5,151	4,906	4,660	4,415	4,170	3,924	3,679	3,434
	from Treasury	Period	24	years	Repayment									0	0	2,045	2,045	2,045	2,045	2,045	2,045	2,045	2,045	2,045
	44,981	(Grace	2	years)	Debt outstandings(end)			6,642	39,020	39,020	39,020	39,020	44,970	44,970	44,970	42,925	40,880	38,836	36,791	34,747	32,702	30,658	28,613	26,568
12	FRENCH - AMBATALE	FF	140 mn.		Re-lending to NWSDB						6,281	111,100	361,926	65,016										
	Loan Amount (Rs.)	Interest	12.0%		Interest						377	7,420	35,801	61,418	65,319	65,319	65,319	62,350	59,380	56,411	53,442	50,473	47,504	44,535
	from Treasury	Period	24	years	Repayment										0	0	24,742	24,742	24,742	24,742	24,742	24,742	24,742	24,742
	544,334	(Grace	2	years)	Debt outstandings(end)						6,281	117,380	479,306	544,322	544,322	544,322	519,579	494,837	470,094	445,352	420,610	395,867	371,125	346,382
13	ADB -1235	SDR	28.31mn.		Re-lending to NWSDB										49,450	150,500	219,300	270,900	73,100					
	Loan Amount (Rs.)	Interest	12.0%		Interest										2,967	14,964	37,152	66,564	87,204	91,590	91,590	91,590	87,427	83,263
	from Treasury	Period	24	years	Repayment															0	0	34,694	34,694	34,694
	761,263	(Grace	2	years)	Debt outstandings(end)										49,450	199,950	419,250	690,150	763,250	763,250	763,250	728,556	693,862	659,169
14	OECF - TS	Yen	3,726 mn.		Re-lending to NWSDB										21,900	47,500	253,250	360,700	155,000					
	Loan Amount (Rs.)	Interest	12.0%		Interest										1,314	5,478	23,523	60,360	91,302	100,602	100,602	96,029	91,456	
	from Treasury	Period	24	years	Repayment															0	0	38,107	38,107	38,107
	838,364	(Grace	2	years)	Debt outstandings(end)										21,900	69,400	322,650	683,350	838,350	838,350	838,350	809,243	762,135	724,028
15	Proposed New Projects				Re-lending to NWSDB									16,000	226,680	311,660	134,340	13,200	0	0	0	0	0	0
		Interest	12%		Interest									960	15,521	47,821	74,581	83,434	84,226	84,226	82,311	78,483	74,654	70,826
			31,904		Repayment																31,904	31,904	31,904	31,904
		1			Debt outstandings(end)									16,000	242,680	554,340	688,680	701,880	701,880	701,880	669,976	638,071	606,167	574,263
16	Local Loans	Rs.			Re-lending to NWSDB						130,471													
		Interest	9%		Interest							11,742	11,449	11,155	10,862	10,568	10,275	9,981	9,687	9,394	9,100	8,807	8,513	8,220
		Period	40	years	Repayment							3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262
		(Grace	0	years)	Debt outstandings(end)						130,471	127,209	123,947	120,686	117,424	114,162	110,900	107,639	104,377	101,115	97,853	94,591	91,330	88,068
	TOTAL					Prior to1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
					Debt outstandings(beg.)	0	609,299	738,699	774,903	867,586	943,165	1,117,867	1,289,403	1,824,963	2,240,401	3,113,912	4,011,087	4,593,820	5,167,462	5,261,929	5,105,865	4,917,896	4,657,125	4,396,355
					Re-lending to NWSDB	609,299	129,400	36,205	92,683	108,007	207,131	207,226	571,250	451,128	912,830	943,590	653,800	644,800	228,100	0	0	0	0	0
	Loan Amount (Rs.)				Loan Interest	50,030	58,598	61,697	70,900	81,018	88,333	112,641	155,097	212,260	280,579	368,343	447,337	516,122	561,592	560,877	544,001	525,211	497,684	470,157
	from Treasury				Capital Repayment	0	0	0	0	32,428	32,428	35,699	35,699	35,699	39,319	46,415	71,157	71,157	133,633	156,065	187,969	260,770	260,770	260,770
	4,963,292				Debt outstanding(end)	609,299	738,699	774,903	867,586	943,165	1,117,867	1,289,403	1,824,963	2,240,401	3,113,912	4,011,087	4,593,820	5,167,462	5,261,929	5,105,865	4,917,896	4,657,125	4,396,355	4,135,585

Table 14.7 Loan Repayment Schedule (without the Kalu Ganga Project) (2 of 2 sheets)

No.	Project	2004	2005	2006	2007	2008	2009	2010	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
1	IDA 1700																					656,793
		57,320	53,738	50,155	46,572	42,990	39,407	35,825	7,165	3,582												1,290,339
		29,854	29,854	29,854	29,854	29,854	29,854	29,854	29,854	29,854												656,793
		447,813	417,958	388,104	358,250	328,396	298,541	268,687	29,853	-1												
2	ADB 817																					717,674
		62,633	58,719	54,804	50,889	46,975	43,060	39,146	7,829	3,914												1,360,141
		32,622	32,622	32,622	32,622	32,622	32,622	32,622	32,622	32,622												717,674
		489,321	456,700	424,078	391,457	358,835	326,214	293,592	32,620	-2												
3	ODA																					79,842
		5,226	4,790	4,355	3,919	3,484	3,048	2,613														150,280
		3,629	3,629	3,629	3,629	3,629	3,629	3,629														79,842
		39,918	36,289	32,660	29,031	25,401	21,772	18,143														
4	OECF/TE																					493,496
		9,533	8,973	8,412	7,851	7,290	6,729	6,169	1,682	1,121	561											189,958
		22,432	22,432	22,432	22,432	22,432	22,432	22,432	22,432	22,432	22,432											493,496
		358,902	336,470	314,039	291,607	269,175	246,744	224,312	44,859	22,428	-4											
5	IDA - 1041																					383,439
		10,980	9,411	7,843	6,274	4,705	3,137	1,568														530,244
		17,429	17,429	17,429	17,429	17,429	17,429	17,429														383,439
		104,569	87,140	69,711	52,282	34,853	17,424	-5														
6	USAID	0	0	0	0	0	0	0														76,945
		909	839	769	699	629	559	490														25,434
		3,497	3,497	3,497	3,497	3,497	3,497	3,497														76,945
		41,964	38,466	34,969	31,471	27,974	24,476	20,979														
7	FRENCH - TRINCO																					226,343
		4,321	3,703	3,086	2,469	1,851	1,234	617														209,033
		10,288	10,288	10,288	10,288	10,288	10,288	10,288														226,343
		61,723	51,435	41,146	30,858	20,570	10,281	-7														
8	FRENCH - NEGOMBO I																					55,475
		1,941	1,663	1,386	1,109	831	554	276														92,889
		2,522	2,522	2,522	2,522	2,522	2,522	2,522														55,475
		15,122	12,600	10,078	7,557	5,035	2,514	-8														
																						Fixed Assets
9	FRENCH - NEGOMBO II																					48,164
		1,685	1,444	1,203	962	721	481	240														75,242
		2,189	2,189	2,189	2,189	2,189	2,189	2,189														48,164
		13,127	10,937	8,748	6,559	4,370	2,180	-9														
10	FRENCH - KURUNEGARA																					34,179
		2,422	2,236	2,050	1,863	1,677	1,490	1,304														80,006
		1,554	1,554	1,554	1,554	1,554	1,554	1,554														34,179
		18,633	17,080	15,526	13,972	12,419	10,865	9,312														
11	FRENCH - BADULLA																					44,981
		3,188	2,943	2,698	2,452	2,207	1,961	1,716														95,062
		2,045	2,045	2,045	2,045	2,045	2,045	2,045														44,981
		24,524	22,479	20,435	18,390	16,346	14,301	12,256														
12	FRENCH - AMBATALE																					544,334
		41,566	38,597	35,628	32,659	29,689	26,720	23,751														986,802
		24,742	24,742	24,742	24,742	24,742	24,742	24,742														544,334
		321,640	296,897	272,155	247,412	222,670	197,928	173,185														
13	ADB -1235																					763,263
		79,100	74,937	70,774	66,610	62,447	58,284	54,121	20,815	16,651	12,488	8,325	4,162									1,445,309
		34,694	34,694	34,694	34,694	34,694	34,694	34,694	34,694	34,694	34,694	34,694	34,694									763,263
		624,475	589,781	555,087	520,394	485,700	451,006	416,312	138,762	104,068	69,375	34,681	-13									
14	OECF - TE																					838,364
		86,883	82,310	77,738	73,165	68,592	64,019	59,446	22,863	18,290	13,717	9,144	4,571									1,540,086
		38,107	38,107	38,107	38,107	38,107	38,107	38,107	38,107	38,107	38,107	38,107	38,107									838,364
		685,920	647,813	609,705	571,598	533,490	495,383	457,275	152,416	114,308	76,201	38,093	-14									
15	Proposed New Pr	0	0	0	0	0	0	0	0	0	0	0	0									701,895
		66,997	63,169	59,340	55,512	51,683	47,855	44,026	13,398	9,569	5,741	1,912										1,317,230
		31,904	31,904	31,904	31,904	31,904	31,904	31,904	31,904	31,904	31,904	31,904										701,895
		542,358	510,454	478,550	446,645	414,741	382,837	350,933	95,698	63,794	31,889	-15										
16	Local Loans																					130,487
		7,926	7,633	7,339	7,045	6,752	6,458	6,165	3,816	3,523	3,229	2,936	2,642	2,348	2,055	1,761	1,468	1,174	881	587	294	240,719
		3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	130,471
		84,806	81,544	78,283	75,021	71,759	68,497	65,235	39,141	35,880	32,618	29,356	26,094	22,832	19,571	16,309	13,047	9,785	6,524	3,262	0	
		2004	2005	2006	2007	2008	2009	2010	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
	TOTAL	4,135,585	3,874,815	3,614,044	3,353,274	3,092,504	2,831,734	2,570,963	726,224	533,349	340,477	210,083	102,130	26,094	22,832	19,571	16,309	13,047	9,785	6,524	3,262	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5,295,537
		442,631	415,101	387,578	360,051	332,525	304,998	277,472	77,568	56,652	35,736	22,317	11,375	2,348	2,055	1,761	1,468	1,174	881	587	294	9,628,854
		260,770	260,770	260,770	260,770	260,770	260,770	260,770	192,875	192,875	130,399	107,967	76,063	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	5,795,657
		3,874,815	3,614,044	3,353,274	3,092,504	2,831,734	2,570,963	2,310,193	533,349	340,474	210,079	102,115	26,067	22,832	19,571	16,309	13,047	9,785	6,524	3,262	0	

14.2 Projection of Financial Plan of the NWSDB up to 2000

To realize the objectives set out in the Corporate Plan (1991-1995), the positive support of the major external financial agencies and the government for cost containment programs, collection improvement strategies and tariff revisions enabled a series of measures designed to improve the overall financial viability of the institution, to have been carried, resulting in the good performance for the past three years (1991-1993) with a strong financial support of the government.

14.2.1 Corporate Financial Targets

The following corporate financial targets are set up through frequent discussion with the staff concerned to make the NWSDB an independent and sustainable public utility organization less free of the government support by the year of 2000, when the accumulated deficit amounting to Rs.1,330 million as of 31 December 1993 be liquidated.

1) The revenues should cover its operating cost, depreciation and loan interest.

2) Debt service coverage ratio (Profit before interest and depreciation/Debt services) is maintained at more than 1.5 to 2.0.

3) The increase in average unitary tariff should be kept within an inflation rate.

4) Account Receivable (Debtors), amounting to Rs.650,525,742 as of 1993.12.31, should be, in part, written off over a reasonable period, say, 10 years.

5) The net surplus for the year, that is, net profit after interest and depreciation, should be around 2% on the net fixed assets. (No revaluation of fixed assets in place is taken into account over the period up to 2000).

6) The accumulated deficit should be cleared up by the year of 2000. (After the accumulated deficit having been cleared up, it should be considered whether a dividend holiday be lifted up or maintained further).

Table 14.8 List of Newly Proposed Projects

1. Proposed Project : Outside the Greater Colombo Area

Name of the Scheme	Capacity (m^3/day)	Year of Commissioning	Project Cost F.C. (Rs.mil)	Project Cost L.C. (Rs.mil)	Distribursement Schedule	F.C. (Rs.mil)	L.C. (Rs.mil)	Source of Finance
Ja-Ela	1,000	1995	-	52.0	1994 1995	- -	25.0 27.0	Gov. of Sri Lanka
Samanturai	4,500	1996	-	240.0	1993	-	60.0	Gov. of Sri Lanka
Matara	15,000	1997	7.76	328.0	1994 1995 1997	3.85 2.5 1.11	125.0 195.4 111.7	Lloyd Bank & Gov. of Sri Lanka
Ydunuwara & Yatinuwara	11,000	1996	5.4	432.0	1994 1995 1997	3.27 1.98 0.29	87.4 124.8 66.1	Foreign Fund
Hemmathagama	900	1995	-	37.0	1993 1994 1995	- - -	5.0 10.0 22.0	Gov. of Sri Lanka & NWSDB
Hasalaka	400	1994	-	15.0	Completed			Gov. of Sri Lanka & NWSDB
Anudarapura	28,000	1997	-	1,000	not yet finalized			not yet finalized
Homagama	1,360	1994	-	40.0	1994	-	40.0	Local fund
Kalmunai	4,550	1996	169.0	323.0	1994 1995 1996	155.2 123.8 44.1	135.8 11.7 21.1	Gov. of Sri Lanka & EFIC of Australia (Export Finance and Insurance Corp.)

2. Proposed Project : In the Greater Colombo Area

Name of the Scheme	Capacity (m^3/day)	Year of Commissioning	Project Cost F.C. (Rs.mil)	Project Cost L.C. (Rs.mil)	Distribursement Schedule	F.C. (Rs.mil)	L.C. (Rs.mil)	Source of Finance
Ambatale Treatment facilities Extension Project (Remote surveillance of Colombo Water Distribution System)		1996	277.3	319.1	1994 1995 1996	83.2 217.7 18.2	74.2 341.6 21.5	Gov. of Sri Lanka and French Credit

The following three measures described in the Corporate Plan (1991-1995) will be indispensable as well to accomplish the above corporate financial targets, designed to improve the overall financial viability of the Board.

1) Cost containment programs
2) Collection improvement strategies
3) Tariff revisions

14.2.2 Pre-conditions of Financial Management

The pre-conditions for preparation of the future revenue and cash-flow projection are assumed as follows;

(1) Production Capacity of the NWSDB up to the year of 2000

The production capacity up to 2000 is estimated in such condition that the projects proposed for outside Greater Colombo to augment the production capacity, the list of which is given in Table 14.8, are to be implemented.

A very simple model is used to project a future revenue where the water produced at a 90 percent operation rate of design capacity minus NRW be consumed by each group with the respective predetermined ratio.

(2) Operating Rate

The water treatment plant is estimated to be operated at the rate of 90 percent of full capacity, so that the annual water served is estimated by multiplying the following two factors;

1)	Production capacity	715,000 m^3/day
2)	Capacity utilization	90 %

resulting in 228,000,000 m^3/year as same as that in 1993.

(3) Non-Revenue Water

The Non_revenue Water (NRW*) has been reported to be in the range of 35 to 45 percent of the water served, based on the studies carried out by the NWSDB and the past operation data. It should be noted that these figures are based on incomplete data consisting of flow measurements made at certain locations and measurement of water production at treatment plants, and on other assumptions.

In this study, the NRW as of the end of 1993 is assumed to be 45 percent and is scheduled to decrease from 45 percent in 1993 to 40 percent in 2000, being attributable to expected improvement in the situation of the factors represented by non-physical loss such as illegal/unmetered connections, defective meters, etc.

This assumption is based on the engineering judgment that all water supply and distribution systems will have to allow a certain acceptable/manageable UFW level, say, 35 percent which can be, in other term, regarded as limit to the loss of water that should be tolerated.

(4) Allocation of Water Served

The allocation of water served is classified into the following five groups based on the past performance;

		Allocation of water served for Total Region
1)	Domestic	48 %
2)	Non-domestic	27 %
3)	Others	3 %

---

* Definition of Non-Revenue Water (NRW)

The Non-Revenue Water (NRW) is here defined as the percentage of the water production, representing Unaccounted-for water (UFW) plus accounted Non-Revenue Water (A/C NRW). The UFW is further divided into physical loss and non-physical loss.

The following can be considered as major factors affecting NRW:

		Physical loss	Non-physical loss
1)	Leakage in the transmission/distribution	O	
2)	Illegal/unmetered connections		O
3)	Defective meters/Erroneous/Estimated Readings		O
4)	Misuse of stanposts		O

0% 100%

Production			
Sales	NRW		
Sales	A/C NRW	UFW	
Sales	A/C NRW	Non-Physical loss	Physical loss

Note: Water use within the yard of treatment plant which is estimated less than 5% is considered to be included in A/C NRW.

4)	STD/POST	13 %
5)	Bulk	9 %

(5) Bill Collection Rate

The average bill collection rate is assumed to be 95 %, based on the past performance.

(6) Other Revenues

The revenues except from sale of water are defined here as other revenues, representing new/re-connection recoveries, fees and other charges, interest, etc. The "other revenues" are estimated based in the 1993 data with an incremental rate of 2 percent per annum.

(7) Operation and Maintenance Costs

The direct operating cost and the total operating cost including administrative overheads, are assumed as follows;

1)	Direct operating cost	3.0 Rs./m^3
2)	Total operating cost	3.6 Rs./m^3

The above cost has been deduced from the income statements of the NWSDB (1993).

The unit production cost, which is the operation and maintenance expenses divided by the water production, indicates 8 to 9 percent increase per annum for the past 3 years as shown on Table 14.6. These figures seems to be not sufficiently reliable for discussion due to a lack of correct measurement at each treatment plant.

(8) Depreciation

The depreciation is based on the information from the NWSDB. The NWSDB applies much higher rate of depreciation at around 5 percent than that commonly used in the accounting principles in Sri Lanka.

(9) Debt Services

The debt services which consist of interest and principal repayment, have been constructed as shown in Table 14.7 based on the information from the NWSDB.

(10) Inflation Rate

The inflation rate in Sri Lanka is forecasted as follows:

10 %	to 1998

The inflation rate for the capital expenditures to be imported is estimated at 3 percent.

As a whole, the escalation rate for the capital expenditures for the external-aid projects is estimated to be at 5 percent, where the foreign and local portions are 70 percent and 30 percent, respectively.

(11) Average Tariff

The average tariff for each group is estimated based on the performance of based on the past performance.

1.	Domestic	Rs. 4.4/m^3
2.	Non-domestic	Rs. 20.2/m^3
3.	Others	Rs. 29.2/m^3
4.	Standposts	Rs. 1.50/m^3
5.	Bulk	Rs. 4.80/m^3

The incremental rate of tariff for each group has been determined to meet the corporate financial targets set out as below. The projections do not include tariff increases in real terms but include provision for tariff adjustment in line with inflation.

14.2.3 Projected Financial Plan

The projection of the financial statement up to 2000, such as income statements, cashflow statements and balance sheets, are presented in Table 14.9, having met the corporate financial targets, the vital criteria of which is to make the accumulated deficit cleared up by that year.

The tariff revision for the major categories/groups which will be required to meet the targets, its resultant net income, and its cashflow, etc. are presented in Table 14.10.

14.2.4 Implications of Financial Management

The forecasts of revenues and cashflows in the previous section include that the NWSDB will be able to make substantial contributions to solving the accumulated deficit problem by the year of 2000, eventually resulting in raising a part of funds required to implement its capital programs from internally generated funds.

Key assumptions include those related to continuous efforts in bill collection, the government's recognition of annual tariff adjustment and revision in line with general inflation and continuous undertakings of cost control measurements.

Table 14.9 Projection of Financial Statements up to 2000

Revenues Projection		1993	1994	1995	1996	1997	1998	1999	2000	Rate of Growth
		Base year								
Production Capacity(m3/day)		715,021	751,421	788,173	825,305	866,447	916,189	929,531	942,521	4.0%
NRW(%)		45.1% 45%	44.0%	43.0%	42.0%	41.5%	41.0%	40.5%	40.0%	
Water Consumed ('000 m3)		125,168	136,338	145,560	155,091	164,226	175,139	179,195	183,226	5.6%
Sales ('000 Rs.)		1,128,899	1,350,641	1,574,791	1,822,434	2,068,387	2,346,325	2,534,235	2,736,030	13.5%
Average Tariff (Rs./m3)		9.1	9.9	10.8	11.8	12.6	13.4	14.1	14.9	7.3%
Total Revenues from Operation		1,489,899	1,718,011	1,948,650	2,202,903	2,455,590	2,740,388	2,935,285	3,144,198	11.3%

Income Statements		1993	1994	1995	1996	1997	1998	1999	2000	Rate of Growth
Revenues		1,488,926	1,718,011	1,948,650	2,202,903	2,455,590	2,740,388	2,935,285	3,144,198	11.3%
Total Expenses	5%	814,491	913,207	1,005,765	1,105,806	1,218,977	1,353,406	1,441,771	1,535,015	9.5%
Depreciation,etc.		282,939	361,000	438,000	501,000	530,000	553,000	608,300	669,130	13.1%
Interest		201,891	280,579	368,344	447,338	516,123	561,594	560,879	544,003	15.2%
Net profit		151,581	163,225	136,541	148,759	190,489	272,388	324,336	396,050	14.7%
Profit on Net Assets		(Adjustment included)	2.9%	2.6%	2.0%	2.3%	3.5%	2.9%	3.8%	

Cash-Flow Statements	1993	1994	1995	1996	1997	1998	1999	2000
Net profit from operation	151,581	163,225	136,541	148,759	190,489	272,388	324,336	396,050
Depreciation	282,939	361,000	438,000	501,000	530,000	553,000	608,300	669,130
Repayment	33,865	39,318	46,412	71,154	71,154	133,630	156,061	187,965
Decrease in A/C receivables	-64,274	65,053	65,053	65,053	65,053	65,053	65,053	65,053
Debtor at end of the year	650,526	662,888	672,170	692,670	724,114	768,369	820,056	880,945
Net Cash-flow	336,381	549,960	593,181	643,657	714,388	756,810	841,627	942,268
Expected Cash Generation	336,381	615,012	673,717	726,674	800,144	845,303	933,229	1,035,978
TOTAL FUND FROM OPERATION	400,655	484,907	528,129	578,605	649,335	691,758	776,575	877,215
Accumulated generated funds	1,242,602	1,727,509	2,255,638	2,834,243	3,483,578	4,175,336	4,951,911	5,829,126

BALANCE SHEETS	1993	1994	1995	1996	1997	1998	1999	2000
Fixed Assets	4,431,560	5,692,160	5,315,160	7,625,594	8,330,751	7,853,751	11,097,522	10,520,352
Work in Progress	10,041,990	10,824,656	13,042,603	12,022,702	12,581,012	13,189,279	9,420,808	9,420,808
TOTAL FIXED ASSETS	14,473,550	16,516,817	18,357,763	19,648,297	20,911,763	21,043,030	20,518,330	19,941,160
DEFERRED COST	312,681	258,681	197,681	128,681	54,681	0	0	0
INVESTMENTS	1,113,543	1,513,543	1,913,543	2,313,543	2,713,543	3,113,543	3,513,543	3,913,543
TOTAL CURRENT ASSETS	2,300,423	2,400,423	2,500,423	2,600,423	2,700,423	2,800,423	2,900,423	3,000,423
TOTAL ASSETS	18,200,197	20,689,464	22,969,410	24,690,944	26,380,410	26,956,996	26,932,296	26,855,126
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
LONG-TERM LIABILITIES	3,761,393	4,603,425	5,388,743	5,963,539	6,537,185	6,631,655	6,475,594	6,287,629
SHAREHOLDERS'EQUITY	14,453,189	15,922,106	17,308,323	18,384,906	19,459,573	19,839,739	19,839,739	19,839,739
RETAINED EARNINGS	-1,330,475	-1,167,250	-1,030,709	-881,950	-691,461	-419,073	-94,737	301,313
Adjustment		-84,907	-213,036	-391,641	-640,976	-911,414	-1,204,389	-1,589,645
LIABILITIES & SHAREHOLDERS'EQUITY	18,200,197	20,689,464	22,969,410	24,690,944	26,380,411	26,956,997	26,932,297	26,855,126
BALANCE C/F	-1,330,475	-1,167,250	-1,030,709	-881,950	-691,461	-419,073	-94,737	301,313

Table 14.10 Summary of Revenues and Cashflow Projection (Unit: '000 Rs.)

	1993	1994	1995	1996	1997	1998	1999	2000	Average growth rate 1993-2000
1. Revenues	1,488,926	1,718,011	1,948,650	2,202,903	2,455,590	2,740,388	2,935,285	3,144,198	11.3%
2. Net income	151,581	163,225	136,541	148,759	190,489	272,388	324,336	396,050	14.7%
3. Net income on net fixed assets	4.1%	2.9%	2.6%	2.0%	2.3%	3.5%	2.9%	3.8%	
4. Debt services									
Interest	201,891	280,579	368,344	447,338	516,123	561,594	560,879	544,003	
Repayment	33,865	39,318	46,412	71,154	71,154	133,630	156,061	187,965	
5. Net cashflow	336,381	549,960	593,181	643,657	714,388	756,810	841,627	942,268	15.9%
6. Balance of C/F	Δ1,330,475	Δ1,167,250	Δ1,030,709	Δ881,950	Δ691,461	Δ419,073	Δ94,737	301,313	
Main Parameters									
A. Domestic (Rs/m^3)	4.39	4.5	4.8	5.2	5.6	5.9	6.2	6.5	
Incremental rate to the previous year (%)		2.0%	8.0%	8.0%	7.0%	6.0%	5.0%	5.0%	5.8%
B. Non-domestic (Rs/m^3)	20.17	22.2	24.4	26.6	28.5	30.2	31.7	33.3	
Incremental rate to the previous year (%)		10.0%	10.0%	9.0%	7.0%	6.0%	5.0%	5.0%	7.4%
C. Total (Rs/m^3)	9.1	9.9	10.8	11.8	12.6	13.4	14.1	14.9	
Incremental rate to the previous year (%)		8.3%	9.2%	8.6%	7.2%	6.4%	5.6%	5.6%	7.3%

If these assumptions hold true, the forecasts indicates an ability to contribute its own funds to further capital investment to be required for the year to come.

The possibility that the government could withdraw a part of the capital grant, now amounting to Rs.9,834 million representing almost 70 percent of the shareholder's equity, will not be likely for the years to come.

Even of the good performance be attained so as to meet the corporate financial targets satisfactorily, major levels of equity financing (capital grant) from the government will be required for the major projects envisaged such as the Kalu Ganga Project.

The final decisions concerning the amounts to be allocated to the Project and the timing for such in relation to investment to be made in other projects, shall be made by the officials of the Ministry concerned and the top management of the NWSDB.

The NWSDB, however, is clearly capable of undertaking the full investment program as envisaged, under the stated assumptions. In any event, further strengthening of the NWSDB's institutional development inclusive of inter-departmental management information system under the initiative of the Corporate Planning Unit and decentralization of RSCs, and financial improvement programs will be needed to reach the levels of financial performance indicated in these forecasts.

Furthermore, it is important to expand and institutionalize the operation and the financial management so that it fully covers all regional operating activities. To achieve this objective, it is indispensable that Corporate Planning Division, Commercial Division and Finance Division cooperate closely each other with intermittent advise from Operation Division and prepare the Key Management Information Report, representing the accepted performance review document of the NWSDB for the top management.

14.3 Water Tariff Consideration

14.3.1 General

The tariff revisions implemented for the recent years have had a major impact on the financial improvement of the Board as discussed in the previous chapter, and have resulted in satisfactory levels of cash generation to permit the NWSDB to cover all operating costs and debt service for these three years.

However the accumulated deficit still remains, amounting to Rs.1,330 million as of December 1993 which is almost equal to the annual revenue. Revenue generation is projected in the previous chapter to

reach the point where the NWSDB becomes subject to corporate income tax in 2000 when the accumulated deficit be totally cleared up, if the operation be satisfactorily performed so as to meet the corporate targets set out. The current accumulated deficit appears to be, in part, due to the NWSDB being not allowed to make tariff revision before 1990. The deficit had been made up for in form of capital grant from the government, in other words, government subsidy.

This successful performance on cash generation is dependent on a current high level of collections (including arrears) being sustained and on satisfactory-level achievement of cost reduction programs. The projections of cash generation, focusing on the increase of revenues, should be interpreted to include provision for tariff adjustment in line with inflation.

14.3.2 Present Level of Water Tariff

The historical tariff structure is presented in Table 14.11. The consumers are classified into several categories, the tariff rate of which is established in due consideration of cross subsidies among the categories. The tariff is based on metered consumption, having a unified system across the country.

Especially, there is a significant cross-subsidies among the domestic consumers. That is, users with low consumption pay a low tariff rate while users with high level of consumption pay higher tariff rate. This scheme will also encourage the poor household to make an application for connecting to the water system. This will meet "the social objectives" represented by philosophy "some for all, rather than more for some".

14.3.3 Future Water Tariff Consideration

To meet the corporate financial targets, the tariff revision in addition to the cost containment programs and collection sustainable strategy, will be advised to be made as shown on Table 14.10. According to the study result, the incremental rate of each tariff group over a period of (1994-2000) may be ranged within the expected inflation level.

Group	Average incremental rate over a period of 1994-2000
Domestic	7.0%
Non-domestic	8.6%
Total	7.6%

However, the actual tariff structure for the domestic sector should be specified by consumption magnitude in the same manner as before by the top management, reflecting cross-subsidies among the domestic consumers.

Table 14.11 Water Tariff Structure

Category	1984-1989	1990 Aug.	1991 Jan.	1992 Jan.	1993 Jan.	1994 Jan.
Direct Billing (Rs./month)						
Service Charge						
All consumers	0	5.00	5.00	5.00		
Domestic					6.00	6.00
Non-Domestic					10.00	10.00
Domestic (Rs./m^3)						
0-10 m^3	Free	Free	1.00	0.65	0.75	0.75
10-20 m^3	1.00	1.00	1.50	1.10	1.20	1.30
20-30 m^3	3.00	3.00	4.50	4.00	4.50	4.80
30-40 m^3	5.50	5.50	8.00	7.50	8.50	9.40
40-50 m^3	5.50	5.50	8.00	7.50	8.50	12.00
Over 50 m^3	5.50	11.00	19.50	20.00	25.00	25.00
Standpost	0.80	0.80	1.00	1.25	1.50	1.75
Non-Domestic (Rs./m^3)						
Government, institutions and Commercial	5.60	11.00	19.50	20.00	21.00	22.00
Tourist Hotels	9.00	16.50	25.00	27.00	27.00	27.00
Industries	9.00	16.50	25.00	27.00	25.00	25.00
Shipping	50.00	50.00	75.00	80.00	80.00	80.00
Religious Institutions	same as Domestic					
Unmetered Flat Rate (Rs./month)						
Domestic	30.00	100.00	100.00	100.00	150.00	150.00
Non-Domestic	40.00	500.00	500.00	750.00	1,000.00	1,500.00
Bulk Billing (Rs./m^3)						
without Electricity	NA	1.75	2.50	2.70	-	3.40
with Electricity	NA	NA	4.00	4.00	4.45	4.90

The unitary tariff for each category is estimated based on that discussed in the previous chapter and an incremental rate of tariff. The unitary tariff is summarized as follows.

Future Unitary Tariff (Rs./m^3)

Category/Group	1993 (Actual)	2000	2002 (Commissioning year the Kalu Ganga)
Domestic	4.4	7.0	7.7
Non-domestic	20.2	35.8	39.5
Others	29.2	41.0	45.2

14.3.4 Affordability

The average income for the middle 20 percent (3rd 20 percent quintile) is estimated to be Rs.3,677/month in 1989 as shown in Table 14.12. The income in 1994 can be deduced at Rs.4,262/month with a conservative assumption that the incremental rate is 3 percent per annum. Generally the affordability for water charge is said to be around 3 percent of the household income.

$$\text{3 \% of monthly household income} = 4{,}262 \times \frac{3}{100}$$
$$= \text{Rs.127.9}$$

Average monthly billing per household as of 1994 = Rs.51.5./month

The scheme is sufficiently affordable.

On the other hand, according to the extensive analysis of affordability discounted in the Report of Greater Colombo Master Plan Update Addendum Report, September 1992" such a general conclusions still holds that the current tariff be well within the range of affordability (1.5 and 1.7 percent of household incomes excluding households in the lowest quintile of income).

The household income excluding household in the lowest quintile of income is estimated to be Rs.7,578 (= (2,090 + 3,677 + 5,326 + 19,217)/4).

The income in 1994 is deducted to be Rs.8,784/month with a conservative assumption that the incremental rate is 3 percent per annum.

$$\text{1.5\% of the household income} = 8{,}784 \times (1.5/100)$$
$$= \text{Rs.132}$$

The scheme is sufficiently affordable as well.

At present the tariff rates appear to be affordable compared with the water tariff in other countries as shown on Table 14.13. Future increases may necessitate further cross-sector subsidies from the high water users in the domestic sector and from the non-domestic sector, however, such increased cross sector subsidies may be more difficult to justify so that the tariff revision will be necessary to be made independently and flexibly for the respective category in cope with the future debt services, and its social and economic requirements.

14.4 Financial Plan for Implementation of the Kalu Ganga Project up to 2010

A precise review of the financial performance of the NWSDB was carried out in the previous section to assist in preparing the future tariff revision based on the revenue projection and the debt service obligation and in assessing its capacity for undertaking future major investments.

The unitary tariff and other major parameters applied for the financial analysis are as follows:

1) Unitary tariff rate by category (as of 2000)

Domestic	Rs. 6.5/m^3
Non-domestic (commercial)	Rs. 33.3/m^3
Others (Industries)	Rs. 56.8/m^3

2) New connection charge (as of 1993)

The expenses for new connections are made up for by the connection charges on the users. Therefore, no revenue are accounted for in the revenue calculation.

3) Average water production unit cost (as of 1993) Rs.3.0/m^3

The unit production cost for operation and maintenance is estimated based on the engineering estimates for the Project.

The major assumptions are as follows:

Incremental rate of tariff	8% per annum
Incremental rate of production cost	5% per annum

14.4.1 Financing for the Proposed Project

1)	Project Cost (1994 price)	Table 14.14
2)	15% of the Project Cost	Government grant
3)	85% of the Project Cost	External loan

50 % of the external loan		Government grant
50 % of the external loan		Relending to the NWSDB

4) The debt burden of the NWSDB 42.5% of the project cost

5) Conditions of relending to the NWSDB

Interest	12%
Repayment period (including a grace period of 2 years)	24 years

14.4.2 Projection of Revenue and Cashflow

The revenue and the cashflow have been projected using the unitary tariff by category in the previous section and the water demand projection in Chapter 4.

The forecasted financial statements consisting of revenue projections, repayment schedule and cash flow projection, are presented in Table 14.15 in which the following cashflow projections are shown:

1) Cashflow for the NWSDB without the Kalu Ganga Project
2) Financing for the Kalu Ganga Project
3) Cashflow to proceed from the Kalu Ganga Project
4) Integrated cashflow for the NWSDB with the Kalu Ganga Project

The integrated balance sheets up to 2010 are presented in Table 14.17. The major assumptions in this calculations are as follows:

1) Water allocation

Domestic	60%
Non-domestic	35%
Others	5%

2) Water supply and water consumption (m^3/day)

	2002	2003	2004	2005	2006	2007	2008	2009	2010 onward
Water supply	2,116	20,867	39,617	58,368	78,338	98,308	118,278	138,247	158,217
Water consumption	1,438	14,176	26,914	39,653	53,220	66,787	80,354	93,920	107,517

3) Fund shortage

The shortage of money which will occur due to loan interest in the initial stage of construction, will be made up for by the NWSDB's own funds. These funds are included in equity portion.

Table 14.12 Income Distribution in Greater Colombo

Income Receiver Quintile (1)	1981/82 Colombo			1985 Urban		1989 Colombo HH Income		
	IR (2)	SU (3)	SU/IR (4)	IR (5)	HH (6)	Unadjusted Rs./mo (7)	Adjustment Factor % (8)	Adjustment Rs./mo (9)
Lowest 20%	3.3	4.0	1.21	1.4	1.7	514	+22.5	630
Second 20%	6.5	7.1	1.10	5.3	5.9	1,786	+17.0	2,090
Third 20%	9.8	11.1	1.13	9.9	11.3	3,420	+7.5	3,677
Fourth 20%	16.3	18.0	1.10	15.8	17.6	5,326		5,326
Highest 20%	64.1	59.8	0.93	67.6	63.5	19,217		19,217
Total	100	100		100	100	30,263		30,940

Note IR - Income Receiver
SU - Spending Unit
HH - Household

Data in columns (2) and (3) from Wasantha (1984).
Data in column (5) from Department of Census and Statistics (1987).
Column (6) = column (5) x (4)
Data in columns (7) and (8) relate to survey over period January to June 1989 reported by Szumllo (1990).

As shown in Figure 14.3, 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 are expected to reach the amount above Rs.1,640 million.

Here, it should be noted that hte 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.

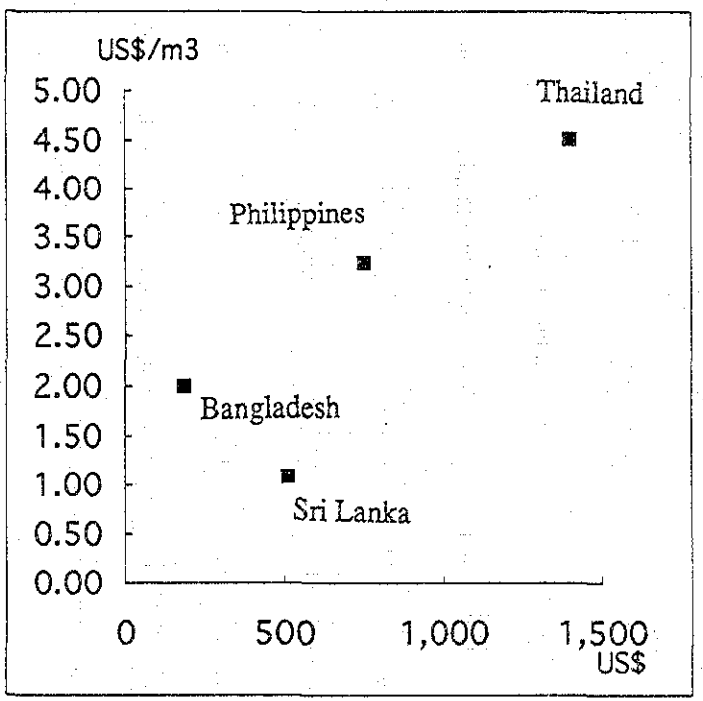
14.4.3 Integrated Repayment Schedule and Balance Sheets Projection

The integrated repayment schedule is shown in Figure 14.4 and in Table 14.16 in which the repayment schedule for Case I (base case) is incorporated into the current repayment schedule shown in Table 3.12 in Chapter 3. The integrated balance sheets up to 2010 is presented in Table 14.17.

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 services n case of without-project as high as Rs.786 million in 2001. 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 14.13 Comparison of Water Charges in Asia Countries

Country	Water Charges	GDP per capita
Thailand	115.00 Bharts	1,402 US$
	= 4.51 US$	(1990)
	US$= 25.50 Bharts	
Philippines	82.75 Peso	750 US$
	= 3.24 US$	(1992)
	US$= 25.51 Peso	
	(1992)	
Bangladesh	69.00 TK	190 US$
	= 2.00 US$	(1991)
	US$= 34.57 TK	
	(1990)	
Sri Lanka	50.50 Rs.	512 US$
	= 1.10 US$	(1991)
	US$= 46.00 Rs.	
	(1994)	



Water charges are calculated for the average monthly consumption per household,being 25 m3/month.

Table 14.14 Project Cost (Phase 1 Base Case - 1994 price)

	Item	Stage 1		Stage 2		Phase 1 Total
		Foreign Portion (Rs.'000)	Local Portion (Rs.'000)	Foreign Portion (Rs.'000)	Local Portion (Rs.'000)	(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 14.15 Financial Plan for the NWSDB up to 2010

(Unit: '000 Rs.)

1 Cashflow for THE NWSDB without the KALU GANGA Project

	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	758,452	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	TOTAL
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						16,275,736
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						9,358,548
	Capital Grant from External Agency	0	0	0	0	0	0	0	0	0	0						0
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						6,917,188
4	Working Capital (Board's own funds) to be required to make up for the cash shortage.	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	5,061,434
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	14,419,982

3 Cashflow to proceed from KALU GANGA

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Revenues							11,264	119,964	245,978	391,394	567,329	768,909	999,112	1,261,216	1,559,305
O & M cost							3,594	37,219	74,196	114,778	161,751	213,134	269,251	330,445	397,197
Gross profit							7,669	82,745	171,783	276,615	405,578	555,775	729,861	930,772	1,162,109
Debt Services															
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
Repayment									178,057	178,057	178,057	178,057	314,418	314,418	314,418
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
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

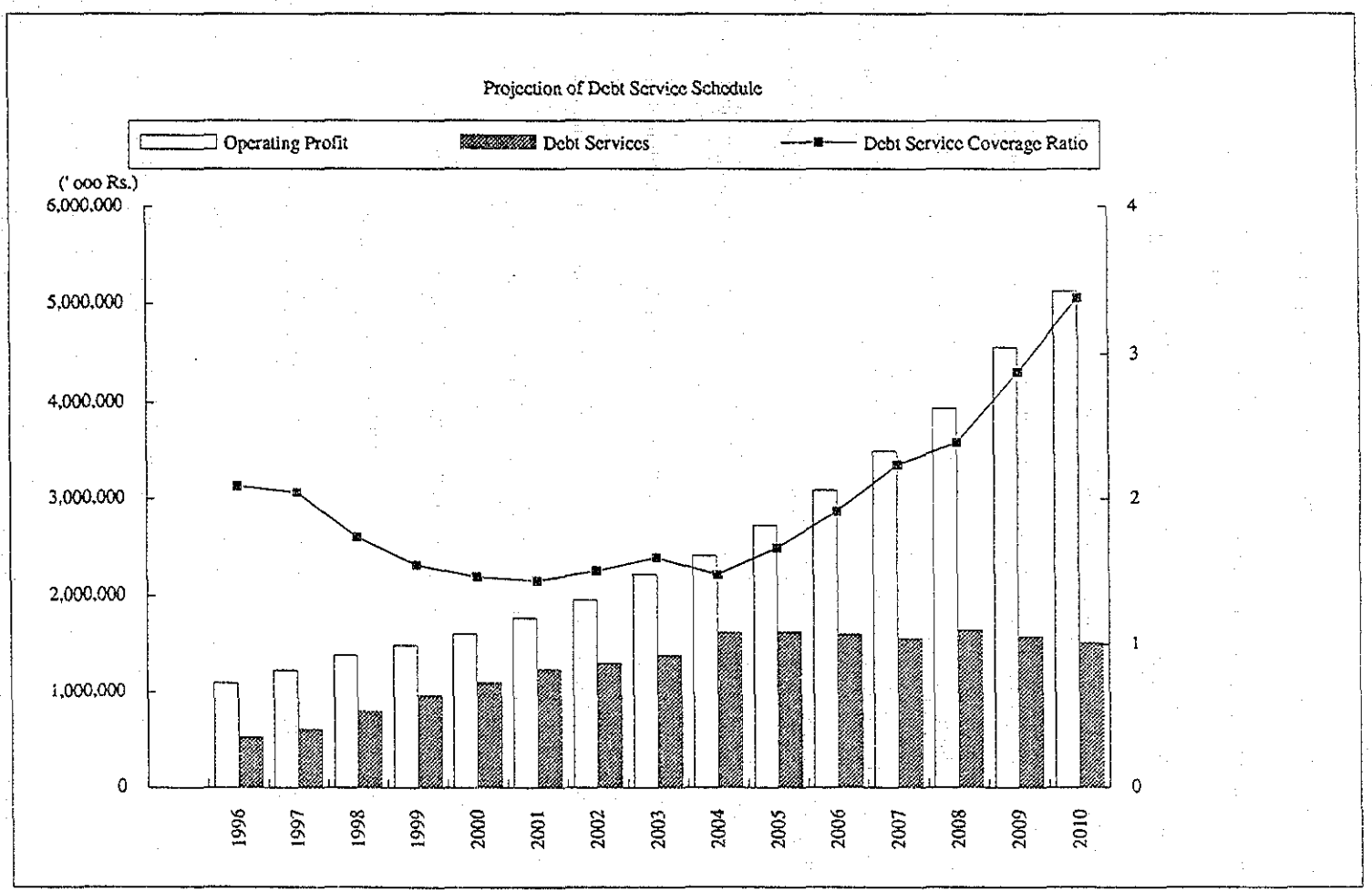
4 Integrated Cashflow to proceed from NWSDB inclusive of the Kalu Ganga

	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	3,697,193	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	1,963,160	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	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
Interest	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
Repayment	71,154	71,154	133,630	156,061	187,965	260,765	260,765	260,765	438,822	438,822	438,822	438,822	575,183	575,183	575,183
Net Cashflow	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
Accu. 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

Figure 14.3 Financial Plan for the NWSDB up to 2010

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	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 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%



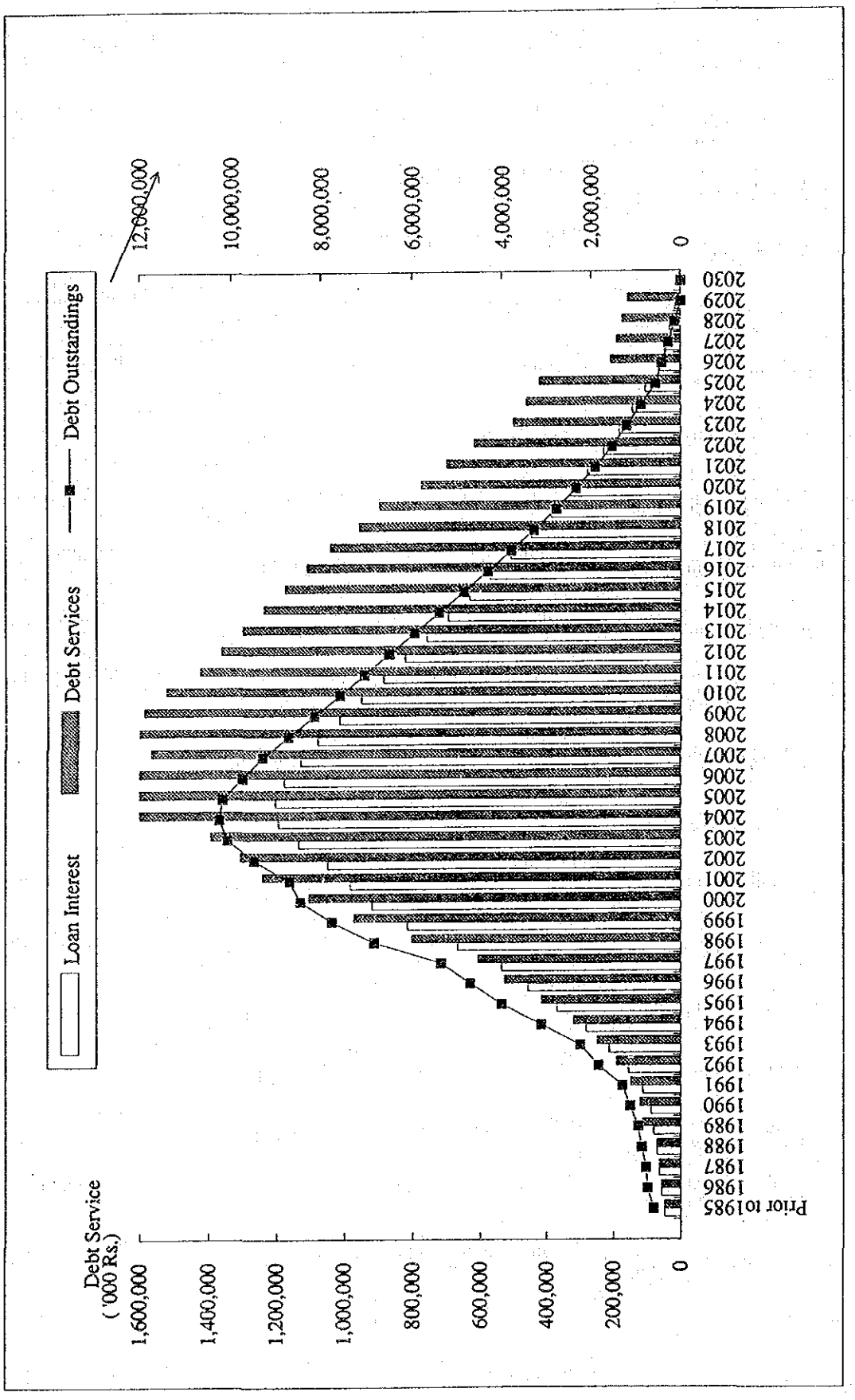


Figure 14.4 Integrated Repayment Schedule (with the Kalu Ganga Project)

Table 14.16 Loan Repayment Schedule (with the Kalu Ganga Project) (1 of 2 sheets)

No.	Project	Currency Unit	Loan Amount			Disbursement & Repayment Schedule: Prior to 1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	IDA 1700	SDR	32.1 mn.		Re-lending to NWSDB			21,828	22,846	32,633	24,160	58,291	98,369	102,166	174,000	122,500								
	Loan Amount (Rs.)	Interest	12.0%		Interest			1,310	3,990	7,319	10,726	15,673	25,073	37,105	53,675	71,465	78,815	78,815	78,815	75,233	71,650	68,068	64,485	60,903
	from Treasury	Period	24	years	Repayment												0	0	29,854	29,854	29,854	29,854	29,854	29,854
	656,793	(Grace	2	years)	Debt outstandings(end)			21,828	44,674	77,307	101,467	159,757	258,126	360,292	534,292	656,792	656,792	656,792	626,938	597,084	567,229	537,375	507,521	477,667
2	ADB 817	SDR	24.6 mn.		Re-lending to NWSDB			6,178	6,852	11,111	11,062	7,686	101,098	246,455	240,800	86,430								
	Loan Amount (Rs.)	Interest	12.0%		Interest			371	1,152	2,230	3,561	4,686	11,213	32,066	61,301	80,935	86,121	86,121	86,121	82,206	78,292	74,377	70,462	66,548
	from Treasury	Period	24	years	Repayment												0	0	32,622	32,622	32,622	32,622	32,622	32,622
	717,674	(Grace	2	years)	Debt outstandings(end)			6,178	13,030	24,141	35,203	42,889	143,988	390,442	631,242	717,672	717,672	717,672	685,051	652,429	619,808	587,186	554,565	521,943
3	ODA	St.Pounds	3,954,768		Re-lending to NWSDB					56,413	21,787	1,639												
	Loan Amount (Rs.)	Interest	12.0%		Interest					3,385	8,077	9,482	9,581	9,581	9,581	9,145	8,710	8,274	7,839	7,403	6,968	6,532	6,097	5,661
	from Treasury	Period	24	years	Repayment							0	0	0	3,629	3,629	3,629	3,629	3,629	3,629	3,629	3,629	3,629	3,629
	79,842	(Grace	2	years)	Debt outstandings(end)					56,413	78,200	79,839	79,839	79,839	76,210	72,581	68,952	65,323	61,693	58,064	54,435	50,806	47,177	43,547
4	OECF / TE	Yen	1,977 mn.		Re-lending to NWSDB									21,492	200,000	225,000	47,000							
	Loan Amount (Rs.)	Interest	2.5%		Interest									269	3,037	8,350	11,750	12,337	12,337	12,337	11,777	11,216	10,655	10,094
	from Treasury	Period	24	years	Repayment													0	0	22,432	22,432	22,432	22,432	22,432
	493,496	(Grace	2	years)	Debt outstandings(end)									21,492	221,492	446,492	493,492	493,492	493,492	471,060	448,628	426,197	403,765	381,334
5	IDA - 1041	US$	30 mn.		Re-lending to NWSDB	331,868	51,566																	
	Loan Amount (Rs.)	Interest	9.0%		Interest	29,868	34,509	34,509	34,509	34,509	32,940	31,372	29,803	28,235	26,666	25,097	23,529	21,960	20,392	18,823	17,254	15,686	14,117	12,548
	from Treasury	Period	24	years	Repayment			0	0	17,429	17,429	17,429	17,429	17,429	17,429	17,429	17,429	17,429	17,429	17,429	17,429	17,429	17,429	17,429
	383,439	(Grace	2	years)	Debt outstandings(end)	331,868	383,434	383,434	383,434	366,005	348,576	331,147	313,718	296,289	278,860	261,430	244,001	226,572	209,143	191,714	174,285	156,856	139,427	121,998
6	USAID	US$	30 mn.		Re-lending to NWSDB				30,607	7,850	13,370	21,891	3,221	0	0	0	0	0	0	0	0	0	0	0
	Loan Amount (Rs.)	Interest	2.0%		Interest				306	691	903	1,255	1,507	1,539	1,539	1,539	1,469	1,399	1,329	1,259	1,189	1,119	1,049	979
	from Treasury	Period	24	years	Repayment									0	0	3,497	3,497	3,497	3,497	3,497	3,497	3,497	3,497	3,497
	76,945	(Grace	2	years)	Debt outstandings(end)				30,607	38,457	51,827	73,718	76,939	76,939	76,939	73,441	69,944	66,446	62,949	59,451	55,954	52,456	48,959	45,461
7	FRENCH - TRINCO	FF	112.47 mn.		Re-lending to NWSDB	210,166	16,170																	
	Loan Amount (Rs.)	Interest	6.0%		Interest	12,610	13,095	13,580	13,580	13,580	12,963	12,346	11,728	11,111	10,494	9,876	9,259	8,642	8,024	7,407	6,790	6,173	5,555	4,938
	from Treasury	Period	24	years	Repayment			0	0	10,288	10,288	10,288	10,288	10,288	10,288	10,288	10,288	10,288	10,288	10,288	10,288	10,288	10,288	10,288
	226,343	(Grace	2	years)	Debt outstandings(end)	210,166	226,336	226,336	226,336	216,048	205,760	195,471	185,183	174,895	164,606	154,318	144,030	133,741	123,453	113,165	102,876	92,588	82,300	72,011
8	FRENCH - NEGOMBO I	US$	3.753 mn.		Re-lending to NWSDB	45,329	10,138																	
		FF	35 mn.		Interest	4,986	5,544	6,101	6,101	6,101	5,824	5,547	5,269	4,992	4,715	4,437	4,160	3,882	3,605	3,328	3,050	2,773	2,495	2,218
	Loan Amount (Rs.)	Interest	11.0%		Repayment			0	0	2,522	2,522	2,522	2,522	2,522	2,522	2,522	2,522	2,522	2,522	2,522	2,522	2,522	2,522	2,522
	from Treasury	Period	24	years	Debt outstandings(end)	45,329	55,467	55,467	55,467	52,945	50,424	47,902	45,381	42,859	40,338	37,816	35,294	32,773	30,251	27,730	25,208	22,686	20,165	17,643
	55,475	(Grace	2	years)				130,511																
9	FRENCH - NEGOMBO II	FF	35 mn.		Re-lending to NWSDB	6,630	41,525																	
10	FRENCH - KURUNEGARA	FF	14.724 mn.		Re-lending to NWSDB	15,306	10,002	1,557	0	0	0	6,619	687											
11	FRENCH - BADULLA	FF	15 mn.		Re-lending to NWSDB			6,642	32,377	0	0	0	5,950											
12	FRENCH - AMBATALE	FF	140 mn.		Re-lending to NWSDB						6,281	111,100	361,926	65,016										
13	ADB - 1235	SDR	28.31mn.		Re-lending to NWSDB										49,450	150,500	219,300	270,900	73,100					
	Loan Amount (Rs.)	Interest	12.0%		Interest										2,967	14,964	37,152	66,564	87,204	91,590	91,590	91,590	87,427	83,263
	from Treasury	Period	24	years	Repayment															0	0	34,694	34,694	34,694
	763,263	(Grace	2	years)	Debt outstandings(end)										49,450	199,950	419,250	690,150	763,250	763,250	763,250	728,556	693,862	659,169
14	OECF - T/S	Yen	3,726 mn.		Re-lending to NWSDB										21,900	47,500	253,250	360,700	155,000					
	Loan Amount (Rs.)	Interest	12.0%		Interest										1,314	5,478	23,523	60,360	91,302	100,602	100,602	100,602	96,029	91,456
	from Treasury	Period	24	years	Repayment															0	0	38,107	38,107	38,107
	838,364	(Grace	2	years)	Debt outstandings(end)										21,900	69,400	322,650	683,350	838,350	838,350	838,350	800,243	762,135	724,028
15	Proposed New Projects				Re-lending to NWSDB									16,000	226,680	311,660	134,340	13,200	0	0	0	0	0	0
		Interest	12%		Interest									960	15,521	47,821	74,581	83,434	84,226	84,226	82,311	78,483	74,654	70,826
			31,904		Repayment																31,904	31,904	31,904	31,904
		1			Debt outstandings(end)									16,000	242,680	554,340	688,680	701,880	701,880	701,880	669,976	638,071	606,167	574,263
16	KALU GANGA				Debt outstandings(beg.)													125,665	190,699	1,553,814	2,649,752	3,534,343	4,041,991	5,092,511
					(Disbursed to Treasury)												267,324	137,558	3,178,612	2,548,526	2,025,730	1,147,032	2,444,900	1,960,255
	Loan Amount (Rs.)		12%		Re-lending to NWSDB												125,665	65,034	1,363,115	1,095,938	884,591	507,648	1,050,520	845,117
	from Treasury				Interest												7,540	18,982	104,671	252,214	371,046	454,580	548,070	661,808
	6,917,187		1		Repayment												0	0	0	0	0	0	0	0
					Debt outstandings(end)												125,665	190,699	1,553,814	2,649,752	3,534,343	4,041,991	5,092,511	5,937,628
17	Local Loans	Rs.			Re-lending to NWSDB						130,471													
		Interest	9%		Interest							11,742	11,449	11,155	10,862	10,568	10,275	9,981	9,687	9,394	9,100	8,807	8,513	8,220
		Period	40	years	Repayment							3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262
		(Grace	0	years)	Debt outstandings(end)						130,471	127,209	123,947	120,686	117,424	114,162	110,900	107,639	104,377	101,115	97,853	94,591	91,330	88,068

		Prior to1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
TOTAL	Debt outstandings(beg.)	0	609,299	738,699	774,903	867,586	943,165	1,117,867	1,289,403	1,824,963	2,240,401	3,113,912	4,011,087	4,719,485	5,358,161	6,815,743	7,755,617	8,452,239	8,699,116	9,488,866
	Re-lending to NWSDB	609,299	129,400	36,205	92,683	108,007	207,131	207,226	571,250	451,128	912,830	943,590	779,555	709,834	1,591,215	1,095,938	884,591	507,648	1,050,520	845,117
Loan Amount (Rs.)	Loan Interest	50,030	58,598	64,697	70,900	81,018	88,333	112,641	155,097	212,260	280,579	368,343	454,877	535,104	666,263	813,091	915,047	979,791	1,045,754	1,131,966
from Treasury	Capital Repayment	0	0	0	0	32,428	32,428	35,590	35,690	35,690	39,319	46,415	71,157	71,157	133,633	156,065	187,969	260,770	260,770	260,770
11,880,479	Debt outstandings(end)	609,299	738,699	774,903	867,586	943,165	1,117,867	1,289,403	1,824,963	2,240,401	3,113,912	4,011,087	4,719,485	5,358,161	6,815,743	7,755,617	8,452,239	8,699,116	9,488,866	10,073,213

Table 14.16 Loan Repayment Schedule (with the Kalu Ganga Project) (2 of 2 sheets)

No.	Project	2004	2005	2006	2007	2008	2009	2010	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
1	IDA 1700																					656,793
		57,320	53,738	50,155	46,572	42,990	39,407	35,825	7,165	3,582												1,290,339
		29,854	29,854	29,854	29,854	29,854	29,854	29,854	29,854	29,854												656,793
		447,813	417,958	388,104	358,250	328,396	298,541	268,687	29,853	-1												
2	ADB 817																					717,674
		62,633	58,719	54,804	50,889	46,975	43,060	39,146	7,829	3,914												1,360,141
		32,622	32,622	32,622	32,622	32,622	32,622	32,622	32,622	32,622												717,674
		489,321	456,700	424,078	391,457	358,835	326,214	293,592	32,620	-2												
3	ODA																					79,842
		5,226	4,790	4,355	3,919	3,484	3,048	2,613														150,280
		3,629	3,629	3,629	3,629	3,629	3,629	3,629														79,842
		39,918	36,289	32,660	29,031	25,401	21,772	18,143														
4	OECF / TE																					493,496
		9,533	8,973	8,412	7,851	7,290	6,729	6,169	1,682	1,121	561											189,958
		22,432	22,432	22,432	22,432	22,432	22,432	22,432	22,432	22,432	22,432											493,496
		358,902	336,470	314,039	291,607	269,175	246,744	224,312	44,859	22,428	-4											
5	IDA - 1041																					383,439
		10,980	9,411	7,843	6,274	4,705	3,137	1,568														530,244
		17,429	17,429	17,429	17,429	17,429	17,429	17,429														383,439
		104,569	87,140	69,711	52,282	34,853	17,424	-5														
6	USAID	0	0	0	0	0	0	0														76,945
		909	839	769	699	629	559	490														25,434
		3,497	3,497	3,497	3,497	3,497	3,497	3,497														76,945
		41,964	38,466	34,969	31,471	27,974	24,476	20,979														
7	FRENCH - TRINCO																					226,343
		4,321	3,703	3,086	2,469	1,851	1,234	617														209,033
		10,288	10,288	10,288	10,288	10,288	10,288	10,288														226,343
		61,723	51,435	41,146	30,858	20,570	10,281	-7														
8	FRENCH - NEGOMBO I																					55,475
		1,941	1,663	1,386	1,109	831	554	276														92,889
		2,522	2,522	2,522	2,522	2,522	2,522	2,522														55,475
		15,122	12,600	10,078	7,557	5,035	2,514	-8														
9	FRENCH - NEGOMBO II																					48,164
10	FRENCH - KURUNEGARA																					34,179
11	FRENCH - BADULLA																					44,981
12	FRENCH - AMBATALE																					544,334
13	ADB -1235																					763,263
		79,100	74,937	70,774	66,610	62,447	58,284	54,121	20,815	16,651	12,488	8,325	4,162									1,445,300
		34,694	34,694	34,694	34,694	34,694	34,694	34,694	34,694	34,694	34,694	34,694	34,694									763,263
		624,475	589,781	555,087	520,394	485,700	451,006	416,312	138,762	104,068	69,375	34,681	-13									
14	OECF - T/S																					838,362
		86,883	82,310	77,738	73,165	68,592	64,019	59,446	22,863	18,290	13,717	9,144	4,571									1,540,086
		38,107	38,107	38,107	38,107	38,107	38,107	38,107	38,107	38,107	38,107	38,107	38,107									838,364
		685,920	647,813	609,705	571,598	533,490	495,383	457,275	152,416	114,308	76,201	38,093	-14									
15	Proposed New Proj	0	0	0	0	0	0	0	0	0	0	0										701,895
		66,997	63,169	59,340	55,512	51,683	47,855	44,026	13,398	9,569	5,741	1,912										1,317,250
		31,904	31,904	31,904	31,904	31,904	31,904	31,904	31,904	31,904	31,904	31,904										701,895
		542,358	510,454	478,550	446,645	414,741	382,837	350,933	95,698	63,794	31,889	-15										
16	KALU GANGA	5,937,628	6,376,120	6,561,073	6,383,016	6,204,959	5,890,542	5,576,124	3,060,783	2,746,366	2,431,948	2,117,531	1,803,113	1,488,696	1,174,278	859,860	545,443	409,082	272,721	136,361	0	
		1,421,033	822,989																			15,953,959
		616,549	363,010	0																		6,917,187
		749,508	786,915	787,329	765,962	744,595	706,865	669,135	367,294	329,564	291,834	254,104	216,374	178,643	140,913	103,183	65,453	49,090	32,727	16,363	0	13,302,263
		178,057	178,057	178,057	178,057	314,418	314,418	314,418	314,418	314,418	314,418	314,418	314,418	314,418	314,418	314,418	136,361	136,361	136,361	136,361	0	6,917,187
		6,376,120	6,561,073	6,383,016	6,204,959	5,890,542	5,576,124	5,261,707	2,746,366	2,431,948	2,117,531	1,803,113	1,488,696	1,174,278	859,860	545,443	409,082	272,721	136,361	0	0	
17	Local Loans																					130,488
		7,926	7,633	7,339	7,045	6,752	6,458	6,165	3,816	3,523	3,229	2,936	2,642	2,348	2,055	1,761	1,468	1,174	881	587	294	240,719
		3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	3,262	130,471
		84,806	81,544	78,283	75,021	71,759	68,497	65,235	39,141	35,880	32,618	29,356	26,094	22,832	19,571	16,309	13,047	9,785	6,524	3,262	0	
		2004	2005	2006	2007	2008	2009	2010	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
	TOTAL	10,073,213	10,250,935	10,175,118	9,736,290	9,297,463	8,722,275	8,147,088	3,787,007	3,279,715	2,772,426	2,327,613	1,905,243	1,514,790	1,197,110	879,431	561,752	422,129	282,507	142,884	3,262	
		616,549	363,010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12,712,724
		1,192,139	1,202,019	1,174,907	1,126,013	1,077,120	1,011,863	946,606	444,862	386,216	327,570	276,421	227,749	180,992	142,968	104,945	66,921	50,264	33,607	16,950	264	22,931,117
		438,827	438,827	438,827	438,827	575,188	575,188	575,188	507,292	507,292	444,817	422,385	390,481	317,679	317,679	317,679	139,622	139,622	139,622	139,622	3,262	12,712,844
		10,250,935	10,175,118	9,736,290	9,297,463	8,722,275	8,147,088	7,571,900	3,279,715	2,772,423	2,327,609	1,905,228	1,514,763	1,197,110	879,431	561,752	422,129	282,507	142,884	3,262	0	

Table 14.17 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
									1									
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	37,394,436	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	1,572,650	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	485,361	0	0	0	0	0
LONG-TERM LIABILITIES	3,761,393	4,634,905	5,532,083	6,301,979	6,974,813	9,242,602	10,831,994	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 thru. Treasury	330,957	912,830	943,590	841,050	743,988	2,401,419	1,745,453	1,396,201	799,621	1,674,936	1,345,998	979,978	573,992	0	0	0	0	0
Minus Capital Repayment	33,865	39,318	46,412	71,154	71,154	133,630	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 Outstandings(end)	2,224,408	3,097,920	3,995,098	4,764,994	5,437,828	7,705,617	9,295,009	10,503,245	11,042,101	12,456,272	13,541,505	14,085,899	14,224,307	13,788,723	13,353,139	12,784,173	12,215,207	11,646,241
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	1,475,771	3,091,243	2,484,158	1,808,636	1,059,353	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	1,726,122	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)	228,232	307,000	377,000	432,000	456,000	477,000	524,700	577,170	687,108	652,753	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	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
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	1,113,543	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	2,300,423	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	18,200,197	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	53,986,464	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	4,634,905	5,532,083	6,301,979	6,974,813	9,242,602	10,831,994	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	37,394,436	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		-84,907	-214,053	-388,077	-627,976	-815,830	-884,799	-932,693	-1,077,957	-1,345,776	-1,785,920	-2,184,950	-2,892,234	-3,987,637	-5,534,577	-7,446,605	-10,046,724	-13,276,912
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LIABILITIES & SHAREHOLDERS'EQUITY	18,200,197	20,773,411	23,351,650	25,751,711	27,789,550	35,999,387	42,105,163	46,931,807	48,220,469	51,158,959	53,432,507	54,975,569	55,717,131	55,349,736	54,935,215	54,480,115	53,986,463	53,456,188

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 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 cuurent water organization. In case that this Project be implemented, the debt service would rise up to as large as Rs.1,631 in 2004, or six times as large as that of 1993.

In light of the this financial situation concerning debt burban 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 considerarion of affordability.

Under such conditions and a strong intention of the NWSDB 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 resonable level as shown 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 study on the tariff revision is strongly recommended to be carried out by the Board 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 programmes

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[1] and ROE[2] calculation was prepared based on the estimated costs and revenue. The figure of ROE is more concern for the corporate entity. Because this figure show 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 chapter 14.4.1.

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 details of the computation are presented in Annex A in this volume.

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 %

The project will be viable if the tariff is allowed to be increased to reasonable level.

15.1.3 Sensitivity Analysis

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

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[1] Financial Internal Rate of Return (FIRR)

The Project is evaluated as a whole in terms of "Financial Internal Rate of Return" based on the gross profit which is equal to water sales revenue minus operating expense, being as cash inflow and capital investment such as intake, water treatment plant and transmission, etc. as cash outflow. In this analysis, no interest is considered, because all the capital expenditure is assumed to be financed by the equity.

[2] Return on Equity (ROE)

The Project is evaluated in terms of "Return on Equity" on a cash-flow basis in which the profit after interest and corporate tax plus depreciation is regarded as the main source of cash inflow, and capital expenditures and loan repayment are regarded as the main source of cash outflow.

Table 15.1 Financial Analysis for the Kalu Ganga Project

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	50	
1	INCOME STATEMENTS	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2045	
	Revenues	0	0	0	0	0	0	11,264	119,964	245,978	391,394	567,329	768,909	999,112	1,261,216	1,559,305	24,632,886	314,537,565
	O & M Costs	0	0	0	0	0	0	3,594	37,219	74,196	114,778	161,751	213,134	269,251	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	555,775	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	813,787	813,787	813,787	813,787	813,787	0	16,275,737
	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	13,302,265
	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
	Accu. Profit	-7,540	-26,522	-131,193	-383,407	-754,452	-1,209,032	-2,218,725	-3,267,080	-4,314,097	-5,293,689	-6,489,226	-7,513,200	-8,341,722	-8,931,602	-9,252,415	245,689,313	
2	CASHFLOW STATEMENTS	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2045	
	Plus: Depreciation	0	0	0	0	0	0	469,291	469,291	469,291	469,291	813,787	813,787	813,787	813,787	813,787	0	16,275,737
	Minus: Repayment	0	0	0	0	0	0	0	0	178,057	178,057	178,057	178,057	314,418	314,418	314,418	0	6,917,188
	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	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				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			5,140,352
	Minus: Replacement Cost																	0
	Net Cashflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	178,556	22,441,942	260,188,214
	Accumulated Net Cashflow	0	0	0	0	0	0	0	1	1	1	1	1	1	1	178,557	260,188,214	
	Mobilized Funds																	
	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	834,154	491,131	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
	< 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	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2045	
	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						16,275,737
	Revenues before Interest & Repayment	0	0	0	0	0	0	7,669	82,745	171,783	276,615	405,578	555,775	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	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2045	
	EQUITY (exclu. 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	0	-14,498,901
	ROE= 9.6% 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 (at the year of 1996) =	9.6%
5	FINANCING	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2045	
	EQUITY PORTION	170,018	87,987	1,844,214	1,482,740	1,196,800	686,818	1,421,292	1,143,394	834,154	491,131	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 Outstandings(end of year)	125,665	190,699	1,553,814	2,649,752	3,534,343	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	
	Repayment	0	0	0	0	0	0	0	0	178,057	178,057	178,057	178,057	314,418	314,418	314,418	0	6,917,188
	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					16,275,737
	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						
	NET FIXED ASSETS						9,214,886	8,745,594	8,276,303	7,807,011	7,337,720	13,633,596	12,819,810	12,006,023	11,192,236	10,378,449		
	Depreciation	0	0	0	0	0	0	469,291	469,291	469,291	469,291	813,787	813,787	813,787	813,787	813,787	0	16,275,737

The conditions for the case study are as follows;

Case Study

	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%

Case I Base Case

Case II More concessional condition applied for repayment (internal rate 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 fund, is examined for the financial arrangement purpose. With an increase 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 Sensitivity Analysis

	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 primary objective of the Project is to ameliorate the social welfare of the society, especially in the initial stage of the economic development. The economic analysis has not been carried out in a qualitative manner in the Study financially supported by multilateral aid agencies, mainly due to difficulty in practically-meaningful measurement of costs and benefits.

The implementation of the Project will bring to the society the following socio-economic benefits other than tangible 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 m^3/d in 2010 and 140,234 m^3/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 to 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 to 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 in 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 m^3/d (Existing Production Capacity)

Water transmission plan for the lower demand projected for 2010 is shown in Figure 15.1. Sizes of the transmission pipeline are tabulatedin Table 15.4.

The cost estimated for the alternative scenario is shown on Table 15.5. The results of the financial analysis are as follows;

FIRR	10.1 %
ROE	9.7 %

Table 15.4 Transmission Pipeline for Lower Demand Scenario

Facility	Stage 1 WTP capacity 15 mgd	Stage 2 WTP capacity 31 mgd
Raw Water Transmission Pipeline		
Water Intake to WTP	dia.1200 mm, L= 7,670 m	
Clear Water Transmission Pipeline		
WTP to H.L.R.	dia.1350 mm, L= 3,000 m	-
H.L.R. to Pokunuwita Junction	dia.1000 mm, L= 6,680 m	-
Pokunuwita Junction to Piliyandala	-	dia.1000 mm, L= 17,000 m
Piliyandala to Moratuwa	dia.900 mm, L= 4,800 m	-
Piliyandala to Dehiwala		dia.1000 mm, L= 9,580 m
Moratuwa to Keselwatte	dia.500 mm, L= 3,500 m	-
Pokunuwita J. to Panadura	dia.400 mm, L= 15,250 m	-
Connection to Horana	-	dia.200 mm, L= 2,200 m
Connection to Homagama	dia.400 mm, L= 200 m	
Connection to Kesbewa Sub Area	dia.300 mm, L= 1,000 m	
Storage Facility		
High Level Reservoir	vol. = 30,000 m^3	

15.4 Financial Analysis for Alternative Scenario (II)

Under the ADB Loan Covenant[1], 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 appplied for the Kalu Ganga Project, the conditions for financing the Project are assumed as follows:

1)	15% of the Project Cost	Governemnt grant
2)	85% of the Project Cost	Externatl loan
	20% of the external loan	Governemnt grant
	80% of the external loan	Relending to the NWSDB

[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:

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

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 priod 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 perecnt as same as the base case. As shown in Table 15.6 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 reaschs 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 attainted only when the cost containment program ne executed in a proper manner and the tariff be allowed to increase annually to a reasonable level.

15.5 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.

Lower Demand Scenario (Water Loss - 5% less in Existing Area)

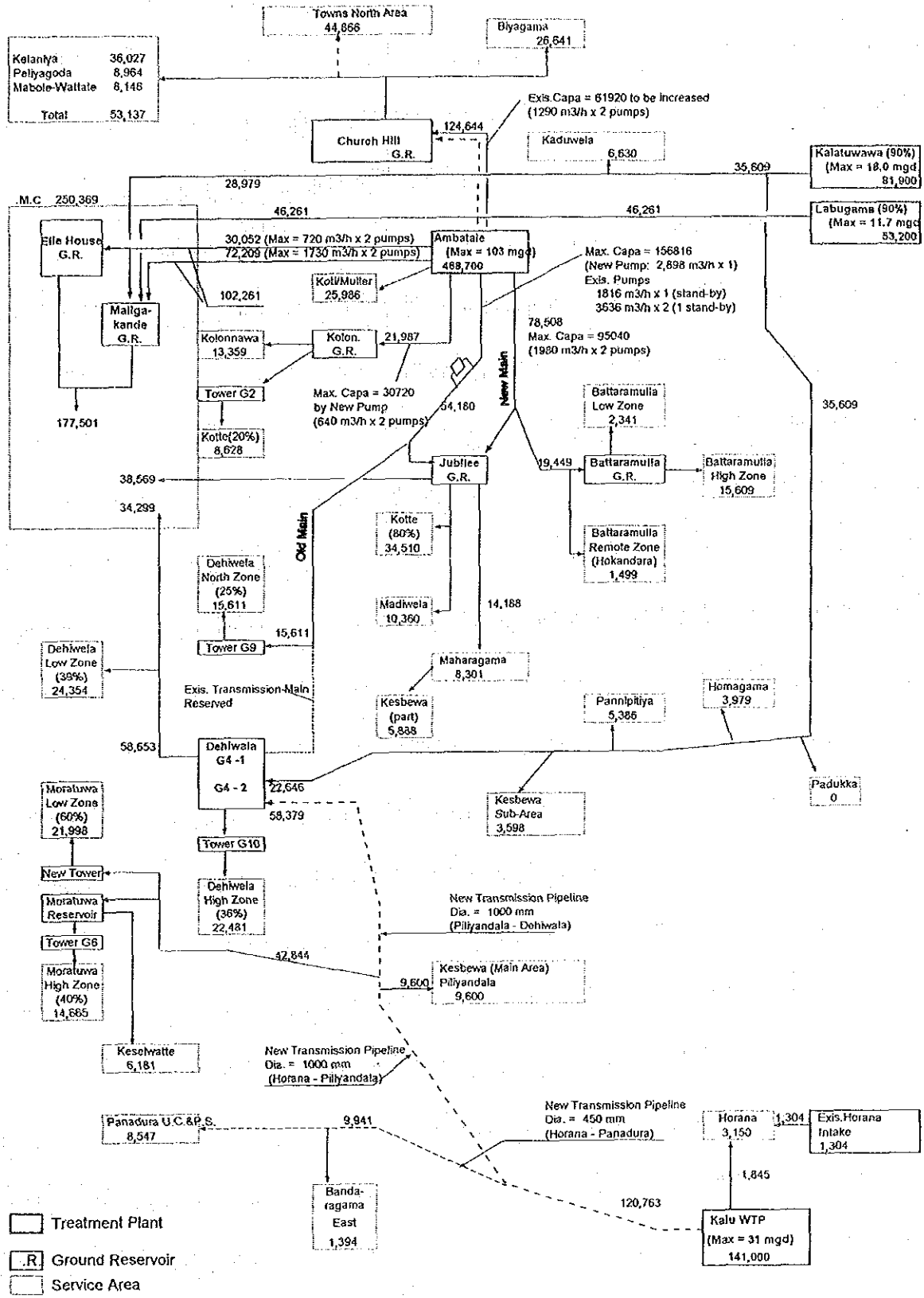


Figure 15.1

Transmission Diagram for 2010 Demand

(Lower Demand Scenario)

Table 15.5 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 15.6 Financial Plan for NWSDB up to 2010 (1 of 2 sheets)

(Unit: '000 Rs.)

1 Cashflow for THE NWSDB without the KALU GANGA Project		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	758,452	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	TOTAL
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						16,275,737
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						5,208,236
	Capital Grant from External Agency	0	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						11,067,501
4	Working Capital (Board's own funds) to be required to make up for the cash shortage.	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	10,532,617
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	15,740,853

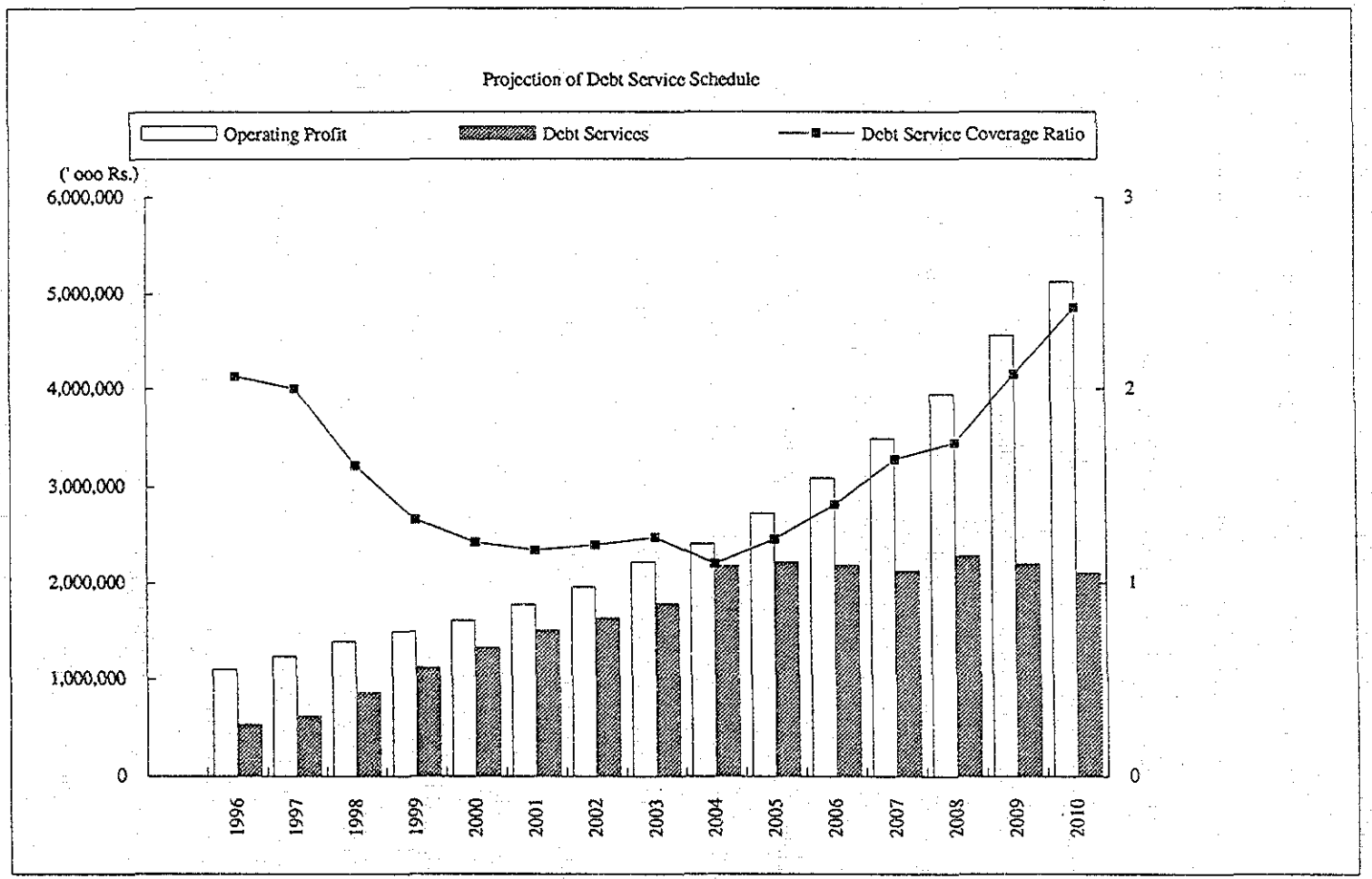
3 Cashflow to proceed from KALU GANGA	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Revenues							11,264	119,964	245,978	391,394	567,329	768,909	999,112	1,261,216	1,559,305
O & M cost							3,594	37,219	74,196	114,778	161,751	213,134	269,251	330,445	397,197
Gross profit							7,669	82,745	171,783	276,615	405,578	555,775	729,861	930,772	1,162,109
Debt Services															
Interest	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
Repayment									284,891	284,891	284,891	284,891	503,068	503,068	503,068
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	3,697,193	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	1,963,160	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
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	545,656	545,656	545,656	545,656	763,833	763,833	763,833
Net Cashflow	566,541	618,965	524,285	373,032	283,542	263,231	327,796	430,470	225,187	509,835	897,300	1,362,046	1,655,547	2,367,021	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 15.6 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%



15.5 Technical Evaluation

In the course of planning the Kalu Ganga Water Supply System, a various kinds 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 maintenace of the system and minimization of the impact on the surrounding environment during and after 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.

15.6 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.

CHAPTER 16

ENVIRONMENTAL PROTECTION CONSIDERATION

16. ENVIRONMENTAL PROTECTION CONSIDERATIONS

16.1 Legislation Related to Environmental Protection

There are numerous pieces of legislation (more than 75) relating to environmental protection, the earliest dating from 1861. A list of the more relevant Ordinances, Laws, Acts and Regulations is given in Table 16.1.

The most significant legislative document is undoubtedly the National Environmental Act No.47 of 1980. The main features of this Act and its subsequent amendments are given below.

16.1.1 National Environmental Act No.47 of 1980

This act, introduced on 29th October 1980, was primarily concerned with the establishment of a Central Environmental Authority (CEA) and an Environmental Council. These bodies were formed to make provision for the "protection and management of the environment" under the following headings:

- Land use
- Natural resources
- Fisheries
- Wildlife
- Forestry
- Soil conservation

Definitions were also given for nine items including "pollution", "environment" and "waste".

16.1.2 National Environmental (Amendment) Act No.56 of 1988

This Act, certified on 12th December 1988, expanded on the 1980 Act by extending its long title to "for the protection, management and enhancement of the environment, for the regulation, maintenance and control of the quality of the environment, for the prevention, abatement and control of pollution".

In particular it introduced the requirement for the submission of proposals for new projects or changes or abandonment of existing projects. Most importantly it required the CEA to issue an annually renewable license to "any person to discharge, deposit or emit waste into the environment in accordance with such standards and criteria as may be prescribed under this act". All persons discharging waste, in whatever form must apply for such a license. Pollution of the air, land and water were included in this act as well as noise pollution.

Table 16.1 Environmental Legislation of Sri Lanka

Name of Laws, Regulations	Effected in
Thoroughfares Ordinance and Act	1861
Irrigation Ordinance	1900
Colombo Municipal Council Waterplant Ordinance	1907
The Forest Ordinance	1907, amended in 1966,1979, 1982
Plant Protection Ordinance No.10	1924
Land Development Ordinance	1935
Factories Ordinance	1945
Irrigation Ordinance	1946
Crown Lands Ordinance	1947
Soil Conservation Act	1951
Water Resources Development Board Act	1964
Land Reclamation and Development Corporation Act	1968, amended in 1982
Mines and Minerals Law No.4	1973
National Water Supply and Drainage Board Act	1974
Sri Lankan Ports Authority Act	1977
Urban Development Authority Act	1978
Agrarian Services Act	1979
Control of Pesticides Act	1980
National Environmental Act No.47	1980
National Aquatic Resources and Development Agency Act	1981
Coast Conservation Act	1981
Marine Pollution Prevention Act	1981
National Resources Energy and Science Authority of Sri Lanka Act	1981
Land Reclamation and Development Corporation Amendment Act	1982
Forest Ordinance Amendment Act	1988
National Environmental Act Amendment	1988
National Environmental (Protection and Quality) Regulations	1990
National Environmental (Procedure for Approval of Projects) Regulations	1993

16.1.3 National Environmental (Protection and Quality) Regulation No.1 of 1990

This expansion of Section 32 of the 1980 Act gave regulations governing applications for discharge licenses and for the first time gave detailed standards covering the following effluents:

- General standards for discharge of effluents into inland surface waters.
- Tolerance limits for industrial effluents discharged for irrigation purposes.
- Tolerance limits for industrial and domestic effluents discharged to marine coastal areas.
- Tolerance limits for effluents from rubber factories discharged into inland surface waters.
- Tolerance limits for effluents from textile industries discharged into inland surface waters.

- Tolerance limits for effluents from tanning industries.

These standards are presented in Table 16.2. The general standards cease to apply when a separate standard exists for a particular industry.

Table 16.2 Environmental Standard from National Environmental (Protection and Quality) Regulation, NO.1, 1990

Parameter	Unit	General standard for discharge of effluents into surface waters	Tolerance Limit for: Industrial effluent discharge on land for irrigation purpose	Industrial & domestic effluents discharged into marine coastal areas	Effluents from rubber factories discharged into inland surface waters: Type 1	Effluents from rubber factories discharged into inland surface waters: Type 2	Effluents from textile industry discharged unto I.S.W.	Effluents from tanning industry discharged into: I.S.W.	Effluents from tanning industry discharged into: M.C.W.
Total Suspended Solids	mg/l	50.0	-	150*2	100	100	50.0	100	150
Particle Size of Suspended Solids	mm	≤0.85	-	Fltble ≤ 3.0 Stble≤ 0.85	-	-	-	-	-
pH at Ambient Temperature		6.0 to 8.5	5.5 to 9.0	6.0 to 8.5	6.5 to 8.5	6.5 to 8.5	6.5 to 8.5	5.5 to 9.0	5.5 to 9.0
BOD_5	mg/l	30.0	250	100	60.0	50.0	60.0	60	100
Temperature	°C	40.0*1	-	45.0*3	-	-	40.0*4	-	-
Oils and Greases	mg/l	10.0	10.0	20.0	-	-	10.0	10.0	20.0
Phenolic Compounds (as OH)	mg/l	1.0	-	5.0	-	-	1.0	1.0	5.0
Cyanides (as CN)	mg/l	0.2	-	0.2	-	-	-	-	-
Sulphides (as S)	mg/l	2.0	-	5.0	2.0	2.0	2.0	2.0	5.0
Fluorides (as F)	mg/l	2.0	-	15.0	-	-	-	-	-
Total Residual Chlorine	mg/l	1.0	-	1.0	-	-	-	-	-
Arsenic (as A's)	mg/l	0.2	0.2	0.2	-	-	-	-	-
Cadmium (as Cd)	mg/l	0.1	2.0	2.0	-	-	-	-	-
Chromium (as Cr) Total	mg/l	0.1	1.0	1.0	-	-	2.0	2.0	2.0
Hexavalent Chromium (as Cr)	mg/l	-	-	-	-	-	0.5	0.5	0.5
Copper (as Cu)	mg/l	3.0	-	3.0	-	-	3.0	-	-
Lead (as Pb)	mg/l	0.1	1.0	1.0	-	-	-	-	-
Mercury (as Pb)	mg/l	0.0005	0.01	0.01	-	-	-	-	-
Nickel (as Ni)	mg/l	3.0	-	5.0	-	-	-	-	-
Selenium (as Se)	mg/l	0.05	-	0.05	-	-	-	-	-
Zinc (as Zn)	mg/l	5.0	-	5.0	-	-	5.0	-	-
Ammonia Nitrogen (as N)	mg/l	50.0	-	50.0	300	40	60.0	-	-
Pesticides		undetectable	-	-	-	-	-	-	-
Radio Active Material α Emitters	μ curie/l	10^{-7}	10^{-9}	10^{-8}	-	-	-	-	
Radio Active Material β Emitters	μ curie/l	10^{-8}	10^{-8}	10^{-7}	-	-	-	-	-
COD	mg/l	250	-	250	400	400	250	250	300
Total Dissolved Solids	mg/l	-	2,100	-	-	-	-	-	-
Chloride (as Cl)	mg/l	-	600	-	-	-	70.0	1,000	not applicable
Sulphate (as SO_4)	mg/l	-	1,000	-	-	-	-	-	-
Boron (as B)	mg/l	-	2.0	-	-	-	-	-	-
Sodium Absorption Ratio (SAR)		-	10 to 15	-	-	-	-	-	-

Table 16.2 Environmental Standard from National Environmental (Protection and Quality) Regulation, NO.1, 1990 (cont'd)

Parameter	Unit	General standard for discharge of effluents into surface waters	Tolerance Limit For: Industrial effluent discharge on land for irrigation purpose	Industrial & domestic effluents discharged into marine coastal areas	Effluents from rubber factories discharged into inland surface waters: Type 1	Effluents from rubber factories discharged into inland surface waters: Type 2	Effluents from textile industry discharged unto I.S.W.	Effluents from tanning industry discharged into: I.S.W.	Effluents from tanning industry discharged into: M.C.W.
Residual Sodium Carbonate	mol/l	-	2.5	-	-	-	-	-	-
Organo Phosphorous Compounds		-	-	1.0	-	-	-	-	-
Chlorinated Hydrocarbons (as Cl)	mg/l	-	-	0.02	-	-	-	-	-
Total Solids	mg/l	-	-	-	1,500	1,000	-	-	-
Total Nitrogen	mg/l	-	-	-	300	60	-	-	-
Alkalinity (as $CaCO_3$)	mg/l	-	-	-	-	-	-	750	not applicable

*1 Not to be exceeded in any section of the stream within 15 m downstream from the effluent outlet.
*2 For process wastewaters. For cooling water effluents : total SS of influent cooling water plus 10%
*3 At the point of discharge.
*4 Measured at the site of sampling.
NOTES :
For all but Industrial Effluents Discharged on land for Irrigation
(1) All efforts should be made to remove color and unpleasant odor as far as practicable.
(2) These values are based on dilution of effluents by at least 8 volumes of clean receiving water. If the dilution is below 8 times, the permissible limits are multiplied by 1/8 of the actual dilution.

A point worth noting is absence of any value for color and odor in any of the standards, they merely state that "all efforts should be made to remove color and unpleasant odor as far as possible". This is particularly relevant to the textile industries as they can produce highly colored effluents and to the tanning industry which produces noxious wastes.

16.1.4 National Environmental (Procedure for Approval of Projects) Regulations No.1 of 1993

These regulations expand Section 23 Z of the 1988 Amendment Act and give details of the projects and undertakings for which approval will be necessary.

Initial Environmental Examination reports (IEE) and Environmental Impact Assessment reports (EIA) are defined in these regulations and must be submitted, as required, to one of Fourteen specified state agencies which will act as Project Approving Agencies.

16.1.5 Decentralization

Under the powers contained in Section 26(1)(5) of the National Environmental Act No.47 of 1980, from 1st January 1994 the Ministry of Environment and Parliamentary Affairs implemented a scheme

of decentralization of environmental functions to Divisional Authorities. With the scheme the following functions are assigned to the Divisional Secretaries.

- Assist in implementing the National Environmental Action Plan at the divisional level.
- Assist in creating public awareness of the environment.
- Coordination on matters relating to environment and development.

The responsibilities placed upon the Local Authorities include the abatement and control of environmental pollution and the issuing of environmental protection licenses in respect of low polluting industries. A list of industries and farms, some with maximum daily output limits, has been published which fit this category. Any industry not specified or one with a higher than specified output must still apply to the CEA for a license to discharge.

A number of difficulties are foreseen in achieving satisfactory results from this scheme. The major problem will be the lack of equipment and expertise of Local Authority employees. Where such problems occur, the CEA is required to provide the necessary manpower and facilities. With the current limited resources of the CEA it is difficult to accept that the decentralization scheme can be adequately implemented in the short to medium term.

The CEA is aware of the problems and believes there is an urgent need to train Local Authority officers to carry out the tasks required for pollution assessment and control.

16.1.6 National Environmental Action Plan

Although not a piece of legislature mentioned must be made of the National Environmental Action Plan, the plan was published in October 1991 by the Ministry of Environment and Parliamentary Affairs. Highly detailed, the plan presented a phased environmental agenda for the period 1992 to 1996 covering the following:

1)	Land resources	7)	Urban pollution
2)	Water resources	8)	Industrial pollution
3)	Mineral resources	9)	Energy
4)	Coastal resources	10)	Environmental education
5)	Forestry	11)	Culture
6)	Bio-diversity and wildlife	12)	Institutional capacity

Some progress has been made in implementing the plan but it is now believed that completion by 1996 is impossible.

16.2 Environmental Requirements in the Implementation of the Project

16.2.1 Legal Requirements

There are two environmental aspects of the project which are affected by current Sri Lankan legislation:

- Obtaining consent to construct the intake and treatment plant.
- Obtaining an environmental protection license for waste water discharge from the treatment plant.

(1) Project Approval

The National Environmental (Procedure for Approval of Projects) Regulations No.1 of 1993, Part I Section (13), states that approval is only required for the construction of water treatment plants of capacity exceeding 0.5 million m^3/d. As the proposed Kalu Ganga treatment plant will have a capacity well below this figure, approval will not be required under this section of the Act.

Part II of the Act however states that approval will be required for all projects and undertakings listed in part I, irrespective of their magnitudes, if they are located wholly or partly within the areas specified in Part III of the Schedule. Part III is reproduced as Table 16.3. Of particular significance is the inclusion of projects within "60 m from the bank of a public stream as defined in the Crown Lands Ordinance (Chapter 454) and having a width of more than 25 m at any point in its course". The intake structure will be within such a prescribed area.

From the above it must be concluded that approval will be necessary for the treatment plant project.

The regulations require that requested preliminary information on the project be submitted as early as possible to the appropriate Project Approving Agency. This Agency and the CEA will subject the information to environmental scooping to set the terms of reference for either and IEE or EIA, whichever is considered appropriate. The Project Approving Agency can consider that the preliminary information is adequate to be an IEE. A list of the state agencies specified as Project Approving Agencies is given in the Regulations and is reproduced as Table 16.4.

No information is given as to the procedure for selecting the appropriate Project Approving Agency, who should do so, or how the request for preliminary information on the project shall be issued.

(2) Environmental Protection License

Under the National Environmental (Protection and Quality) Regulation No.1 of 1990, the discharge of wastewater from the proposed treatment plant will be covered by Schedule 1, General Standards for Discharge of Effluents to Inland Surface Waters. This is reproduced in Table 16.4.

The National Environmental Act No.47 of 1980 and its subsequent amendments require all industries which discharge any type of waste into the environment to obtain an Environmental Protection License.

Under the Decentralization Policy introduced on 1st January 1994, Local Authorities are responsible for the issue of licenses for a range of low polluting industries. Water treatment plants are not covered under this policy and therefore the license must be issued by the CEA.

Table 16.3 National Environmental (Procedure for Approval of Projects) Regulations No.1 of 1993

PART III
1. Within 100m from the boundaries of or within any area declared under the National Heritage Wilderness Act No.3 of 1988 the Forest Ordinance (Chapter 451) Whether or not such areas are wholly or partly within the Coastal Zone as defined in the Coast Conservation Act No.57 of 1981.
2. Within the following areas whether or not the areas are wholly or partly within the Coastal Zone. any erodable area declared under the Soil Conservation Act (Chapter 450) any Flood Area declared under the Flood Protection Ordinance (Chapter 449) and any flood protection area declared under the Sri Lanka Land Reclamation and Development Corporation Act No.15 of 1968 as amended by act No.52 of 1982 60 meters from the bank of a public stream as defined in the Crown Lands Ordinance (Chapter 454) and having a width of more than 25 meters at any point of its course any reservation beyond the full supply level of a reservoir any archeological reserve, ancient or protected monument as defined or declared under the Antiquities ordinance (Chapter 188) any area declared under the Botanical Gardens Ordinance (Chapter 446)
In these regulations unless the context otherwise requires - "hazardous waste" means any waste which has toxic, corrosive, flammable, reactive, radio active or infectious characteristics. "reservoir" means an expanse of water resulting from man made constructions across a river or a stream to store or regulate water. Its "environs" will include that area extending up to a distance of 100 meters from full supply level of the reservoir inclusive of all islands falling within the reservoir.

16.3 Environmental Impact Assessment

16.3.1 Introduction

The proposed project concerns the use of the Kalu Ganga as the raw water source for a new 182,000 m^3/d water treatment plant to feed the Greater Colombo area. The project will be made up of five components:

1) A raw water intake structure beside the Kalu Ganga close to Anguruwatote

Table 16.4 Project Approving Agencies Specified in the National Environmental (Procedure for Approval of Projects) Regulations, No.1 of 1993

Ministry of Policy Planning and Implementation, Ministry of Lands, Irrigation and Mahaweli Development, Ministry of Power and Energy, Ministry of Transport and Highways, Ministry of Industries, Science and Technology, Ministry of Housing and Construction, Ministry of Fisheries and Aquatic Resources, Ministry of Agricultural Development and Research, Coast Conservation Department, Central Environmental Authority established by the National Environmental Act No.47 of 1980, Urban Development Authority established by the Urban Development Authority Law No.41 of 1978, Board of Investment of Sri Lanka established by the Greater Colombo Economic Commission Law No.** of 1978 as amended interlia by Act No.49 of 1992, Geological Survey and Mines Bureau established by the Mines and Minerals Act No.33 of 1992, Ceylon Tourist Board established by the Ceylon Tourist Board Act No.10 of 1966,

2) A raw water transmission main to convey water from the intake to the treatment plant

3) A water treatment plant located beside the main road to Kalawellawa, about 1 km from the junction with the Horana-Anguruwatote road (B-157)

4) A clear water transmission main between the treatment plant and a new high-level reservoir

5) A new high-level reservoir located on the top of a hill at Wewalakanda, south of Horana town

6) A clear water transmission main between the new high-level reservoir and a service reservoir in the existing service area

The locations of these components are given in Figure 16.1.

It is inevitable that a project of this nature will have some impact on the environment, related both to the size of the areas affected and the nature and extent of the activities to be performed. To carry out an assessment of the possible harmful effects, two main elements were considered:

1) construction phase
2) operation phase

For each of these, the four major elements of the project have been examined:

1) river intake
2) treatment plant
3) high-level reservoir
4) transmission pipelines

The three transmission mains have been grouped together as the environmental problems associated with their construction and operation will be the same.

The nature and extent of the potential impacts of the whole project on the environment have been assessed using the JICA Environmental Guidelines methodology, with particular use of the Screening and Scooping proforma. It would appear that no formal methodology has been prepared by the Sri Lankan authorities, though definitions for "Initial Environmental Evaluation Report", "Environmental Impact Assessment" are contained in The Sri Lankan National Environmental (Procedure for approval of projects) Regulation No. 1 of 1993. The definitions are reproduced in Supporting Report (Volume III)

An initial Screening exercise was carried out, sub-dividing the environment into 23 categories. The result is presented as Table 16.5. This shows that certain aspects of the environment may be subjected to adverse change and thus an Environmental Impact Assessment (EIA) or Initial Environmental Evaluation (IEE) should be prepared.

To this end, a Scooping exercise was performed to assign a degree of severity to the potential environmental impacts. This is presented in Table 16.6. Those items awarded an A (serious impact expected), B (minor impact expected), or C (uncertain) have been subjected to an even more detailed evaluation including an indication of the countermeasures that can be taken to eliminate or minimize the impact. These evaluations are presented in Supporting Report (Volume III).

The following sections give an assessment of each of the 23 environmental factors reviewed for the EIA, considering separately the existing situation and the construction and operation phases of the project.

16.3.2 Existing Situation

(1) Resettlement

There are a few scattered houses in the general area of the proposed intake site, none on the reservoir site but a significant number on the proposed treatment plant site. The existing situation at the treatment plant site is complicated by the apparent intention to resettle a large number of additional

families at that location in the immediate future. the matter is dealt with in greater detail in sub-section 16.3.3.1)

(2) Economic Activities

The proposed sites for the intake and reservoir are currently parts of rubber plantations. The treatment plant site has no commercial crops, animal farms or commercial enterprises at the present time.

(3) Transportation and Daily Life

The local roads in the vicinity of the three proposed project areas are narrow but have only light traffic. The exception to this is the road leading south from Horana. This road is frequently congested on the outskirts of the town but mainly due to parked trucks and stationary busses.

The sites are located in country areas with relatively few houses in any close proximity. The proposed pipeline routes run alongside the roads for most of their length and pass by domestic housing, shops, schools, commercial premises etc.

(4) Interruption to the Community

This item is not relevant to the existing situation except to say that the current communities appear to be stable and to enjoy a reasonably peaceful life.

(5) Cultural Assets and Archaeology

Temples and shrines are fairly plentiful in the whole of the area but none of any antiquity exist on or beside the three main sites.

There are no known archaeological remains on the proposed project sites.

(6) Water and Common Rights

Water rights in the project area are assumed to be those that might exist with respect to the Kalu Ganga. Little if any commercial fishing has been observed and some temporary and minor water abstractions sometimes occur during prolonged dry spells when groundwater levels are reduced.

(7) Sanitation and Health

In common with nearly the entire Greater Colombo area, no sewerage systems exist in any of the areas surrounding the proposed site areas. Poorly designed, inadequate or non existent toilet facilities are to be found in the majority of the houses.

The general health of those people living near to the sites is not known but it must be assumed that water-borne diseases are not uncommon if it approximates to the reported cases for the Greater Colombo districts.

(8) Waste

Household refuse makes up the bulk of the waste generated in the areas surrounding the three main project sites. No formal waste collection appears to be carried out, though Horana town may be an exception. Burning of rubbish at the roadside seems to be a normal occurrence.

(9) Dangers

The dangers faced by the local communities are those to be found in any urban or rural area. They range from traffic accidents to house fires, injuries caused by agricultural equipment to infectious diseases. There are no specific dangers unique to the district.

(10) Topography and Geology

The topography of the three main site areas are varied. The proposed treatment plant site occupies a low hill which rises to a maximum height of 8 m above the surrounding countryside. A stream loops round the site to the west, north and east and discharges into the Kalu Ganga about 2.0 km to the south. Bedrock underlies the site at varying depths and rock outcrops are in evidence scattered over the site area. The type of rock and soil cover are not known at present.

The intake site is close by the Kalu Ganga and lies in the flood plain of the river on it's right bank. The geology of the area is not known at present.

The reservoir site is located on top of a hill to the south of Horana town at Wewalakanda. The crest of the hill is some 80 m above the town and is one of a line of hilltops of approximately the same elevation. The proposed site area comprises a thin soil cover over solid rock of currently unknown composition.

(11) Soil Erosion

Soil erosion is not known to be a problem in any of the proposed site areas.

(12) Groundwater

Groundwater exists under the intake and treatment plant sites. No analyses are available to make any comment on it's quality but wells are used at both locations. It may be presumed that some degree of

sewage pollution is present due to the minimal toilet facilities available to the local residents. The groundwater situation at the reservoir site is unknown but may be assumed to be minimal.

(13) Lakes, Marshes and Rivers

There are no lakes and, with the exception of a few very small areas, no marshes in the locations directly affected by the proposed project.

The Kalu Ganga flows directly beside the intake site and a small stream near to the treatment plant site as described in sub-section 16.3.2.10). More details concerning the stream are given in Suporting Report (Volume III).

There are no rivers or streams near to the reservoir site.

(14) Coastline and Sea

The sea is a significant distance from the project area and as such is not relevant.

(15) Flora and Fauna

As far as can be determined there are no rare or endangered species of flora or fauna in the affected areas. The most prevalent flora comprises rubber trees and rice paddy with grass scrub and common types of trees making up the remainder. Some cattle and water buffaloes are to be seen but do not seem to be plentiful.

(16) Weather

The weather in the region is typical for a wet zone in a tropical climate. There are two monsoon seasons, Giving heaviest rainfall in May/June and in October/November. Mean monthly temperatures vary from around 22 °C in January to around 32 °C in April.

(17) View

The view of the treatment plant site is currently unremarkable, comprising as it does a slight hill rising out of the surrounding countryside. Scrub, grass, bushes and small trees are seen against a backdrop of rubber trees and larger hills in the middle distance.

The intake site is shrouded in rubber trees and cannot be seen except at close quarters.

The reservoir site, the hilltop to the south of Horana town, is visible from a significant distance. At present it has a wooded aspect, it's slopes and crown covered in rubber trees, with a large rock outcrop clearly visible just below the summit when viewed from the south and east.

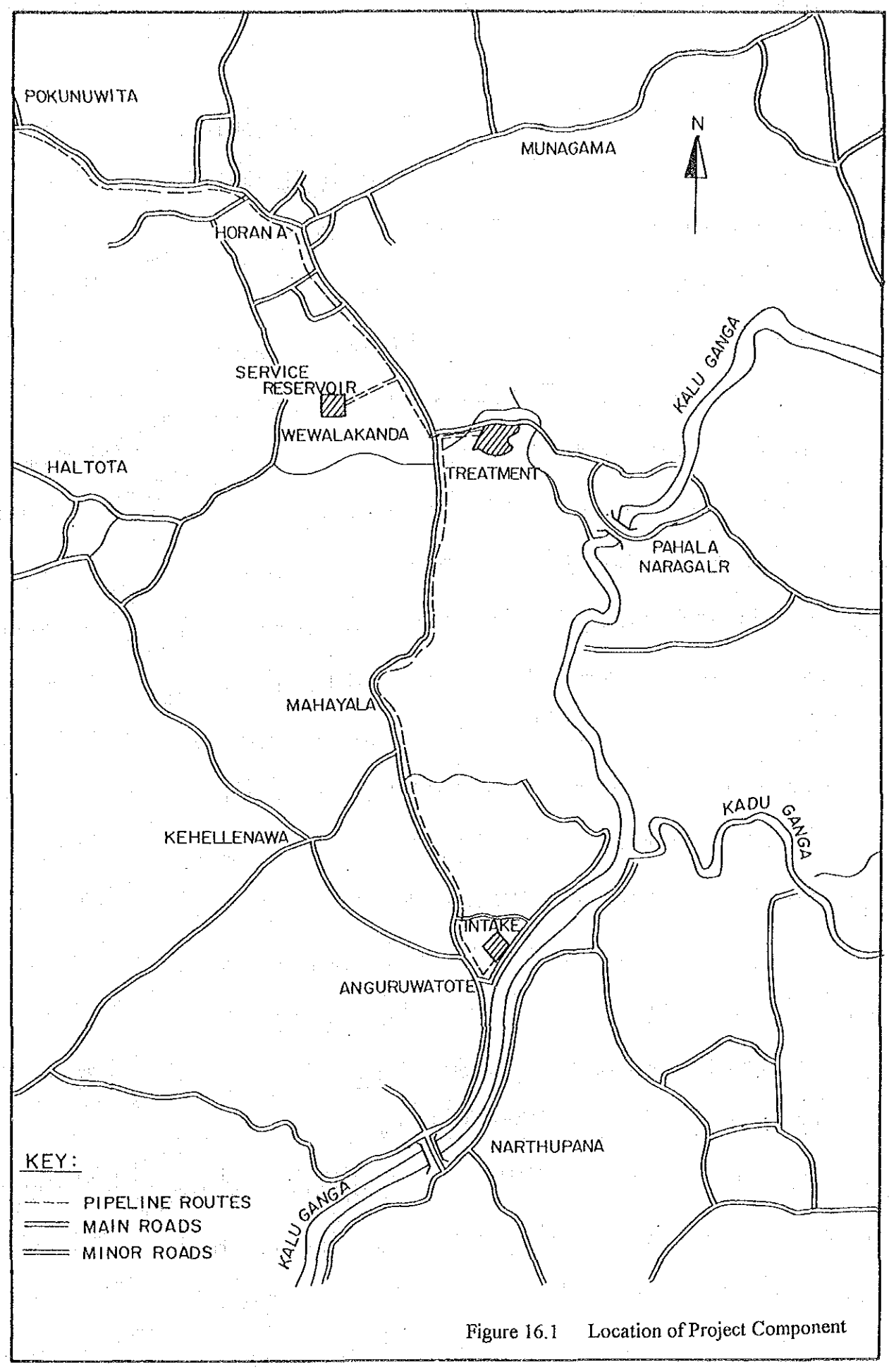


Figure 16.1 Location of Project Component

Table 16.5 Screening Check List

	Item	Cause	EI			Comments
			Yes	No	?	
1	Resettlement	Land acquisition	X			Will be some
2	Economic Activities	Loss of production from acquired land			X	Rubber trees on some sites
3	Transport	Disruption of local transport by construction traffic and excavations	X			Pipeline routes alongside roadways
4	Separation of Community	From pipe laying activities and work force	X			Will be some
5	Cultural Assets and Archaeology	Loss or damage to shrines etc. due to construction activities			X	None on but some close to sites
6	Water and Common Rights	Interference with fishing etc. by water abstraction and pollution		X		Little fishing carried out
7	Sanitation	Sewage from construction work force			X	Depends on adequate latrines
8	Waste	Construction waste, sludge etc.		X		Should be minor
9	Dangers	Excavation cave ins, chemicals		X		Only minor excavations and two chemicals
10	Topography and Geology	Changes due to construction		X		Only minor structures
11	Soil Erosion	Soil wash off from sites		X		Only little uncovered
12	Groundwater	Abstraction and pollution due to construction		X		Very little to be used if any
13	Lake, Marsh and River	Abstractions from river	X			
14	Coastline and Sea	Erosion and/or deposition due to construction		X		Not close to the sea
15	Flora and Fauna	Destruction or interference with habitats by construction		X		No special specimens on or near sites
16	Weather	Structures causing change		X		Only minor structures
17	View	Obstruction due to structures		X		Only minor structures
18	Air Pollution	Exhaust gas emissions by plant etc.		X		Not much generated
19	Water pollution	Discharge of wastewaters	X			Some expected
20	Soil Pollution	Discharge of wastewaters			X	Depends on latrines
21	Noise and Vibration	From site vehicles and construction activities	X			Some will occur
22	Ground Subsidence	Reduction of groundwater level		X		Very little if any used
23	Noxious odors	Exhaust fumes, rotting waste		X		Very little generated

Conclusion	Does the development require the implementation of an IEE or EIA ?	YES	NO
		X	

Table 16.6 Scooping Check List

	Item	Eval.	Reasons
1	Resettlement	B	Land acquisition for intake and treatment works
2	Economic Activities	C	Rubber trees on intake and reservoir site
3	Transportation and Institution	B	Delivery of plant and pipe laying activities
4	Separation of the Community	B	Mostly from pipe laying activities
5	Cultural Assets and Archeology	C	None on sites but some nearby
6	Water and Common Rights	D	Little fishing, slight at low river flows
7	Sanitation	C	Maybe at construction
8	Waste	D	Very little generated
9	Dangers	D	Slight during excavations
10	Topography and Geology	D	Only minor structures
11	Soil Erosion	D	Minor stripped areas for short time
12	Groundwater	D	Little or none used
13	Lake, Marsh and River	B	Some impact during low river flows
14	Coastline and Sea	D	Not near to the sea
15	Flora and Fauna	D	No rare or endangered species
16	Weather	D	Only minor structures
17	View	D	Only minor structures
18	Air Pollution	D	Only exhaust gasses during construction
19	Water Pollution	B	Maybe sewage during construction, sludge sometimes during operation
20	Soil Pollution	C	Possibly from latrines
21	Noise and Vibration	B	During construction only
22	Ground Subsidence	D	No activities to cause any
23	Noxious Odors	D	None generated

Evaluation Key:

A Serious impact expected
B Minor impact expected
C Uncertain (may become clear on investigation)
D Almost no impact expected, no need for EIA

(18) Air Pollution

The only forms of air pollution currently experienced in the project areas are those caused by exhaust fumes and smoke from the burning of rubbish etc. These are not considered to be particularly significant except the main roads in the immediate area of Horana where exhaust emissions are highest during peak traffic periods.

In general the inhabitants of the project areas can be said to enjoy good air quality at the present time.

(19) Water Pollution

The only significant water courses that need to be considered are the stream near to the treatment plant site and the Kalu Ganga.

At present the stream suffers from high suspended solids of natural origin during the rainy season and a small amount of pollution from people and animals. The Kalu Ganga also experiences high suspended solids loads in the rainy season and some degree of pollution from commercial operations such as discharges from rubber factories. People bathe and wash clothes in the river and sewage must enter the river at numerous locations but generally in small quantities at a time.

There are a multitude of small drainage ditches beside the roads and in paddy fields. Pollution of these ditches is evident from sewage and discarded solid waste in the village areas in particular. Some pollution from oil etc. from vehicles must also occur.

(20) Soil Pollution

The extent of soil pollution in the relevant areas is difficult to assess but can be assumed to be due to such things as sewage and discarded sump oil etc.

It may generally be assumed to be of a relatively minor nature and not to pose any serious problem.

(21) Noise and Vibration

Noise and vibration problems in the project areas are limited to those normally associated with the movement of vehicles. With the exception of Horana, they are considered to be negligible.

(22) Ground Subsidence

Ground subsidence is not a problem at any of the site areas.

(23) Noxious Odors

The only noxious odors are those caused by rotting refuse, sewage-polluted ditches and exhaust fumes. These are mainly confined to the villages and Horana town.

16.3.3 Construction Phase

(1) Resettlement

1) Intake Site

The planned intake will occupy an area of approximately 1.3 ha. At present there are only a few houses in the general area and how many, if any, will be affected will become clear once the optimum location has been selected. It may be presumed however that resettlement, should it be required, will prove to be a minor problem as it should be possible to relocate the people nearby.

2) Treatment Plant Site

The proposed treatment plant will occupy an area of approximately 13.2 ha. The NWSDB currently has the option to purchase the selected site, a significant advantage, and it is strategically placed between the intake and the high-level reservoir.

A visual inspection of the location showed that about 67 single story houses currently exist within the site area and conversations with the residents indicated that about 73 families are living there. Some 36 of the houses are built with wooden frames and woven panels, the remainder being of brick or blockwork construction. A temple and community hall/school are located within the housing area as well as the abandoned remains of the original block of living quarters when rubber plantation workers occupied the site.

Each of the houses was said to have a permit or license to be built on an allotted area of 15 perches. According to the local residents, a further 120 families were due to move onto the site by the end of August 1994. Each would be allotted the same area of 15 perches as the existing houses. Mandarawella Area Division was said to be responsible for the allocations, with some involvement of the local MP.

The site residents earn their living in a variety of ways, though none were said to be employed locally. Most worked as laborers, carpenters, masonry workers, business men etc.

It was obvious during the site visits that the local inhabitants were greatly concerned with their fate should the site be taken over. The NWSDB were made aware of the urgent need for detailed discussions with the current residents to fully explain the situation and to consult with them regarding their resettlement. An even greater urgency was expressed over the need to investigate the accuracy of the information regarding the imminent arrival of 120 more families. If correct, Mandarawella Area Division must be appraised of the situation and urged to make alternative arrangements.

The current residents appear to have formed a close community and strongly stated that they wished to remain so. A resettlement area should therefore be found that can accommodate all of the current residents, preferably not too far from their existing location so they can continue in their present occupations.

3) High-Level Reservoir Site

The area required for the high-level reservoir will occupy about 2.5 ha with no houses currently in existence on the proposed site. Depending on the route chosen, there is a possibility that one or two houses might be affected when a service road is constructed to bring in plant and equipment. This will

become clear at the detailed planning stage. If any resettlement is required, it should be possible within the local area.

4) Transmission Mains

The raw water transmission main will be approximately 7.7 km in length, the clear water main approximately 3.0 km between the treatment plant and a high-level reservoir and 20.6 km between the high-level reservoir and a service reservoir in the existing service area.

Due to the fact that the transmission mains are intended to follow the roadways, it is considered unlikely that any resettlement will be required for this aspect of the project.

(2) Economic Activities

1) Treatment Plant Site

A visual inspection and verbal inquiries indicated that no commercial activities were taking place on the proposed site area. The rice paddies that bound the site to the west and east seem to be only partially cultivated. There is evidence of rice paddy on the western part of the site itself though they do not appear to have been in use for some time. A few cattle have been seen tethered on the site and the grass is generally cropped short, an indication that cattle regularly graze the area.

A rubber factory is currently under construction at the north west corner of the site and is due to start production in July. According to the site manager the raw material will be taken by truck to the factory from rubber plantations some distance away. Inquiries should be made as to the legality of the proposed discharge of liquid waste to the nearby stream.

2) Intake Site

The area selected for the intake site is currently part of a rubber plantation. There will be some commercial loss as a result of the felling of the rubber trees on the area needed for construction. However, the intake site will be relatively small and the loss of income should not be too significant.

3) High-Level Reservoir Site

As with the intake site, the site selected for the new high-level reservoir near to Horana is covered in rubber trees except for the areas close to rock outcrops. Some loss of income can be expected but again the area to be used for construction is relatively small. Access to the site area is poor and it will be necessary to construct a service road to bring in the plant and equipment. This will result in the felling

of more trees and possibly the loss of a small part of rice paddy between the main road and the start of the hillside.

(3) Transportation and Daily Life.

1) Intake, Treatment Plant and Reservoir

On the assumption that all plant and equipment will have to be brought to the construction sites from the Colombo area, traffic problems can be expected. None of the local roads are particularly wide, two large vehicles such as trucks or busses need to take care in passing. In general, construction plant, equipment and vehicles are wider than normal and are often slow moving. It is therefore inevitable that local traffic will be subject to delays when plant etc. is brought to the sites. In particular the traffic in Horana town is likely to be the most affected as it is quite congested under normal circumstances.

Careful planning of the timing of the movements of construction traffic will help in minimizing the problem. Once the plant and equipment has been delivered to site there should be no need for it to use the public roads until the contract is completed.

Disruption to the local traffic should therefore be of relatively short duration.

2) Transmission Mains

The major cause of disruption to local traffic and the daily life of the nearby population will be the pipe laying activities. As detailed above, the local roads are not wide and it is intended that the transmission mains will generally follow the roadways. Wherever possible the pipelines will be laid alongside the roads in the verges. Not infrequently however, both sides of the road are closely bounded by drainage ditches, telephone poles, electricity poles, houses and walls. Often the road is built as a causeway with a significant drop on both sides to paddy fields. Therefore in some cases it will be necessary to excavate in the road itself, possibly leading to the complete closure of road for the duration of the pipe laying activities.

Under these circumstances it will be essential to plan detailed traffic control measures, in advance of any work taking place, in order to minimize disruption. Such measures should include one way systems and diversions if roads have to be closed. The local population must be informed well before work commences and any diversions clearly marked with road signs.

(4) Interruption to the Community

Certain unwelcome effects are often associated with construction sites and these can be broadly divided into those caused by the implementation of the project itself and those caused by the work force.

1) Project Related

Under the first category are disturbances caused by construction traffic, principally noise, dust, vibrations and impediment of traffic flow. There are similar potential problems due to the work carried out on the site itself. With the exception of the intake site, there are no concentrations of population in the immediate vicinity and therefore the construction activities should cause no inconvenience. Close to the intake site lies the small town/village of Anguruwatote. Unless an access road is constructed around the town, inconvenience will certainly be caused by the delivery of plant and equipment to site. This should however be of short duration and careful planning should minimize the problem.

During construction, noise, dust etc. could cause problems to the Anguruwatote residents but the intervening rubber trees should provide a degree of insulation. A short distance beyond the site is an engine mechanics training school. The construction activities may cause some disturbance to this institution and care will have to be taken to allow easy access to the school whilst work is in progress on site.

The activity which will cause the greatest disturbance to local communities will be trenching/pipe laying operations. Noise, dust, and obstruction of roadways will be inevitable, and particularly noticeable where the pipeline route passes through a town or village.

Countermeasures to be considered should include giving ample warning to each community, detailed planning to minimize the time for trenching, pipe laying, backfilling and damping down in those areas where dust becomes a problem.

2) Work force Related

The second category of unwelcome effects, those caused by the work force, embraces increased crime, drunkenness, violence etc. Countermeasures should include the establishment of a code of conduct for the work force and provision for it's enforcement, plus identifying areas for limited or prohibited access.

Positive effects on the local communities are increased trade and the potential opportunity of employment.

(5) Cultural Assets and Archaeology

1) Treatment Plant Site

A survey of the site and the surrounding area showed no evidence of any significant shrines, temples or archaeological remains. The nearest items of this nature are a Buddhist temple some 1,000 m in a direct line from the south eastern boundary of the site and a second temple located to the north west at a

distance of about 1,100 m. Both are well screened by trees and other vegetation and should not be affected by the construction activities or the operation of the treatment plant.

No archaeological remains are known to exist in the proposed site area.

2) Intake Site

The nearest cultural assets to the intake site are a Buddhist shrine approximately 1.5 km to the north and another at a similar distance across the river to the east. Two Hindu temples lie about 1.0 km to the south west. The closest of all is a Buddhist temple only 0.5 km to the south west. It is possible that the noise generated by the construction activities may cause some disturbance to this temple.

Possible countermeasures against this potential nuisance could include the construction of sound absorbing bunds and the limitation of construction activities. The temple priests should be consulted as to the time schedule for the daily work program.

No archaeological remains are known to exist in the proposed site area.

3) High-Level Reservoir Site

The nearest religious structure is a Buddhist shrine about 0.8 km to the east of the proposed site. Although it is well screened by trees and other vegetation, it is possible that the elevated situation of the site may lead to some noise nuisance during construction activities. It may also be necessary to construct a site access road in the near vicinity, which may also lead to some inconvenience. The priests should be given advanced warning that construction is to take place and should be consulted after operations have commenced to determine if they are suffering any problems as a result.

No archaeological remains are known to exist in the proposed site area.

4) Pipeline Routes

The intention is for the pipelines to follow the roadways as far as possible. Where this is achieved it is unlikely that any temples, shrines or archaeological remains will be affected. Where the pipeline route has to deviate from the highway, it is assumed that a known cultural asset or archaeological remains will be automatically bypassed.

(6) Water and Common Rights

Any potential infringement of water and common rights caused by the project during the construction phase will be limited to those related to the Kalu Ganga. Any right of passage on the river will be unaffected and little if any fishing appears to take place near to the intake site. This is the only site

which has the potential to directly affect the river during construction, primarily by disturbed soil being washed off by rainfall and during the breaching of the river bank to build the raw water intake structure. Careful planning of the operations and the construction of suitable bunds should minimize the problem.

It can therefore be concluded that no impact on common rights is likely to occur during the construction phase of the project.

(7) Sanitation and Health

Effects related to sanitation and health will be primarily caused by the presence of a large number of workers at the construction sites. An adequate number of properly designed and constructed latrines must be provided to ensure that a health hazard is not created that could lead to the spread of water borne diseases. Similarly, adequate living accommodation must also be provided if the construction workers are to live on site. Overcrowding in sub-standard make-shift buildings will rapidly create insanitary conditions.

(8) Waste

Construction sites have the capability of creating a certain amount of solid waste. Initially it consists of the vegetation that must be cleared from the site areas and this should be stacked in designated locations. At the treatment plant site there appears to be little of value in terms of the vegetation. On the intake site and the reservoir site however, the vegetation consists mainly of rubber trees. The wood from these trees must have some commercial value and can reasonably be expected to be removed from site as they are felled.

The second source of waste comprises the packaging, crates, wrappings associated with the plant and equipment delivered to site. Discarded building materials, broken items from construction plant and equipment, old tires etc. make up the remainder.

To avoid unsightly appearances and to minimize wind blown debris such as sacks, plastic sheeting, paper etc. from polluting the neighborhood, it will be necessary to provide well designed and located tips. With careful planning the solid waste generated during the construction phase should not cause any undue harm to the environment. It will be essential however to plan for the ultimate disposal of such materials.

(9) Dangers

Dangers are ever present on construction sites, but provided strict attention is paid to established safe working practices, the risks will be kept to a minimum. Cave-ins during excavations pose a particular threat but no very deep structures are involved in this project. To help reduce the risks, pipe trenches should be kept open for the shortest possible time.

Some danger will be present from the storage of fuels and lubricants for the construction plant and equipment. Adherence to fire regulations and the provision of correct fire fighting equipment will reduce the problem to acceptable levels.

(10) Topography and Geology

None of the structures at any of the construction sites are large enough to cause a noticeable change in the topography and the geology of the areas will be completely unaffected.

(11) Soil Erosion

During the construction phase there is potential for some soil wash-off to occur but, in general terms, this cannot be classified as soil erosion as the amounts will be minimal.

(12) Groundwater

Some water will be obtained in the vicinity of the three main construction sites from ground and/or surface waters for concrete production etc. The quantities will be relatively small and should have no noticeable effect on the environment.

(13) Lakes, Marshes and Rivers

No lakes or marshes exist in the areas of the construction sites and none of the activities during the construction phase will have any effect on river flow.

(14) Coastline and Sea

None of the construction sites are near the coast and none of the construction activities will have any secondary effects that could have an impact on coastline or sea.

(15) Flora and Fauna

As far as can be ascertained there are no rare or endangered species of plants or animals on or near the three main construction sites.

Site clearance and construction activities will eradicate any macro species from the project sites but, as it is intended that the pipeline routes will follow the roadways, it is unlikely that the pipe laying activities will have any direct impact. Where the pipeline route deviates from the highway , a relatively narrow strip of vegetation will be destroyed.

Clearly, the construction of the intake, treatment plant and high-level reservoir will permanently exclude any of the larger forms of plant or animal life within their confines. On the other hand, the pipe laying activities should only cause a temporary effect, with fairly rapid re-establishment of plant life after backfilling.

The noise and disturbance caused by the presence of the work force, plant and equipment may cause nearby animals to take fright. However, there are no livestock industries to be found close to any of the construction sites and therefore no significant impact is expected from this effect.

Some animal life may be attracted to the construction sites, notably scavengers such as rats and crows. The unwelcome increase in these populations can be restricted by ensuring they are denied access to food waste from site canteens etc.

(16) Weather

Only very large projects such as irrigation schemes or the creation of a vast reservoir will have any weather related effect. The proposed project on the Kalu Ganga is too small to have any effect on the weather.

(17) View

Relative to the surrounding area, no large buildings will be constructed at any of the proposed sites. There are no major institutions, residential or recreational areas close enough to the structures to have their view impaired by the new buildings. The possible exception to this may be the new high-level reservoir near Horana. This will be located on top of a hill and could be visible from a distance. It is open to question if this structure will represent an impairment of the view. In all probability it will be partly or completely hidden by the surrounding rubber plantation both during and after construction.

(18) Air Pollution

During construction the exhaust gasses from site vehicles, plant, generators etc., wind blown dust and smoke from the burning of rubbish are the only potential sources of air pollution. Exhaust fumes should be rapidly dispersed and cause no environmental problems. Dust is normally caused by vehicle movements on unmade site roads and from exposed spoil heaps under windy conditions. Provided this

problem is foreseen and equipment made available to damp down the offending areas, the effects can be overcome. Smoke from rubbish burning should be an intermittent and short lived event and should not cause any significant problems.

(19) Water Pollution

The potential for polluting nearby surface or groundwaters is one of the main environmental threats posed by the construction activities. This could occur in a number of different ways. Site clearance and excavation plant will disturb the ground and may lead to soil being washed into nearby watercourses. Where necessary, bunds could be erected to prevent significant pollution from this source.

The construction of the intake structure in the bank of the Kalu Ganga will inevitably lead to soil being deposited in the river. Little can be done to prevent such an occurrence but it should be of short duration and have a limited and temporary impact on water quality for a short distance downstream.

Trenching work for the laying of the transmission mains could pollute nearby ditches etc. and care must be taken not to block such drainage channels with spoil heaps. Large spoil heaps on the main construction sites must be carefully sited to minimize the risk of rainfall washing soil into nearby watercourses.

None of the construction activities themselves will cause pollution of the groundwaters. However, fuel and oil storage tanks for construction vehicles, generators etc. should be located in impermeable bunds to prevent contamination from spillages or leaks. Similarly, vehicle repair and servicing facilities should be equipped with properly designed surface drainage to prevent hydrocarbons being washed into nearby waters. Collection of wastewater from these areas to a central point and treatment via a simple API separator before disposal should reduce such problems to an acceptable level.

(20) Soil Pollution

The only potential sources of soil pollution during the construction phase of the project will be sewage from the construction work force and spillage of fuel and oil. Provided the preventative measures detailed above are carried out, no significant problems should occur.

(21) Noise and Vibration

Noise will be unavoidable from vehicles and construction plant at the three main sites, but generally to a lesser extent but more noticeable from pipe laying activities. The effects will be localized and no large institutions or residential areas are located in the near vicinity of the treatment plant or reservoir sites. A possible exception to this has been described in sub-section 16.3.3.5). The intake site is fairly close