

ANNEX 28

ECONOMIC AND FINANCIAL ANALYSIS

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TABLE OF CONTENTS

1	Economic Evaluation	1
1.1	Methodology of Economic Evaluation	1
1.2	Economic Benefits	2
1.3	Economic Costs	3
1.4	Economic Efficiency	7
1.5	Sensitivity Analysis	7
2	Financial Analysis	12
2.1	Methodology of Financial Analysis	12
2.2	Revenue from Water Supply Services	13
2.3	Costs for Water Production	14
2.4	Financial Feasibility	15
2.5	Sensitivity Analysis	23
2.6	Affordability of Domestic Consumers	24
2.7	Tariff Design based on Average Water Tariff	25
2.8	Cash Flow Analysis	28
3	Financial Simulation	37
3.1	Financial Plan and Assumptions	37
3.2	Financial Simulation	39
3.3	Management Issues and Recommendations	47

LIST OF TABLES

Table 1-1	Water Demand and Benefit with Future Economic Growth Conditions: 2007 - 2020	4
Table 1-2	Financial Cost and Economic Cost of Construction Cost	5
Table 1-3	Financial and Economic Costs of O&M Costs	6
Table 1-4	Financial and Economic Costs of Replacement Costs	6
Table 1-5	Cost and Benefit Stream of Proposed Project under Present Conditions	8
Table 1-6	Cost and Benefit Stream of Proposed Project with Future Economic Growth Conditions	9
Table 1-7	Results of Sensitivity Analysis	10
Table 2-1	Average Water Consumption and Water Charge from 1 st Stage Project	13
Table 2-2	New Connections and Connection Fee from 1 st Stage Project	14
Table 2-3	Water Meter Rental Fee from 1 st Stage Project	14
Table 2-4	Investment Costs of 1 st Stage Project	15
Table 2-5	Cost and Benefit Stream of 1 st Stage Project Applying Present Tariff	17
Table 2-6	Relation between Financial Cost and Average Water Rate	18
Table 2-7	Cost and Benefit Stream of 1 st Stage Project Applying Case-1 Tariff Case 1 Average Water Rate: US\$0.20/m ³	19
Table 2-8	Cost and Benefit Stream of 1 st Stage Project Applying Case-2 Tariff Case 2 Average Water Rate: US\$0.26/m ³	20
Table 2-9	Cost and Benefit Stream of 1 st Stage Project Applying Case-3 Tariff Case 3 Average Water Rate: US\$0.32/m ³	21
Table 2-10	Cost and Benefit Stream of 1 st Stage Project Applying Case-4 Tariff Case 4 Average Water Rate: US\$0.42/m ³	22
Table 2-11	Results of Sensitivity Analysis	24
Table 2-12	Affordability of Domestic Water Consumers	25
Table 2-13	Long Run Average Cost of Water Served	26
Table 2-14	Comparison of New Tariff Structure to Present Tariff	28
Table 2-15	Cash Flow Statement for Full Cost Recovery	31
Table 2-16	Average Water Rate, Monthly Water Charge and Ratio of Water Charge to Monthly Income: 2007-2037	32
Table 2-17	Cash Flow Statement for Financially Sustainable Management	36
Table 2-18	Average Water Rate, Monthly Water Charge and Ratio of Water Charge to Monthly Income: 2007-2037	37
Table 3-1	Procurement of Initial Funds	38
Table 3-2	Procurement of Funds for Replacement	39
Table 3-3	Average Water Tariff of Water Supply Services	39

Table 3-4	Installation Charges of Water Supply Services	39
Table 3-5	Profit and Loss Table of NPVC with 1 st Stage Project: 2005-2037	41
Table 3-6	Cash Flow Management Plan of NPVC with 1 st Stage Project: 2004-2037	43
Table 3-7	Balance Sheet of NPVC with 1 st Stage Project: 2004-2037	45

LIST OF FIGURES

Figure 1-1	Range of Benefit of 1 st Stage project	2
Figure 1-2	Relationship between Benefit/Cost and EIRR	10
Figure 2-1	Relationship between Average Water Rates and Financial Costs	16
Figure 2-2	Relationship between Cost/Revenue and FIRR	23
Figure 2-3	Tariff Structure based on Average Water Rate	27
Figure 2-4	Comparison of Existing and New Tariffs in Vientiane Capital City with Existing Water Tariffs in Major Asian Cities	28
Figure 2-5	Average Household Income and Average Water Charge in Case of Full Cost Recovery Management	33
Figure 2-6	Average Household Income and Average Water Charge in Case of Financially Sustainable Management	35
Figure 3-1	Profit and Loss Based on Financial Simulation of NPVC with 1 st Stage Project ..	47

Chapter 1 ECONOMIC EVALUATION

1.1 Methodology of Economic Evaluation

The economic evaluation in this report is conducted in the same manner as in the master plan. In the feasibility study, the respective experts estimated the costs with discretion, and more precisely than those in the master plan. The 1st stage project could be then be evaluated with more reliability. In spite of that, some uncertainty still exists in the estimations made. In particular, in the case of a long implementation period and the incremental growth of future water demand there are risks in terms of judgment of the project viability. In this context, a sensitivity test is introduced for assessing certain aspects of the project.

In the feasibility study, the preconditions and assumptions for an economic evaluation are the same as defined in the master plan. The costs and benefits are estimated on the basis of economic values instead of market values, which were applied for the financial analysis. The economic values are converted from financial values by applying a conversion factor. For the economic evaluation, the following criteria and assumptions are applied to calculate the economic values and evaluation indicators.

Schedule and evaluation period of the 1st stage project are set as follows. Basic conditions and assumptions are also set in the same manner as done in the master plan.

- | | |
|--|--|
| (a) Base Year: | The year 2004 |
| (b) Construction Period: | Four years in real terms, from 2004 through 2007 |
| (c) Economic Life and Evaluation Period: | 30 years after completion of the project |
| (d) Timing of Benefits Accruing: | After the completion of the project. The plant inaugurates its operation from four months before the end of 2007. The matured benefit is attained in 2009. After 2009, the full capacity of the plant will be realized for the beneficiaries in the service areas. |
| (e) Price Level: | Costs and benefits of the project are set in April 2003. |
| (f) Prevailing Exchange Rates: | 10,720 kip per US\$1.00 and J¥119 per US\$1.00 |
| (g) Opportunity Cost of Capital: | 12% per annum |
| (h) Conversion Factor | 90% of local financial value |
| (i) Economic Value of Land for Plant | No-value |

1.2 Economic Benefits

The unit economic benefits have already been estimated in the master plan. They were calculated as follows: US\$ 0.41 per m³ for domestic water and US\$ 0.21 per m³ for non-residential water under the present socio-economic conditions. The detailed procedures were described in Annex A18 in Volume V of the master plan.

The total water consumption volume during the project live of the 1st stage project is estimated already in the master plan. Actual water demand of beneficiaries is illustrated in Figure 1-1. It was calculated on the basis of average water demand of incremental beneficiaries and water supply capacities of the 1st stage project.

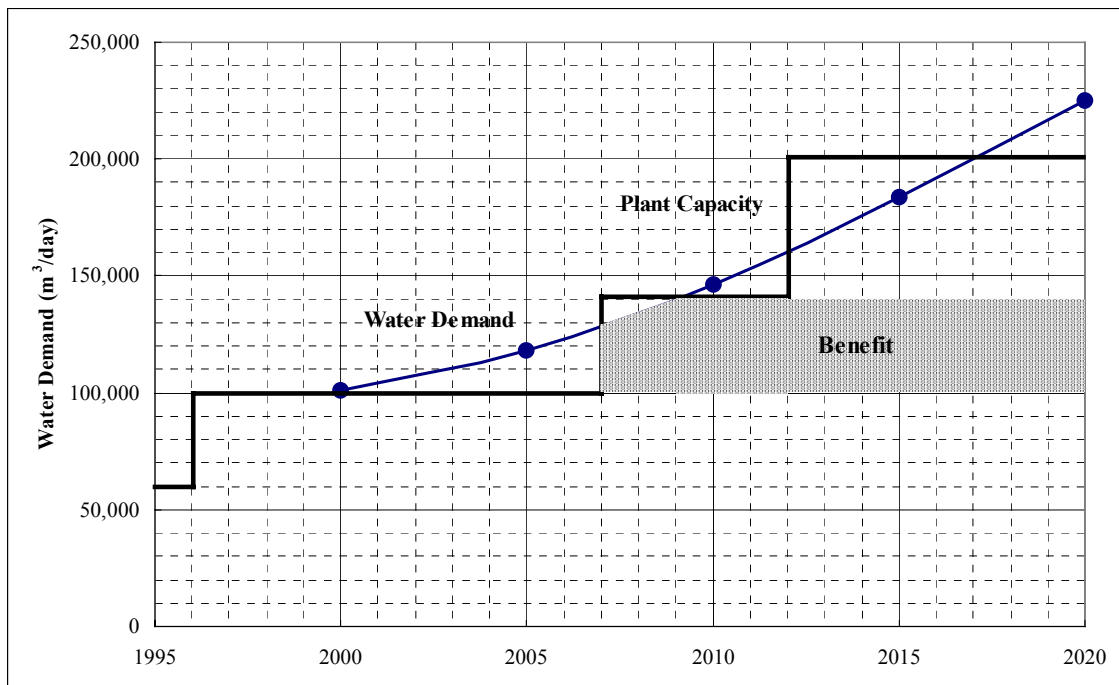


Figure 1-1 Range of Benefit of 1st Stage project

The total benefits are calculated as a product of unit benefits of the respective categories, and total consumption volumes of the corresponding categories. In 2007, the water will be supplied four months before the end of the year 2007, just after the inauguration of the plant. Finally, the total economic benefits were estimated at US\$ 1,011 million in the first year 2007, and US\$ 3.817 million in the matured year 2009.

Item	2007	2008	2009	2010~
I. Water Demand (1000 m ³ /Year)				
Domestic Demand	5,479	6,606	6,987	6,987
Non-residential Demand* ²	3,742	4,398	4,536	4,536
Total	14,823	15,480	15,618	15,618
II. Benefit (US\$1000/Year)	*1			
Domestic Demand	749	2,708	2,865	2,865
Non-residential Demand	262	924	953	953
Total	1,011	3,632	3,817	3,817

Note: *1 Water sales in 2007 are for the last four months only.

With future increased economic growth conditions, the unit benefit was estimated at US\$ 0.71 per m³ for domestic water in 2020. Applying this unit benefit, the total economic benefits were estimated as follows. The detailed benefits are enumerated below in Table 1-1.

Item	2007	2010	2015	2020
Benefit (US\$1000/Year)	*1			
Domestic Demand	852	3,592	4,221	4,961
Non-residential Demand* ²	262	953	953	953
Total	1,114	4,544	5,174	5,914

Note: *1 Water sales in 2007 are for the last four months only.

1.3 Economic Costs

The estimate of the 1st stage project was already described in Chapter 5 in Volume III of the F/S reprot. The estimate however, was enumerated at market prices, what is called the “financial value”. In an economic evaluation, the financial value has to be converted into an economic value. The procedure of this conversion was discussed in Annex A18 in Volume V of the master plan. The total economic cost of the proposed JICA project was calculated at US\$24.3 million. In addition to this work, other projects by the AFD were estimated at US\$5.7 million. The total cost was aggregated to US\$30.0 million. The economic costs are broken down in Table 1-2.

The construction costs will be disbursed in compliance with the construction schedule over four years. The economic construction costs as a total of both the JICA projects and other projects are to be disbursed as follows: US\$0.46 million in 2004, US\$4.30 million in 2005, US\$12.41 million in 2006 and US\$12.79 million in 2007.

The O&M costs are an annual requirement during the economic life of the 1st stage project. The O&M unit cost in economic terms was estimated at US\$0.24 million in 2007, US\$0.77 million in 2008 and US\$0.81 million in 2009. After 2009, the plant will operate at full capacity to meet the water demand, so the O&M unit costs were estimated to be US\$0.81 million in economic terms. The details of the O&M costs are enumerated in Table 1-3.

Table 1-1 Water Demand and Benefit with Future Economic Growth Conditions: 2007 - 2020

Item	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
I. Water Requirement (1000m3/year)														
1. Domestic Water Consumers														
(1) Existing Demand	13,467	13,436	13,404	13,373	13,373	13,373	13,373	13,373	13,373	13,373	13,373	13,373	13,373	13,373
(2) Increment after 2007	5,479	6,606	6,987	6,987	6,987	6,987	6,987	6,987	6,987	6,987	6,987	6,987	6,987	6,987
(3) Total	18,947	20,042	20,392	20,360	20,360	20,360	20,360	20,360	20,360	20,360	20,360	20,360	20,360	20,360
2. Non-domestic Water Consumers														
(1) Existing Demand	11,082	11,082	11,082	11,082	11,082	11,082	11,082	11,082	11,082	11,082	11,082	11,082	11,082	11,082
(2) Increment after 2007	3,742	4,398	4,536	4,536	4,536	4,536	4,536	4,536	4,536	4,536	4,536	4,536	4,536	4,536
(3) Total	14,823	15,480	15,618	15,618	15,618	15,618	15,618	15,618	15,618	15,618	15,618	15,618	15,618	15,618
3. Grand Total	33,770	35,522	36,009	35,978	35,978	35,978	35,978	35,978	35,978	35,978	35,978	35,978	35,978	35,978
	9,221	11,004	11,523	11,523	11,523	11,523	11,523	11,523	11,523	11,523	11,523	11,523	11,523	11,523
II. Annual Benefit (1000US\$/year)														
1. Domestic Water Consumers														
(1) Existing Demand	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2) Increment after 2007	852	3,183	3,477	3,592	3,710	3,831	3,957	4,087	4,221	4,360	4,503	4,651	4,803	4,961
(3) Total	852	3,183	3,477	3,592	3,710	3,831	3,957	4,087	4,221	4,360	4,503	4,651	4,803	4,961
2. Non-domestic Water Consumers														
(1) Existing Demand	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2) Increment after 2007	262	924	953	953	953	953	953	953	953	953	953	953	953	953
(3) Total	262	924	953	953	953	953	953	953	953	953	953	953	953	953
3. Grand Total	1,114	4,107	4,430	4,544	4,662	4,784	4,910	5,039	5,174	5,312	5,455	5,603	5,756	5,914

Note: Water consumed in 2007 will be distributed only for the last 4 months only.

Table 1-2 Financial Cost and Economic Cost of Construction Cost

Financial Cost														(Unit: US\$1000)		
Item	Total			2004			2005			2006			2007			
	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	
1. Priority Project by JICA Study																
(1) Construction Cost	20,312	13,341	6,971	0	0	0	2,366	1,388	979	8,829	5,611	3,218	9,117	6,343	2,774	
(2) Consulting Services, D/D and S/V	1,422	933	489	0	0	0	474	311	163	474	311	163	474	311	163	
(3) Contingencies	4,636	3,064	1,572	0	0	0	474	284	190	1,879	1,196	683	2,283	1,584	699	
(4) Administration	1,319	0	1,319	0	0	0	166	0	166	559	0	559	594	0	594	
Sub Total	27,689	17,338	10,351	0	0	0	3,480	1,983	1,498	11,741	7,118	4,623	12,468	8,238	4,230	
2. Other Projects																
B1 Construction Cost	4,466	3,455	1,011	263	219	44	878	678	200	1,667	1,283	384	1,658	1,275	383	
B2 Consulting Services	400	287	112	100	72	28	100	72	28	100	72	28	100	72	28	
B3 Contingencies	1,214	877	337	94	63	30	216	153	64	421	307	114	483	354	129	
B4 Administration	366	0	366	40	0	40	76	0	76	125	0	125	125	0	125	
Sub Total	6,446	4,619	1,827	496	354	142	1,269	902	367	2,314	1,662	652	2,366	1,701	666	
Total	34,135	21,957	12,178	496	354	142	4,749	2,885	1,864	14,055	8,780	5,275	14,834	9,938	4,896	

Remark: "Unaccounted-for Water Reduction Mains" was appropriated in O&M cost in proportion to water volume in Total supply after 2007 .

Economic Cost														(Unit: US\$1000)		
Item	Total			2004			2005			2006			2007			
	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	
A. Priority Project by JICA Study																
A1 Construction Cost	19,615	13,341	6,274	0	0	0	2,268	1,388	881	8,507	5,611	2,896	8,839	6,343	2,497	
A2 Consulting Services, D/D and S/V	1,373	933	440	0	0	0	458	311	147	458	311	147	458	311	147	
A3 Contingencies	2,098	1,427	671	0	0	0	273	170	103	896	592	304	930	665	265	
A4 Administration	1,187	0	1,187	0	0	0	149	0	149	503	0	503	535	0	535	
Sub Total	24,274	15,701	8,573	0	0	0	3,148	1,869	1,279	10,364	6,514	3,850	10,761	7,319	3,443	
B. Other Projects																
B1 Construction Cost	4,365	3,455	910	259	219	40	858	678	180	1,629	1,283	346	1,620	1,275	345	
B2 Consulting Services	389	287	101	97	72	25	97	72	25	97	72	25	97	72	25	
B3 Contingencies	594	439	154	68	47	21	126	91	34	203	152	51	197	149	49	
B4 Administration	330	0	330	36	0	36	68	0	68	113	0	113	113	0	113	
Sub Total	5,677	4,182	1,495	460	338	121	1,148	841	307	2,042	1,507	535	2,027	1,495	532	
Total	29,951	19,883	10,068	460	338	121	4,296	2,710	1,587	12,406	8,021	4,385	12,789	8,814	3,975	

Remark: "Unaccounted-for Water Reduction Mains" was appropriated in O&M cost in proportion to water volume in Total supply after 2007 .

Table 1-3 Financial and Economic Costs of O&M Costs

Financial Cost (Unit: US\$1000)									
Item	2007			2008			2009		
	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local
(1) Electricity	159	0	159	492	0	492	506	0	506
(2) Chemical Cost	40	40	0	125	125	0	129	129	0
(3) Salary	13	0	13	56	0	56	71	0	71
(4) Others	24	0	24	92	0	92	111	0	111
(5) UFW Reduction Mains	26	13	12	77	40	37	63	29	35
Total	262	53	208	842	165	677	880	158	723

Remark: "Unaccounted-for water" reduction cost was appropriated in O&M cost.

Economic Cost (Unit: US\$1000)									
Item	2007			2008			2009		
	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local
(1) Electricity	143	0	143	443	0	443	455	0	455
(2) Chemical Cost	40	40	0	125	125	0	129	129	0
(3) Salary	12	0	12	50	0	50	64	0	64
(4) Others	22	0	22	83	0	83	100	0	100
(5) UFW Reduction Mains	24	13	11	73	40	33	60	29	31
Total	241	53	188	774	165	609	808	158	650

Remark: "Unaccounted-for water" reduction cost was appropriated in O&M cost.

The pipeline facilities of the respective projects are considered to have an expected lifetime of 30 years. Hence the evaluation period is determined to be 30 years. On the other hand, ancillary machinery such as submersible pumps and booster pumps are considered to last 15 years. These machines will have to be replaced during the system's life. In the disbursement schedule, the replacement costs of these machines are appropriated every 15 years. Thus, these replacement costs are disbursed as follows: US\$8.05 million in economic terms in 2022. Details of the replacement costs are enumerated in Table 1-4.

Table 1-4 Financial and Economic Costs of Replacement Costs

Financial Cost (Unit: US\$1000)			
Item	Total	Foreign	Local
(1) Expansion of Kaolieo Treatment Plant	4,509	4,283	225
(2) Improvement of Km6 Booster Pump Station	567	538	28
(3) Improvement of Chinaimo Treatment Plant	1,129	1,072	56
(4) Rehabilitation of Kaolieo Treatment Plant	1,890	1,795	94
Total	8,094	7,689	405

Economic Cost (Unit: US\$1000)			
Item	Total	Foreign	Local
(1) Expansion of Kaolieo Treatment Plant	4,486	4,283	203
(2) Improvement of Km6 Booster Pump Station	564	538	25
(3) Improvement of Chinaimo Treatment Plant	1,123	1,072	51
(4) Rehabilitation of Kaolieo Treatment Plant	1,880	1,795	85
Total	8,053	7,689	364

1.4 Economic Efficiency

A stream of economic costs and benefits was tabulated in Table 1-5. The benefits were estimated under the present socio-economic conditions. The evaluation indices were 8.1% of EIRR, minus US\$5.84 million of NPV and 0.77 of B/C. Then, the 1st stage project might not be viable under present conditions from the economic point of view, because its EIRR was lower than the opportunity cost of capital, 12%.

Yet, the socio-economic conditions, particularly the people's living standard, will be improved in accordance with the economic growth in the future. In consideration of this future growth conditions, the benefit of the project could be increased in the project evaluation period. These conditions were already discussed in the master plan. The economic benefits with the future economic growth conditions are tabulated in Table 1-6. As shown in the table, the evaluation indices were 12.4% of EIRR, US\$0.68 million of NPV and 1.03 of B/C. Thus, the 1st stage project could be viable from economic point of view, since its EIRR exceeded the opportunity cost of capital.

Item	EIRR (%)	NPV (US\$ Million)	B/C
Under Present Conditions	8.1	-5.84	0.77
With Economic Growth Conditions	12.4	0.68	1.03

1.5 Sensitivity Analysis

As mentioned in Section 7.1.1, the sensitivity test is commenced in this section. A case with cost over-run and decrease of future water demand has risks in terms of judgment on project viability. It is customary, therefore, to test the results of economic analysis for sensitivity to variations in certain important inputs. The test is made for the variations in $\pm 10\%$ and $\pm 5\%$ of the cost and benefit with respect to evaluation factors of the 1st stage project. Then, there are 25 cases under these variations. EIRRs of these variations were tabulated in the table below. Figure 1-2 shows the project viable range of cost and benefit variation from the original estimate. The results of other indices as well as EIRR are given in Table 1-7.

		Benefit				
		-10%	-5%	0%	5%	10%
Cost	10%	9.5%	10.3%	11.0%	11.7%	12.4%
	5%	10.2%	10.9%	11.7%	12.4%	13.1%
	0%	10.9%	11.6%	12.4%	13.1%	13.8%
	-5%	11.6%	12.4%	13.2%	13.9%	14.7%
	-10%	12.4%	13.2%	14.0%	14.8%	15.5%

Table 1-7 Results of Sensitivity Analysis

EIRR

		Benefit				
		-10%	-5%	0%	5%	10%
Cost	10%	9.5%	10.3%	11.0%	11.7%	12.4%
	5%	10.2%	10.9%	11.7%	12.4%	13.1%
	0%	10.9%	11.6%	12.4%	13.1%	13.8%
	-5%	11.6%	12.4%	13.2%	13.9%	14.7%
	-10%	12.4%	13.2%	14.0%	14.8%	15.5%

NPV

(Unit: US\$1000)

		Benefit				
		-10%	-5%	0%	5%	10%
Cost	10%	-4,574	-3,245	-1,915	-585	744
	5%	-3,279	-1,949	-619	710	2,040
	0%	-1,983	-653	677	2,006	3,336
	-5%	-687	643	1,972	3,302	4,632
	-10%	609	1,939	3,268	4,598	5,928

B/C

		Benefit				
		-10%	-5%	0%	5%	10%
Cost	10%	0.84	0.89	0.93	0.98	1.03
	5%	0.88	0.93	0.98	1.03	1.07
	0%	0.92	0.97	1.03	1.08	1.13
	-5%	0.97	1.03	1.08	1.13	1.19
	-10%	1.03	1.08	1.14	1.20	1.25

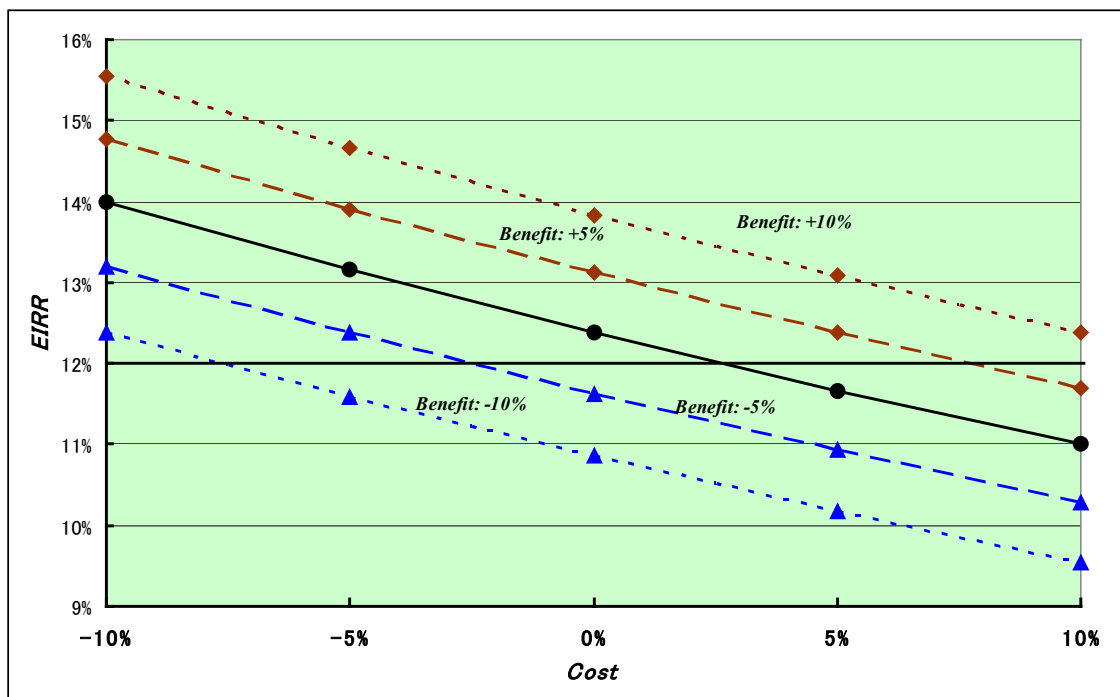


Figure 1-2 Relationship between Benefit/Cost and EIRR

The cases, which their EIRR exceeds 12%, were positioned at the border of 12% among the 25 cases: (a) 10% decrease of cost and also 10 decrease of benefit; (b) 5% decrease of cost and also 5% decrease of benefit; (c) 5% increase of cost and 5% increase of benefit and (d) 10% increase of cost and 10% increase of benefit as well as the original case. Thus, the better cases than those above were viable from the economic viewpoint. While, all other worse cases were less than 12% of EIRR. Accordingly, the estimates of cost and benefit should be reconsidered with prudence at the implementation stage.

Chapter 2 FINANCIAL ANALYSIS

2.1 Methodology of the Financial Analysis

The methodology of the financial analysis in this report is the same as in the master plan. In the feasibility study, the preconditions and assumptions for the financial analysis are the same as defined in the master plan. The project costs are estimated in Annex A25 in Volume VI for the feasibility Study. These costs reflect the actual present market conditions. The revenue of water sales is calculated as a product of the volume of water sold, and the water rates set by the NPVC. Finally, the projects are examined for financial efficiency, and evaluated taking into account of the financial conditions.

The financial evaluation aims to examine the financial viability of the 1st stage project. The project is expected to earn its return by not only covering all the incurred costs, but also with the intention of making a profit. The project inputs are evaluated at actual market prices, called the "financial costs". The project outputs are also evaluated at market prices, called the "financial benefit."

In the feasibility study, and in this report, the financial viability of the 1st stage project is examined by means of an evaluation index of the financial internal rate of return (FIRR). If the FIRR is not sufficient to implement under the preconditions and assumptions from the financial point of view, the financial constraints would be analyzed and identified, and some countermeasures would be proposed at this stage. In addition, the following financial indices were adopted: the net present value (NPV), the benefit-cost ratio (B/C), as well as the FIRR.

The analysis above is conducted mainly concerning the supply side of the project. The project management is also evaluated from the viewpoint of the demand side. Consumers' affordability-to-pay, as well as their willingness-to-pay for water, for the 1st stage projects is an important constraint for the project to be accepted. Through these analyses, this financial study proposes financial solutions and recommendations in the conclusion of the feasibility study. On the basis of these solutions and recommendations, a financial simulation for the most appropriate system is discussed to identify management issues in the future.

The 1st stage project in this feasibility study is an urgent scheme, and was formulated as the first stage of the water supply system formulated in the master plan. The financial analysis aims at working out a successful financial plan for the 1st stage project. The fundamentals of the analysis are based on the following preconditions and assumptions.

- 1) The tariff structure approved in Prime Ministerial Decision (37/PM) was expected to fully recover costs of water production by the new plant system.
- 2) The 1st stage project in this feasibility study is expected to have long-term financial sustainability.
- 3) Establishment of a new organization for operation and maintenance will ensure the long-term financial viability of the managing entity by means of ensuring full cost recovery.
- 4) The management of the system will improve its performance efficiency through the reduction of water losses, better commercial practices and good working incentives.

2.2 Revenue from Water Supply Services

The revenue of the 1st stage project accrues from payments by water consumers for services provided by the NPVC. The consumers pay for water charges in accordance with the volume of water consumed. The NPVC imposed a new water tariff effective in December 2001 for water consumption in their service areas. The average water price was estimated at 385 kip/m³ (equivalent to US\$0.0358/m³) for domestic users (category 1), and 770 kip/m³ (equivalent to US\$0.0718/m³) for non-domestic users (category 1 (non-domestic) to 4).

The revenue from water supply services is calculated as a product of water volume consumed and the unit rates defined by the water tariff. As discussed in the previous section, the average unit volume of water consumption in the 2007 was calculated and consumption volumes were already tabulated in forms of monthly and annual figures. The details of water demand are explained in Section 4.4 in Volume II. Table 2-1 shows the annual average unit revenue of the respective consumers in the initial year of the project in 2007, and in the matured demand year of the project in 2010.

Table 2-1 Average Water Consumption and Water Charge from 1st Stage Project

Type of Consumer	Unit	Domestic User	Non-domestic	Total
Average Unit Price (as of May 2003)	Kip/m ³	385	770	540
1. Annual Consumption in 2007				
Consumption Volume*	1000 m ³	5,479	3,742	9,221
Annual Charge*	US\$ 1000	196	269	465
Annual Charge for 4 months*	US\$ 1000			155
2. Annual Consumption in 2010				
Consumption Volume	m ³	6,987	4,536	11,523
Annual Charge	US\$ 1000	250	326	576

Note: * The figures show annual consumption, although in 2007 the operation is only four months.

In addition to water sales, the NPVC receives fees for connection charges from new consumers. The number of the new consumers is projected to reach 3,970 between 2007 and the beginning of 2009. The NPVC, therefore, will collect connection charges of US\$147,000 in total in 2009 at 2003 constant prices. The annual distribution of this revenue is summarised in Table 2-2.

Table 2-2 New Connections and Connection Fee from 1st Stage Project

Item	Unit	New Connection Fee
Average Unit Price (as of May 2003)	1000 Kip/Unit	1,128
1. New Connection in 2007		
Number of Connections	Unit	1,248
Annual Charge	US\$ 1000	131
2. New Connection in 2009		
Number of Connections	Unit	1,401
Annual Charge	US\$ 1000	147

Furthermore, the NPVC collects meter rental charges from water consumers. The average rate was calculated at 2,280 kip/unit (equivalent to US\$2.56/unit) in 2003. Applying this average rate to the proposed project, the expected income from meter rental was estimated as shown in Table 2-3.

Table 2-3 Water Meter Rental Fee from 1st Stage Project

Item	Unit	New Connection Fee
Average Unit Price (as of May 2003)	1000 Kip/Unit/Year	27.8
1. New Connection in 2007		
Number of Connections	Unit	1,248
Monthly Charge	US\$ 1000	3
2. New Connection in 2009		
Number of Connections	Unit	3,971
Annual Charge	US\$ 1000	10

2.3 Costs for Water Production

The financial construction cost of the 1st stage project consists of the following major items:

- (a) Main construction cost
- (b) Government administration cost
- (c) Engineering service cost
- (d) Physical contingency cost
- (e) Price contingency cost

The components of the main construction costs comprise (i) treatment plant facilities, (ii) supplementary facilities, (iii) water pipe lines and (iv) circulation pumps. The supplementary facilities include a treatment plant house, clear water reservoirs, pumps and other machinery. Other

costs are estimated proportional to the main construction costs. Details of the cost estimates were described in Annex A25 in Volume VI. The financial costs of the 1st stage project were summarized as shown in Table 2-4.

Table 2-4 Investment Costs of 1st Stage Project

(US\$ 1000)			
Description	JICA Portion	Other Projects	Investment Costs
1. Construction Cost	20,312	4,466	24,778
2. Engineering Services	1,422	400	1,822
3. Physical Contingency	2,173	611	2,784
4. Price Contingency	2,463	603	3,066
5. Administration Cost	1,319	366	1,685
Total	27,689	6,446	34,135

Note: The costs above exclude all costs taking part in the whole NPVC management such as “Human Resource Development”. “UFW Reduction” costs are set as an O&M cost in proportion to the new water capacity to the total supply capacity. These costs are included in the financial analysis of the entire waterworks including both existing services and new services.

The construction costs are disbursed in compliance with the construction schedule of the respective stages. The disbursement of the construction costs is tabulated as financial costs in Table 1-2.

In addition to the investment costs above, a connection system including connection service pipes and water meters are installed for each consumer. The installation costs of these connection systems are fully collected from the individual consumers as connection charges. These costs are invested in conformity with the increase of new consumers every year.

The O&M cost is an annual requirement during the economic life of the 1st stage project. The O&M cost was estimated at US\$262,000 in the initial year of the project, 2007, and US\$ 880,000 in the matured year of the project, 2009, at 2003 price levels. Details of the O&M cost are described in the financial costs section of Table 1-3.

As mentioned in the discussion of economic costs, replacement costs are required during the evaluation period of the 1st stage project. Some machinery utilised in the plants needs to be replaced during the system’s life. In the disbursement schedule, the replacement costs of these machines are appropriated for every 15 years. Thus, these replacement costs were estimated at a market value of US\$8.09 million in 2022. An estimate of the replacement costs are shown in Table 1-4.

2.4 Financial Feasibility

Financial costs and revenues earned during the evaluation period are shown as an annual stream in Table 2-5. The table also shows the evaluation indices. The indices were 0.12 of B/C and minus US\$25.6 million of the NPV. The FIRR was not calculated because the revenue was too small compared with the costs. From the financial point of view, accordingly, the 1st stage project is not said to be viable.

The reason why the 1st stage project is not financially viable is that the revenue is small compared with the investment and O&M costs. Based on this result of the financial costs and revenue, the relationship between water tariffs and financial costs were analysed and delineated in a graph as shown in Figure 2-1. In this figure, it was assumed that the charges for new connection installations and water meter rentals are kept at the same level as the present rates. The average rates for these services were US\$105/unit for a new connection, and rental of US\$2.56/unit/year as of May 2003.

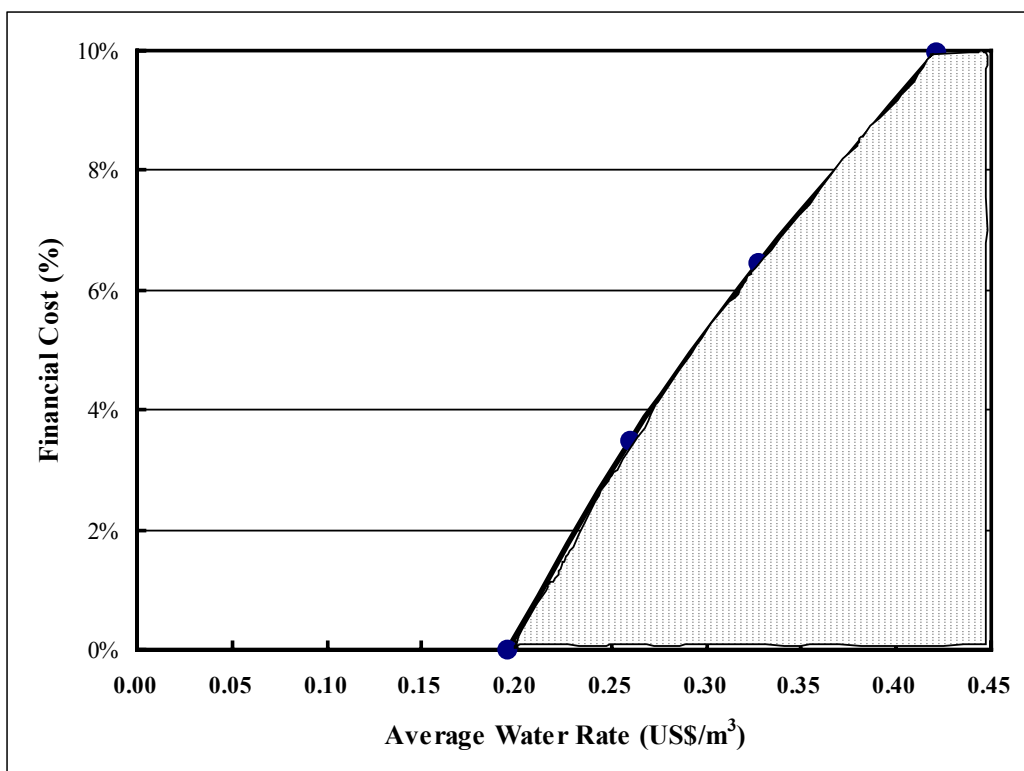


Figure 2-1 Relationship between Average Water Rates and Financial Costs

Table 2-5 Cost and Benefit Stream of 1st Stage Project Applying Present Tariff

(Unit: US\$1000)

Year	Cost				Revenue			Balance	
	Construc- tion	O&M	Replace- ment	Total	Water Charge	Connec- tion	Meter Rental		Total
2004	496			496	0	0	0	0	-496
2005	4,749			4,749	0	0	0	0	-4,749
2006	14,055			14,055	0	0	0	0	-14,055
2007	14,834	262		15,096	155	131	3	289	-14,806
1 2008		842		842	552	139	7	698	-144
2 2009		880		880	576	147	10	733	-147
3 2010		880		880	576	0	10	586	-294
4 2011		882		882	576	0	10	586	-296
5 2012		849		849	576	0	10	586	-263
6 2013		853		853	576	0	10	586	-267
7 2014		853		853	576	0	10	586	-267
8 2015		853		853	576	0	10	586	-267
9 2016		853		853	576	0	10	586	-267
10 2017		853		853	576	0	10	586	-267
11 2018		853		853	576	0	10	586	-267
12 2019		853		853	576	0	10	586	-267
13 2020		853		853	576	0	10	586	-267
14 2021		853		853	576	0	10	586	-267
15 2022		853	8,094	8,947	576	0	10	586	-8,361
16 2023		853		853	576	0	10	586	-267
17 2024		853		853	576	0	10	586	-267
18 2025		853		853	576	0	10	586	-267
19 2026		853		853	576	0	10	586	-267
20 2027		853		853	576	0	10	586	-267
21 2028		853		853	576	0	10	586	-267
22 2029		853		853	576	0	10	586	-267
23 2030		853		853	576	0	10	586	-267
24 2031		853		853	576	0	10	586	-267
25 2032		853		853	576	0	10	586	-267
26 2033		853		853	576	0	10	586	-267
27 2034		853		853	576	0	10	586	-267
28 2035		853		853	576	0	10	586	-267
29 2036		853		853	576	0	10	586	-267
30 2037		853		853	576	0	10	586	-267

FIRR: -- NPV: -25,842 thousand US\$ B/C: 0.11

In the figure, the area shaded indicates the effective combination of financial sources and the water charge. According to the figure, the following financial scenarios were analysed for making the 1st stage project viable from the financial point of view. These scenarios, or cases, are summarised in Table 2-6. Taking into account the following discussion, case 2 is one of the special cases in the areas shaded in Figure 2-1, and is considered as the most likely case, from the viewpoint of past financial performance.

Table 2-6 Relation between Financial Cost and Average Water Rate

Case	Financial Cost		Average Water Rate		Reference
	Interest Rate (%)	Remark	Water Cost (US\$/m ³)	Ratio to Present Rate	
Case 1	0.0%	Complete Grant	0.20	4.0 times	Table 2-7
Case 2	3.5%	Chinaimo Expansion	0.26	5.2 times	Table 2-8
Case 3	6.5%	International Loan	0.33	6.6 times	Table 2-9
Case 4	10.0%	Private Bank Loan	0.42	8.4 times	Table 2-10

If the initial investment costs were granted completely, the average water cost could be around US\$0.20/m³ (equivalent to 2,140 kip/m³) or 4.0 times of the present average water rate, as shown in the table above. The annual flow of this case (named as Case 1) is enumerated in Table 2-7.

In case 2, if the financial cost was set at a lower interest rate of 3.5%, the average water rate could be around US\$0.26/m³ (equivalent to 2,790 kip/m³) or 5.2 times of the present average water rate, as shown in the table above. This rate was already applied in Chinaimo Expansion Project. The annual flow of this case is enumerated in Table 2-8.

In case 3, if the financial cost was set at a standard public interest rate of 6.5%, like loans from international financial organizations such as the World Bank and the ADB, the average water rate could be around US\$0.32/m³ (equivalent to 3,430 kip/m³) or 6.6 times of the present average water rate, as shown in the table above. The annual flow of this case is enumerated in Table 2-9.

In case 4, if the financial cost was set up at an interest rate of 10.0% from a private bank, the average water rate could be around US\$0.42/m³ (equivalent to 4,500 kip/m³) or 8.4 times of the present average water rate, as shown in the table above. The annual flow for this case is enumerated in Table 2-10.

Table 2-7 Cost and Benefit Stream of 1st Stage Project Applying Case-1 Tariff
Case 1 Average Water Rate: US\$0.20/m³

(Unit: US\$1000)

Year	Cost				Revenue			Total	Balance
	Construc- tion	O&M	Replace- ment	Total	Water Charge	Connec- tion	Meter Rental		
2004	496			496	0	0	0	0	-496
2005	4,749			4,749	0	0	0	0	-4,749
2006	14,055			14,055	0	0	0	0	-14,055
2007	14,834	262		15,096	600	131	3	734	-14,362
1 2008		842		842	2,137	139	7	2,283	1,441
2 2009		880		880	2,228	147	10	2,386	1,506
3 2010		880		880	2,228	0	10	2,239	1,358
4 2011		882		882	2,228	0	10	2,239	1,357
5 2012		849		849	2,228	0	10	2,239	1,390
6 2013		853		853	2,228	0	10	2,239	1,385
7 2014		853		853	2,228	0	10	2,239	1,385
8 2015		853		853	2,228	0	10	2,239	1,385
9 2016		853		853	2,228	0	10	2,239	1,385
10 2017		853		853	2,228	0	10	2,239	1,385
11 2018		853		853	2,228	0	10	2,239	1,385
12 2019		853		853	2,228	0	10	2,239	1,385
13 2020		853		853	2,228	0	10	2,239	1,385
14 2021		853		853	2,228	0	10	2,239	1,385
15 2022		853	8,094	8,947	2,228	0	10	2,239	-6,709
16 2023		853		853	2,228	0	10	2,239	1,385
17 2024		853		853	2,228	0	10	2,239	1,385
18 2025		853		853	2,228	0	10	2,239	1,385
19 2026		853		853	2,228	0	10	2,239	1,385
20 2027		853		853	2,228	0	10	2,239	1,385
21 2028		853		853	2,228	0	10	2,239	1,385
22 2029		853		853	2,228	0	10	2,239	1,385
23 2030		853		853	2,228	0	10	2,239	1,385
24 2031		853		853	2,228	0	10	2,239	1,385
25 2032		853		853	2,228	0	10	2,239	1,385
26 2033		853		853	2,228	0	10	2,239	1,385
27 2034		853		853	2,228	0	10	2,239	1,385
28 2035		853		853	2,228	0	10	2,239	1,385
29 2036		853		853	2,228	0	10	2,239	1,385
30 2037		853		853	2,228	0	10	2,239	1,385

FIRR: 0.0% NPV: -17,138 thousand US\$ B/C: 0.41

Table 2-8 Cost and Benefit Stream of 1st Stage Project Applying Case-2 Tariff
Case 2 Average Water Rate: US\$0.26/m³

(Unit: US\$1000)

Year	Cost				Revenue			Balance	
	Construc- tion	O&M	Replace- ment	Total	Water Charge	Connec- tion	Meter Rental		Total
2004	496			496	0	0	0	0	-496
2005	4,749			4,749	0	0	0	0	-4,749
2006	14,055			14,055	0	0	0	0	-14,055
2007	14,834	262		15,096	798	131	3	932	-14,163
1 2008		842		842	2,844	139	7	2,990	2,148
2 2009		880		880	2,965	147	10	3,123	2,243
3 2010		880		880	2,965	0	10	2,976	2,095
4 2011		882		882	2,965	0	10	2,976	2,094
5 2012		849		849	2,965	0	10	2,976	2,127
6 2013		853		853	2,965	0	10	2,976	2,122
7 2014		853		853	2,965	0	10	2,976	2,122
8 2015		853		853	2,965	0	10	2,976	2,122
9 2016		853		853	2,965	0	10	2,976	2,122
10 2017		853		853	2,965	0	10	2,976	2,122
11 2018		853		853	2,965	0	10	2,976	2,122
12 2019		853		853	2,965	0	10	2,976	2,122
13 2020		853		853	2,965	0	10	2,976	2,122
14 2021		853		853	2,965	0	10	2,976	2,122
15 2022		853	8,094	8,947	2,965	0	10	2,976	-5,972
16 2023		853		853	2,965	0	10	2,976	2,122
17 2024		853		853	2,965	0	10	2,976	2,122
18 2025		853		853	2,965	0	10	2,976	2,122
19 2026		853		853	2,965	0	10	2,976	2,122
20 2027		853		853	2,965	0	10	2,976	2,122
21 2028		853		853	2,965	0	10	2,976	2,122
22 2029		853		853	2,965	0	10	2,976	2,122
23 2030		853		853	2,965	0	10	2,976	2,122
24 2031		853		853	2,965	0	10	2,976	2,122
25 2032		853		853	2,965	0	10	2,976	2,122
26 2033		853		853	2,965	0	10	2,976	2,122
27 2034		853		853	2,965	0	10	2,976	2,122
28 2035		853		853	2,965	0	10	2,976	2,122
29 2036		853		853	2,965	0	10	2,976	2,122
30 2037		853		853	2,965	0	10	2,976	2,122

FIRR: 3.5% NPV: -13,256 thousand US\$ B/C: 0.55

Table 2-9 Cost and Benefit Stream of 1st Stage Project Applying Case-3 Tariff
Case 3 Average Water Rate: US\$0.32/m³

(Unit: US\$1000)

Year	Cost				Revenue			Balance	
	Construc- tion	O&M	Replace- ment	Total	Water Charge	Connec- tion	Meter Rental		Total
2004	496			496	0	0	0	0	-496
2005	4,749			4,749	0	0	0	0	-4,749
2006	14,055			14,055	0	0	0	0	-14,055
2007	14,834	262		15,096	1,007	131	3	1,142	-13,954
1 2008		842		842	3,590	139	7	3,736	2,894
2 2009		880		880	3,743	147	10	3,900	3,020
3 2010		880		880	3,743	0	10	3,753	2,873
4 2011		882		882	3,743	0	10	3,753	2,871
5 2012		849		849	3,743	0	10	3,753	2,904
6 2013		853		853	3,743	0	10	3,753	2,900
7 2014		853		853	3,743	0	10	3,753	2,900
8 2015		853		853	3,743	0	10	3,753	2,900
9 2016		853		853	3,743	0	10	3,753	2,900
10 2017		853		853	3,743	0	10	3,753	2,900
11 2018		853		853	3,743	0	10	3,753	2,900
12 2019		853		853	3,743	0	10	3,753	2,900
13 2020		853		853	3,743	0	10	3,753	2,900
14 2021		853		853	3,743	0	10	3,753	2,900
15 2022		853	8,094	8,947	3,743	0	10	3,753	-5,194
16 2023		853		853	3,743	0	10	3,753	2,900
17 2024		853		853	3,743	0	10	3,753	2,900
18 2025		853		853	3,743	0	10	3,753	2,900
19 2026		853		853	3,743	0	10	3,753	2,900
20 2027		853		853	3,743	0	10	3,753	2,900
21 2028		853		853	3,743	0	10	3,753	2,900
22 2029		853		853	3,743	0	10	3,753	2,900
23 2030		853		853	3,743	0	10	3,753	2,900
24 2031		853		853	3,743	0	10	3,753	2,900
25 2032		853		853	3,743	0	10	3,753	2,900
26 2033		853		853	3,743	0	10	3,753	2,900
27 2034		853		853	3,743	0	10	3,753	2,900
28 2035		853		853	3,743	0	10	3,753	2,900
29 2036		853		853	3,743	0	10	3,753	2,900
30 2037		853		853	3,743	0	10	3,753	2,900

FIRR: 6.5% NPV: -9,162 thousand US\$ B/C: 0.69

Table 2-10 Cost and Benefit Stream of 1st Stage Project Applying Case-4 Tariff
Case 4 Average Water Rate: US\$0.42/m³

(Unit: US\$1000)

Year	Cost				Revenue			Balance	
	Construc- tion	O&M	Replace- ment	Total	Water Charge	Connec- tion	Meter Rental		Total
2004	496			496	0	0	0	0	-496
2005	4,749			4,749	0	0	0	0	-4,749
2006	14,055			14,055	0	0	0	0	-14,055
2007	14,834	262		15,096	1,294	131	3	1,428	-13,667
1 2008		842		842	4,612	139	7	4,757	3,916
2 2009		880		880	4,808	147	10	4,966	4,085
3 2010		880		880	4,808	0	10	4,818	3,938
4 2011		882		882	4,808	0	10	4,818	3,937
5 2012		849		849	4,808	0	10	4,818	3,969
6 2013		853		853	4,808	0	10	4,818	3,965
7 2014		853		853	4,808	0	10	4,818	3,965
8 2015		853		853	4,808	0	10	4,818	3,965
9 2016		853		853	4,808	0	10	4,818	3,965
10 2017		853		853	4,808	0	10	4,818	3,965
11 2018		853		853	4,808	0	10	4,818	3,965
12 2019		853		853	4,808	0	10	4,818	3,965
13 2020		853		853	4,808	0	10	4,818	3,965
14 2021		853		853	4,808	0	10	4,818	3,965
15 2022		853	8,094	8,947	4,808	0	10	4,818	-4,129
16 2023		853		853	4,808	0	10	4,818	3,965
17 2024		853		853	4,808	0	10	4,818	3,965
18 2025		853		853	4,808	0	10	4,818	3,965
19 2026		853		853	4,808	0	10	4,818	3,965
20 2027		853		853	4,808	0	10	4,818	3,965
21 2028		853		853	4,808	0	10	4,818	3,965
22 2029		853		853	4,808	0	10	4,818	3,965
23 2030		853		853	4,808	0	10	4,818	3,965
24 2031		853		853	4,808	0	10	4,818	3,965
25 2032		853		853	4,808	0	10	4,818	3,965
26 2033		853		853	4,808	0	10	4,818	3,965
27 2034		853		853	4,808	0	10	4,818	3,965
28 2035		853		853	4,808	0	10	4,818	3,965
29 2036		853		853	4,808	0	10	4,818	3,965
30 2037		853		853	4,808	0	10	4,818	3,965

FIRR: 10.0% NPV: -3,551 thousand US\$ B/C: 0.88

2.5 Sensitivity Analysis

In the same manner as conducted in the economic evaluation, a sensitivity test for the financial evaluation is applied to these data in this section. The test is made for the variations of $\pm 10\%$ and $\pm 5\%$ of the costs for the four revenue scenarios discussed in the previous sections. There are 20 cases using these variations. Figure 2-2 shows the range of FIRRs in accordance with the variations of costs and revenues. The results of the other indices, as well as those of the FIRR are given in Table 2-11.

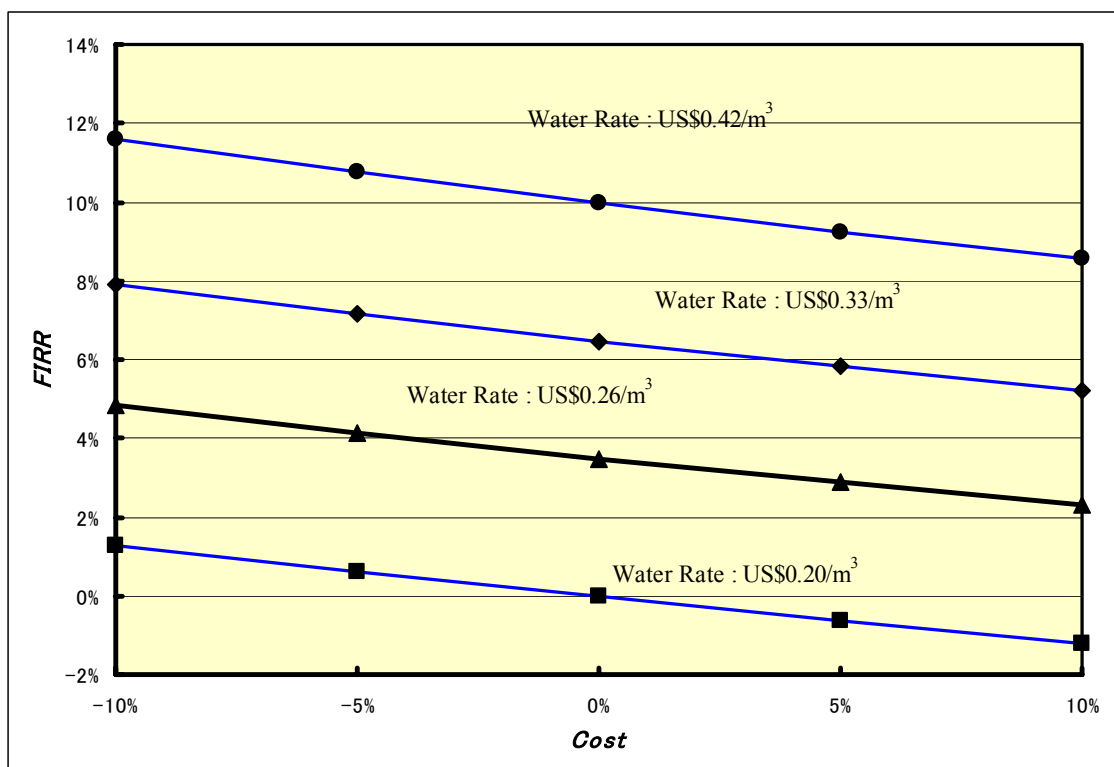


Figure 2-2 Relationship between Cost/Revenue and FIRR

The FIRR indicates that there is a marginal efficiency of investment for the 1st stage project. In the case of water rate set at US\$0.26/m³, the FIRR of the original cost estimate was 3.5%. Then, the project could be expected to have 3.5% of marginal efficiency for investment if it were managed in the most efficient conditions. In other words, the project could be viable from the financial point of view, if an interest rate of less than 3.5% were procured for the execution of the project with favourable management conditions. However, if the costs increased to 10% more than the original estimate, FIRR (marginal efficiency for investment) might go down to 2.2% as shown in the figure. Thus, investment costs directly influence the financial costs, so costs must be carefully reviewed with prudence in the design stage.

Table 2-11 Results of Sensitivity Analysis

FIRR

		Water Rate (US\$/m ³)			
		0.20	0.26	0.33	0.42
Cost	10%	-1.2%	2.3%	5.2%	8.6%
	5%	-0.6%	2.9%	5.8%	9.3%
	0%	0.0%	3.5%	6.5%	10.0%
	-5%	0.6%	4.1%	7.2%	10.8%
	-10%	1.3%	4.8%	7.9%	11.6%

NPV (Unit: US\$1000)

		Water Rate (US\$/m ³)			
		0.20	0.26	0.33	0.42
Cost	10%	-20,054	-16,172	-12,078	-6,467
	5%	-18,596	-14,714	-10,620	-5,009
	0%	-17,138	-13,256	-9,162	-3,551
	-5%	-15,680	-11,798	-7,703	-2,093
	-10%	-14,222	-10,340	-6,245	-634

B/C

		Water Rate (US\$/m ³)			
		0.20	0.26	0.33	0.42
Cost	10%	0.37	0.50	0.62	0.80
	5%	0.39	0.52	0.65	0.84
	0%	0.41	0.55	0.69	0.88
	-5%	0.43	0.57	0.72	0.92
	-10%	0.46	0.61	0.76	0.98

2.6 Affordability of Domestic Consumers

In accordance with the discussion in the master plan, affordability and willingness-to-pay to household income (or expenditure) of domestic users can be summarized as shown in Table 2-12.

Table 2-12 Affordability of Domestic Water Consumers

Survey/Report	Ratio of Water Charge to Household Income (Expenditure)
LECS2, 1997/98, NSC	1.0%
Household Survey by JICA	Household Served by NPVC
In March 2003	Household Not-served by NPVC
Prime Ministerial Decision (No.37/PM)	Lower Block Tariff
	Higher Block Tariff
World Bank Report, 1985	3 ~ 5%

In the Prime Ministerial Decision (No.37/PM), the affordability level of domestic water was set as 3% to 5% of household income. Recently, WASA established the “Tariff Policy 2003” in May 2003. The Tariff Policy suggests that the maximum price households are prepared to pay for water and sanitation facilities are in the order of 3-5% of the disposable household income, subject to revision in the light of new information. In addition, the average tariff should not exceed a level where the average household consumption results in a household water bill that exceeds 3% of the household’s disposable income. For the poorest sector, (the lowest 10% up the community’s income earners), the water tariff should not result in a water bill that exceeds 5% of that household’s disposable income.

The average family income was 1.6 million kip/month (equivalent to US\$150) as of 2003, as discussed in the master plan. Therefore the water charge should be less than 48,000 kip per month for a level of 3% of disposable income, and 80,000 kip per month at 5% of disposable income. In the poorest households, which are assumed to be in the first quintile among the quintile shares based on “Poverty Survey, 2002, NSC”, the household income was estimated at around 0.64 million kip/month, on average. In compliance with the water policy, the water charge for the poor should therefore be less than 19,200 at 3%. In this current study, these water charges are set as the upper level of affordability. As a matter of course, the limits of charges at this level are considered to rise as incomes increase in proportion to the future economic growth.

2.7 Tariff Design based on the Average Water Rate

Firstly, the average water rate is verified, taking into account the cost recovery policy. In general, the water rate is set by means of applying the Long-Run Average Cost (LRAC), or in other words, the Average Incremental Financial Cost (AIFC). From the past experience of the NPVC, the financial opportunity cost of capital was considered to be 3.5%, as the lowest financial cost. Table 2-13 shows that the LRAC was estimated at US\$0.26/m³. Thus, the average water rate of US\$0.26/m³ was considered as the most applicable for the 1st stage project from the viewpoint of both affordability for water consumers, and the financial availability of the NPVC.

Table 2-13 Long Run Average Cost of Water Served

Year	Quantity Demanded (1000m ³)			Cost (US\$1000)		
	Domestic	Non-domestic	Total	Construction	O&M Replacement	Total
2004			0	496		496
2005			0	4,749		4,749
2006			0	14,055		14,055
2007	1826	1247	3074	14,834	262	15,096
1 2008	6606	4398	11004		842	842
2 2009	6987	4536	11523		880	880
3 2010	6987	4536	11523		880	880
4 2011	6987	4536	11523		882	882
5 2012	6987	4536	11523		849	849
6 2013	6987	4536	11523		853	853
7 2014	6987	4536	11523		853	853
8 2015	6987	4536	11523		853	853
9 2016	6987	4536	11523		853	853
10 2017	6987	4536	11523		853	853
11 2018	6987	4536	11523		853	853
12 2019	6987	4536	11523		853	853
13 2020	6987	4536	11523		853	853
14 2021	6987	4536	11523		853	853
15 2022	6987	4536	11523		853	8,947
16 2023	6987	4536	11523		853	853
17 2024	6987	4536	11523		853	853
18 2025	6987	4536	11523		853	853
19 2026	6987	4536	11523		853	853
20 2027	6987	4536	11523		853	853
21 2028	6987	4536	11523		853	853
22 2029	6987	4536	11523		853	853
23 2030	6987	4536	11523		853	853
24 2031	6987	4536	11523		853	853
25 2032	6987	4536	11523		853	853
26 2033	6987	4536	11523		853	853
27 2034	6987	4536	11523		853	853
28 2035	6987	4536	11523		853	853
29 2036	6987	4536	11523		853	853
30 2037	6987	4536	11523		853	853
Present Value						
Discounted at 3.5%	125,574	81,678	186,929			48,684
Long Run Average Cost (US\$/m³)					0.07	
Domestic Water Rate (US\$/m ³)					0.05	
Non-domestic Water Rate (US\$/m ³)					0.11	
Ratio of Non-domestic to Domestic					2.0	

In Section 4.3 in Volume III of the feasibility study, the discussion of “Water Demand Management” considered that water pricing might be one of the most effective measures for water demand management, with the introduction of a progressive block tariff system. Hence, the new water tariff system is designed taking the following cross-subsidisation policies into consideration.

- 1) The water tariff for non-domestic water consumers is to be set at twice the level of the domestic consumers, based on the present structure.
- 2) For the poor sector (nearly 20% of the population of Vientiane), the water tariff is 3% of the household disposable income (around 640,000 kip as of 2003).
- 3) For the average household consumers, the water tariff is 3.5% of the household disposable income (around 1.6 million as of 2003), as discussed in the previous section.

The average water rate for domestic users was calculated at US\$0.17/m³ or 1,806 kip/m³, as shown in Table 2-14. Incidentally, the NPVC applies a new tariff for amendment to the government; an average water rate of which is set as 750 kip/m³. The results of the new tariff design are outlined in Table 2-14. The water tariff for domestic users is illustrated in Figure 2-3.

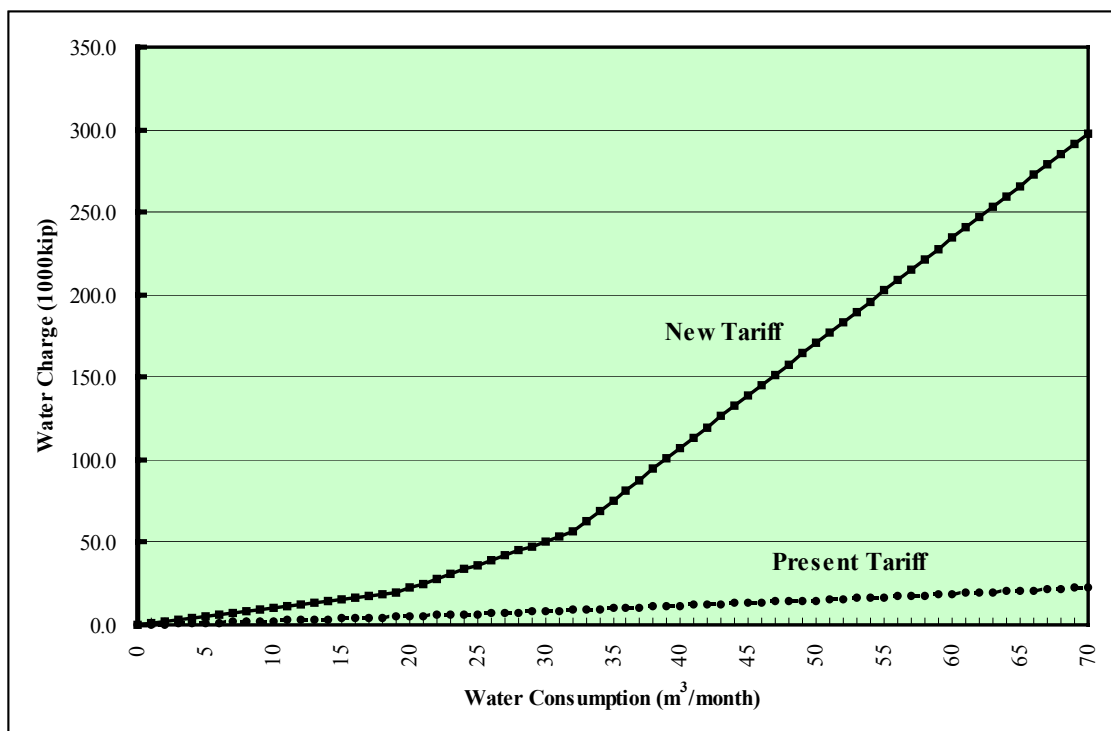


Figure 2-3 Tariff Structure based on Average Water Rate

For the poor, the water charge was calculated at an average of 19,200 kip per household, accounting for 3% of their household income. The water rate for this group was set as 1,016 kip/m³, as shown in the table, which is 4.0 times higher than that of the present rate. For the average household, the

water charge was calculated at 56,000 kip on average, accounting for 3.5% of their household income. The water rate for this group was set as 1,743 kip/m³, as shown in the table, which is 6.2 times that of the present rate. For the higher income people, the water charge was calculated at 224,000 kip on average, accounting for 6.4% of their household income. The water rate for this group was set as 3,831 kip/m³, as shown in the table, which is 12.3 times the present rate.

Table 2-14 Comparison of New Tariff Structure to Present Tariff

Item	Unit	Domestic User				Total/ Average	Average in 2002	Non-domestic User
		Income Group						
		Low	Middle	High				
(1) Composition		20%	70%	10%	100%			
(2) Unit Consumption	liter/Capita/day	100	170	310	170			
(3) Monthly Consumption	m ³ /month	19	32	59	32			
(4) Monthly Income	1000Kip	640	1,600	3,500	1,600			
(5) Ratio of Water Charge		3.0%	3.5%	6.4%				
(6) Monthly Charge	Kip/month	19,200	56,000	224,000				
(7) Average Unit Rate	Kip/m ³	1,016	1,743	3,831	1,806		3,616	
(8) Present Unit Rate	Kip/m ³	251	280	311	277	385	770	
(9) Times of New Rate to Present Rate		4.0	6.2	12.3	6.5		4.7	

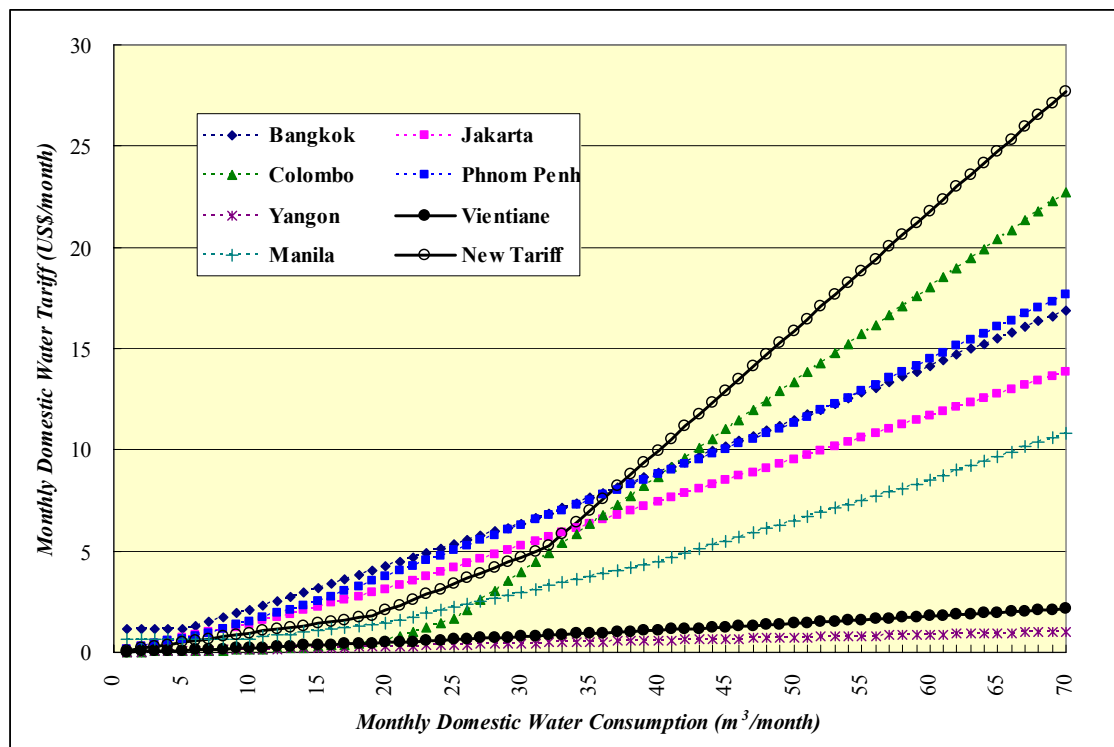


Figure 2-4 Comparison of Existing and New Tariffs in Vientiane Capital City with Existing Water Tariffs in Major Asian Cities

The present water tariff as of 2003 and the new tariff mentioned above were compared with the present tariffs of major cities in South-east Asian Countries. Figure 2-4 shows the water tariffs of these cities with those in Vientiane. The present tariff in Vientiane is the second lowest after Yangon City among these cities, as shown in the figure. The new tariff of low-quantity water consumers of less than 32m³/month was ranked at the fourth from the bottom of Yangon. The tariff of more than 38m³/month became to the top ranked tariff, as shown in the figure. As analyzed in the following section, however, the new tariff will be introduced around 15 years later after the inauguration. It might not be so expensive among the tariffs in the major cities, once economic growth and price escalation in these cities were taken into consideration in the future.

2.8 Cash Flow Analysis

In this section, the 1st stage project is analysed from the viewpoint of the following two aspects: (1) the approach to cost recovery management, and (2) the approach to sustainable management.

(1) Approach to Cost Recovery Management

To recover the total input for the 1st stage project, the project entity is expected to manage its revenues and costs through the project life. This subject is dealt with in a cash flow analysis in the following discussion. Firstly, the water tariff based on the LRAC is introduced in the middle of the target year. Then, the initial tariff is raised over an extended period of time to the LRAC. Finally, the management strives to recover the total cost by the end of the project life.

The following conditions and assumptions are made for the projected cash flow.

- 1) The financial statement is based on general accounting rules as discussed in the following section. The main financial source is procured through a government loan, the terms of which are as follows: the equity covers 50% of the investment costs and the loan covers 50% of the investment costs, which has an interest rate of 6.6% per annum, and there is a 30 year repayment period, including a 10 year grace period. The rule of principal repayment and interest payment is to be compliant with the government direction.
- 2) The financial plan is to be conducted at constant prices without price escalation to assess the need for funds to finance the project expenditure, both during the construction process, and the period of operation.
- 3) The household income was assumed to increase in proportion to the GDP per capita in the future.
- 4) The water tariff for domestic consumers was assumed to start at the present tariff level, and increase every three years, in accordance with the household income, taking into

consideration the upper tariff ceiling (5% of the household income).

- 5) The LRAC is realised by means of rising tariff linked with the projected GDP growth per capita, which results in mitigating the burden of water charges to domestic users.
- 6) Cost recovery is judged on the following criterion.

The Loan Life Debt Service Coverage Ratio (LLCR) shows the multiple number of the present value of net profit before debt service payment, against the principal amount of loans. The LLCR describes an index for testing the solvency of the project cash flow. It makes an assessment rate of the collateral. In other words, when an LLCR=1.0, this number indicates that the project cash flow corresponds to the total amount of loans. The LLCR can be calculated by applying the following formula.

$$LLCR = \frac{\sum^t P_t / (1+r)^t}{L}$$

- Where, *LLCR*: Loan life debt service coverage ratio,
P: Net cash flow before debt service payment
L: Principal amount of loans,
r: Discount rate, i.e., average interest rate of loans in this study, and
t: Period of loan life including construction period.

Table 2-15 shows the result of the cash flow statement, which has barely enough water sales to recover the full cost. As shown in the table, the LLCR was calculated at 1.085, so the project cash flow could cover the total loan amount within the project life.

Yet, there are some difficulties for the management of the project operation. To attain an average water tariff of US\$0.26/m³, the NPVC management has to wait until 2020 because the water tariff will start from the present tariff. Thus, it is projected that the NPVC management has a large deficit for the first half of the project life. In the second half of the project, therefore, it has to cover these deficits. Finally, the debt service was covered by the end of the project life.

Table 2-15 Cash Flow Statement for Full Cost Recovery

(Unit: US\$1000)																				
Year	Financial Flow				Profit & Loss Flow						Cash Flow					Debt Service Coverage Ratio	Return on Equity (ROE)			
	Equity	Capital Investment Fund	Foreign Fund	Interest	Sales Revenue *2	O&M	Expense Depreciation	Interest	Income before Tax	Profit Tax*4	Income after Tax	Revenue	Expense O&M	Tax	Balance before Debt Service			Debt Service*3 Principal	Interest	Net Cash Flow
			Payment																	
2004	248	248																0	0	
2005	2,375	2,375																0	0	
2006	7,027	7,027																0	0	
2007	7,417	7,417			553	262			291	102	189	553	262	102	189	0	0	189	-	1.11%
1 2008					1,332	842	1,408	0	-917	13	-930	1,332	842	13	478	0	0	478	-	2.80%
2 2009					1,400	880	1,408	0	-888	14	-902	1,400	880	14	506	0	0	506	-	2.96%
3 2010					1,511	880	1,408	0	-777	15	-792	1,511	880	15	616	0	0	616	-	3.61%
4 2011					1,511	882	1,408	0	-778	15	-793	1,511	882	15	614	0	0	614	-	3.60%
5 2012					1,511	849	1,408	0	-745	15	-760	1,511	849	15	647	0	0	647	-	3.79%
6 2013					1,990	853	1,408	0	-271	20	-291	1,990	853	20	1,116	0	0	1,116	-	6.54%
7 2014			853	1,087	1,990	853	1,408	1,087	-1,358	20	-1,378	1,990	853	20	1,116	853	1,087	-824	0.575	-4.83%
8 2015			853	1,187	1,990	853	1,408	1,187	-1,458	20	-1,478	1,990	853	20	1,116	853	1,187	-924	0.547	-5.41%
9 2016			853	1,594	2,502	853	1,408	1,594	-1,353	25	-1,378	2,502	853	25	1,624	853	1,594	-824	0.663	-4.83%
10 2017			853	2,028	2,502	853	1,408	2,028	-1,786	25	-1,811	2,502	853	25	1,624	853	2,028	-1,257	0.564	-7.37%
11 2018			853	1,971	2,502	853	1,408	1,971	-1,730	25	-1,755	2,502	853	25	1,624	853	1,971	-1,201	0.575	-7.04%
12 2019			853	1,915	3,067	853	1,408	1,915	-1,109	31	-1,140	3,067	853	31	2,182	853	1,915	-586	0.788	-3.43%
13 2020			853	1,859	3,067	853	1,408	1,859	-1,053	31	-1,084	3,067	853	31	2,182	853	1,859	-530	0.805	-3.10%
14 2021			853	1,802	3,067	853	1,408	1,802	-997	31	-1,027	3,067	853	31	2,182	853	1,802	-473	0.822	-2.77%
15 2022			853	1,746	3,711	853	1,408	1,746	-296	37	-333	3,711	853	37	2,821	853	1,746	221	1.085	1.30%
16 2023			853	1,690	3,711	853	1,408	1,690	-240	37	-277	3,711	853	37	2,821	853	1,690	278	1.109	1.63%
17 2024			853	507	3,711	853	1,408	507	943	330	613	3,711	853	330	2,528	853	507	1,167	1.858	6.84%
18 2025			853	451	4,447	853	1,408	451	1,736	607	1,128	4,447	853	607	2,986	853	451	1,682	2.290	9.86%
19 2026			853	394	4,447	853	1,408	394	1,792	627	1,165	4,447	853	627	2,967	853	394	1,719	2.378	10.07%
20 2027			853	338	4,447	853	1,408	338	1,848	647	1,201	4,447	853	647	2,947	853	338	1,756	2.474	10.29%
21 2028			853	282	5,288	853	1,408	282	2,746	961	1,785	5,288	853	961	3,474	853	282	2,339	3.061	13.70%
22 2029			853	225	5,288	853	1,408	225	2,802	981	1,821	5,288	853	981	3,454	853	225	2,375	3.202	13.92%
23 2030			853	169	5,288	853	1,408	169	2,858	1,000	1,858	5,288	853	1,000	3,434	853	169	2,412	3.359	14.13%
24 2031			853	113	6,249	853	1,408	113	3,875	1,356	2,519	6,249	853	1,356	4,039	853	113	3,073	4.181	18.01%
25 2032			853	56	6,249	853	1,408	56	3,931	1,376	2,555	6,249	853	1,376	4,019	853	56	3,110	4.418	18.22%
26 2033			853	0	6,249	853	1,408	0	3,988	1,396	2,592	6,249	853	1,396	4,000	853	0	3,146	4.687	18.43%
27 2034					7,346	853	1,408	0	5,085	1,780	3,305	7,346	853	1,780	4,713			4,713		27.61%
28 2035					7,346	853	1,408		5,085	1,780	3,305	7,346	853	1,780	4,713			4,713		27.61%
29 2036					7,346	853	1,408		5,085	1,780	3,305	7,346	853	1,780	4,713			4,713		27.61%
30 2037					8,599	853	1,408		6,338	2,218	4,120	8,599	853	2,218	5,527			5,527		32.39%
										Return on Equity (ROE):		7.7%		Average DSCR (Debt Service Coverage Ratio):				1.972		
										Return on Investment (ROI):		6.9%		Loan Life Debt Service Coverage Ratio (LLCR)*1:				1.085		

Note: *1 Discounted at 6.6% of interest rate.

*2 Net sales revenue excluding Turnover Tax.

*3 Debt services were based on the latest principle in the Lao Government.

*4 Imposed 35% of the profit tax on net profit. In case of deficit, the minimum tax is imposed in stead of the profit tax.

*5 Ratio (%) of water charge to household income.

*6 Ratio of non-domestic water rate to domestic water rate.

Regarding the water charge for domestic consumers, the ratio of the charge to household income is set to 1.1% of the household income at the beginning year. The ratio is 2.2% only even in the year 2037. This ratio could satisfy the beneficiaries of domestic users. The transition of the ratio is enumerated in Table 2-16, with the water tariff and the water charge as well as the household income during the project life. It is illustrated in Figure 2-5. The water tariff for non-domestic consumers could keep the same rate of two times higher than that of domestic consumers even in the year 2037, as shown in the right edge column of the table.

Table 2-16 Average Water Rate, Monthly Water Charge and Ratio of Water Charge to Monthly Income: 2007-2037

Year	Average Water Rate*1 (US\$/m ³)	Domestic Consumer			Average Water Rate of Non-domestic Consumer*2 (US\$/m ³)	
		Average Water Rate*2 (US\$/m ³)	Monthly Water Charge*3 (US\$/month)	Average Ratio of Water Monthly Charge to Income*4 (%)		
2003	0.05	0.03	-	149	-	0.06
2004	0.07	0.04	-	156	-	0.09
2005	0.07	0.04	-	164	-	0.09
2006	0.07	0.04	-	172	-	0.09
2007	0.10	0.06	2.0	180	1.1	0.12
2008	0.10	0.06	2.0	188	1.1	0.12
2009	0.10	0.06	2.0	197	1.0	0.12
2010	0.13	0.08	2.7	206	1.3	0.17
2011	0.13	0.08	2.7	217	1.2	0.17
2012	0.13	0.08	2.7	228	1.2	0.17
2013	0.17	0.11	3.5	239	1.5	0.22
2014	0.17	0.11	3.5	251	1.4	0.22
2015	0.17	0.11	3.5	264	1.3	0.22
2016	0.22	0.14	4.4	276	1.6	0.28
2017	0.22	0.14	4.4	289	1.5	0.28
2018	0.22	0.14	4.4	302	1.5	0.28
2019	0.26	0.17	5.4	315	1.7	0.34
2020	0.26	0.17	5.4	330	1.6	0.34
2021	0.26	0.17	5.4	345	1.6	0.34
2022	0.32	0.20	6.6	360	1.8	0.41
2023	0.32	0.20	6.6	377	1.7	0.41
2024	0.32	0.20	6.6	394	1.7	0.41
2025	0.38	0.25	7.9	412	1.9	0.49
2026	0.38	0.25	7.9	430	1.8	0.49
2027	0.38	0.25	7.9	450	1.7	0.49
2028	0.45	0.29	9.3	470	2.0	0.58
2029	0.45	0.29	9.3	491	1.9	0.58
2030	0.45	0.29	9.3	514	1.8	0.58
2031	0.54	0.34	11.0	537	2.1	0.69
2032	0.54	0.34	11.0	561	2.0	0.69
2033	0.54	0.34	11.0	587	1.9	0.69
2034	0.63	0.41	13.0	613	2.1	0.81
2035	0.63	0.41	13.0	641	2.0	0.81
2036	0.63	0.41	13.0	670	1.9	0.81
2037	0.74	0.47	15.2	701	2.2	0.95

Note: *1 Average monthly water was set to increase at the rate of 3.5 times higher than the growth of GRDP per capita.

*2 Ratio of non-domestic rate to domestic rate was set as 2:1.

*3 Average monthly water consumption was set at 32.0 m³.

*4 Household income was assumed to increase in proportion to GRDP per capita.

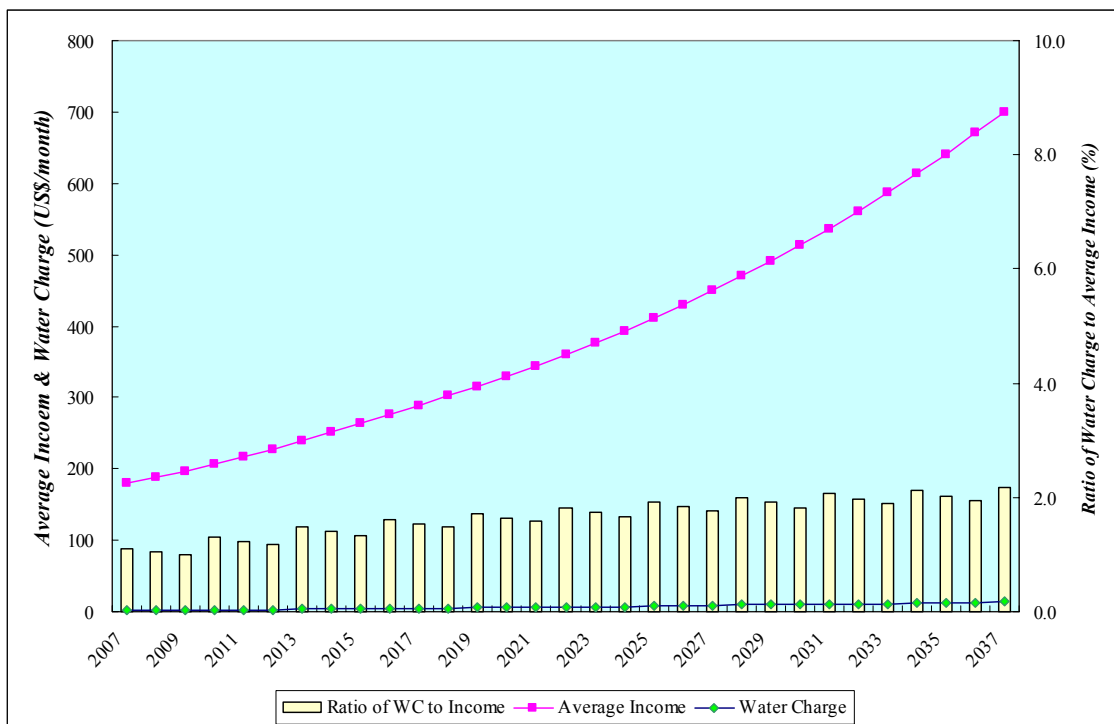


Figure 2-5 Average Household Income and Average Water Charge in Case of Full Cost Recovery Management

(2) Approach to Sustainable Management

This section provides the issues that the management of the project entity needs to achieve to attain commercial financial viability for the long term tariff benefit. This subject also deals with the cash flow analysis. The viability of the project is verified through the return on equity (ROE) and the return on investment (ROI), as well as the LLCR. The conditions and assumptions are the same as mentioned in the previous section.

Hence, ROE_t is the average return of capital input in a certain (t) year, i.e., an index of the yield on the invested capital. It is an essential factor for the investor in deciding for any investment in a project. If the net profit after tax is put on dividends to share holders, an inverse number of the average ROE can indicate an equity payback period. In the private capital market in general, an investor expects to recover the investment within five years. If this judgement is applied to the ROE, it would be expected that the index would be 20%. In the case of special characteristics like investment in real estate and infrastructure, an investor may approve a recoverable period of 10 years. In this case, the ROE would be 10%. Thus, the ROE is expected to be in a range of between 10% and 20%. The ROE can be calculated by applying the following formula.

$$ROE_t = \frac{R_t}{E}$$

$$\text{Average ROE} = \frac{\sum_t R_t}{E}$$

Where, ROE_t : Return on equity in a certain year,
Average ROE: Return on equity over the analysis period,
 R : Net cash flow,
 E : Amount of invested own capital (equity), and
 t : Period, total of which means the loan life including the construction period.

The return on investment, the ROI, is an average return of all funds input, i.e., an index of yield on the project itself. Thus, interest payments are added to the ROE. It indicates the degree of safety for interest payments, as well as the profitability of the project. The ROI can also test the investment payback period of the whole investment including loans. In general, an investor expects to recover both equity and loans as mentioned in the discussion of the ROE. The ROI is also expected to be range between 10% and 20%. The ROI can be calculated by applying the following formula.

$$ROI = \frac{\sum_t (R_t + I_t) / t_0}{E + \sum_t O_t / t_0}$$

Where, ROI : Return on investment over the whole period
 R : Net cash flow,
 I : Interest paid for loans
 E : Amount of invested own capital (equity)
 O : Outstanding of loans, and
 t, t_0 : Period and total period of the loan life including the construction period.

In this financial procurement, the sustainability of project is verified by means of ROE, ROI and LLCR. Table 2-17 shows the result of cash flow statement for sustainable management. As shown in the table, the ROE and the ROI were calculated at 13.7% and 10.5%, respectively. The LLCR was calculated at 1.561. Therefore, the project cash flow could express the sustainable condition for the management of the project.

Yet, it would be difficult for the project entity to manage the operation of the project in the way shown in the statement. The accumulation of the annual incomes from the sales revenue during the project life was US\$163 million, which was almost 37% more than that in the previous result in Table 2-15.

Furthermore, the average water rate was calculated at US\$0.37/m³ at 2003 economic conditions, which was also 42% higher than the previous management case and 7.4 times more than the average water rate in 2003. Although the water charge of domestic consumers could be kept to nearly 3.0% on average as shown in Table 2-18, it would be a question whether or not the beneficiaries might satisfy such high water tariff in the future. It is illustrated in Figure 2-6. The consensus of not only domestic consumers but other stakeholders would be essential for the tariff structure.

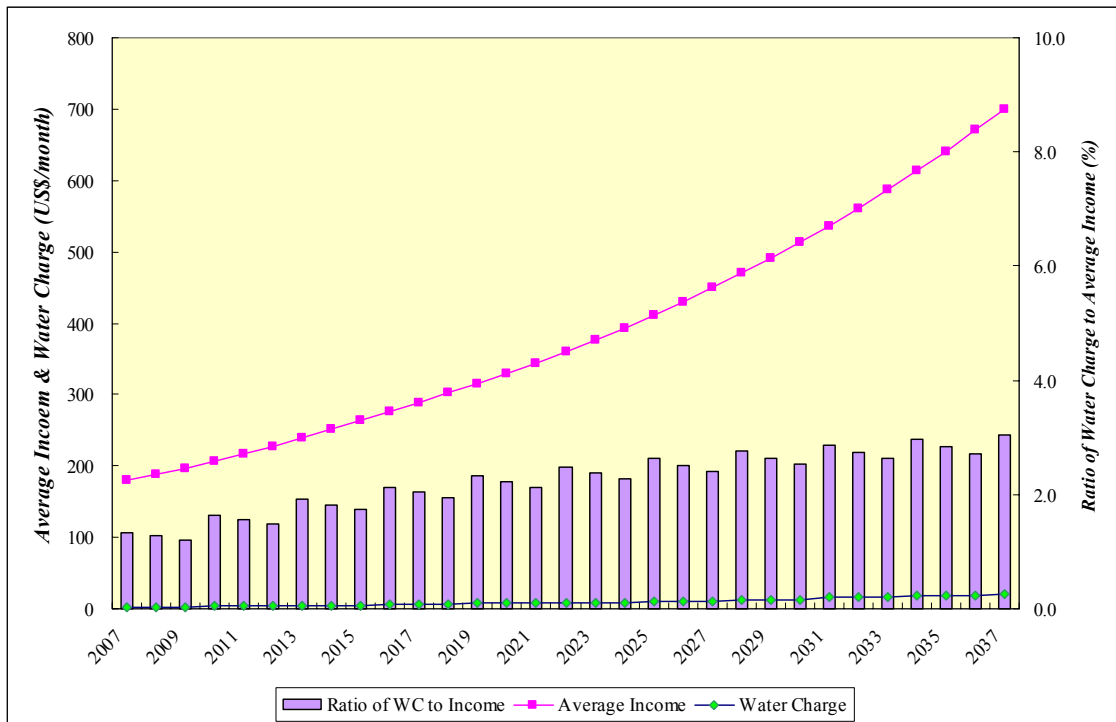


Figure 2-6 Average Household Income and Average Water Charge in Case of Financially Sustainable Management

Table 2-17 Cash Flow Statement for Financially Sustainable Management

																			(Unit: US\$1000)		
Year	Financial Flow				Profit & Loss Flow						Cash Flow					Debt Service Coverage Ratio	Return on Equity (ROE)				
	Equity	Capital Investment Fund	Foreign Fund		Sales Revenue *2	O&M	Expense Depreciation	Interest	Income before Tax	Profit Tax*4	Income after Tax	Revenue	Expense		Balance before Debt Service			Debt Service*3		Net Cash Flow	
			Principal	Interest									O&M	Tax				Principal	Interest		
2004	248	248													0			0			
2005	2,375	2,375													0			0			
2006	7,027	7,027													0			0			
2007	7,417	7,417			665	262			404	141	262	665	262	141	262	0	0	262	-	1.54%	
1 2008					1,604	842	1,408	0	-645	16	-661	1,604	842	16	747	0	0	747	-	4.38%	
2 2009					1,686	880	1,408	0	-602	17	-619	1,686	880	17	789	0	0	789	-	4.62%	
3 2010					1,908	880	1,408	0	-380	19	-399	1,908	880	19	1,008	0	0	1,008	-	5.91%	
4 2011					1,908	882	1,408	0	-382	19	-401	1,908	882	19	1,007	0	0	1,007	-	5.90%	
5 2012					1,908	849	1,408	0	-349	19	-368	1,908	849	19	1,040	0	0	1,040	-	6.09%	
6 2013					2,591	853	1,408	0	330	116	215	2,591	853	116	1,622	0	0	1,622	-	9.51%	
7 2014			853	1,087	2,591	853	1,408	1,087	-756	26	-782	2,591	853	26	1,712	853	1,087	-228	0.882	-1.34%	
8 2015			853	1,187	2,591	853	1,408	1,187	-857	26	-883	2,591	853	26	1,712	853	1,187	-328	0.839	-1.92%	
9 2016			853	1,594	3,324	853	1,408	1,594	-532	33	-565	3,324	853	33	2,437	853	1,594	-11	0.996	-0.06%	
10 2017			853	2,028	3,324	853	1,408	2,028	-965	33	-998	3,324	853	33	2,437	853	2,028	-444	0.846	-2.60%	
11 2018			853	1,971	3,324	853	1,408	1,971	-909	33	-942	3,324	853	33	2,437	853	1,971	-388	0.863	-2.27%	
12 2019			853	1,915	4,130	853	1,408	1,915	-46	41	-88	4,130	853	41	3,235	853	1,915	467	1.169	2.73%	
13 2020			853	1,859	4,130	853	1,408	1,859	10	4	7	4,130	853	4	3,273	853	1,859	561	1.207	3.29%	
14 2021			853	1,802	4,130	853	1,408	1,802	66	23	43	4,130	853	23	3,253	853	1,802	597	1.225	3.50%	
15 2022			853	1,746	5,050	853	1,408	1,746	1,043	365	678	5,050	853	365	3,832	853	1,746	1,232	1.474	7.22%	
16 2023			853	1,690	5,050	853	1,408	1,690	1,100	385	715	5,050	853	385	3,812	853	1,690	1,269	1.499	7.44%	
17 2024			853	507	5,050	853	1,408	507	2,282	799	1,484	5,050	853	799	3,398	853	507	2,038	2.498	11.94%	
18 2025			853	451	6,102	853	1,408	451	3,391	1,187	2,204	6,102	853	1,187	4,062	853	451	2,758	3.115	16.16%	
19 2026			853	394	6,102	853	1,408	394	3,447	1,206	2,240	6,102	853	1,206	4,042	853	394	2,795	3.240	16.37%	
20 2027			853	338	6,102	853	1,408	338	3,503	1,226	2,277	6,102	853	1,226	4,023	853	338	2,831	3.377	16.59%	
21 2028			853	282	7,303	853	1,408	282	4,761	1,666	3,094	7,303	853	1,666	4,784	853	282	3,649	4.215	21.38%	
22 2029			853	225	7,303	853	1,408	225	4,817	1,686	3,131	7,303	853	1,686	4,764	853	225	3,685	4.417	21.59%	
23 2030			853	169	7,303	853	1,408	169	4,873	1,706	3,168	7,303	853	1,706	4,744	853	169	3,722	4.641	21.81%	
24 2031			853	113	8,676	853	1,408	113	6,302	2,206	4,096	8,676	853	2,206	5,616	853	113	4,650	5.814	27.25%	
25 2032			853	56	8,676	853	1,408	56	6,358	2,225	4,133	8,676	853	2,225	5,597	853	56	4,687	6.152	27.46%	
26 2033			853	0	8,676	853	1,408	0	6,415	2,245	4,169	8,676	853	2,245	5,577	853	0	4,724	6.535	27.68%	
27 2034					10,243	853	1,408	0	7,982	2,794	5,188	10,243	853	2,794	6,596			6,596		38.65%	
28 2035					10,243	853	1,408		7,982	2,794	5,188	10,243	853	2,794	6,596			6,596		38.65%	
29 2036					10,243	853	1,408		7,982	2,794	5,188	10,243	853	2,794	6,596			6,596		38.65%	
30 2037					12,033	853	1,408		9,772	3,420	6,352	12,033	853	3,420	7,759			7,759		45.46%	
Return on Equity (ROE):										13.7%		Average DSCR (Debt Service Coverage Ratio):					2.750				
Return on Investment (ROI):										10.5%		Loan Life Debt Service Coverage Ratio (LLCR)*1:					1.561				
Total	17,067	17,067	17,067	19,413	163,967																

Note: *1 Discounted at 6.6% of interest rate.

*2 Net sales revenue excluding Turnover Tax.

*3 Debt services were based on the latest principle in the Lao Government.

*4 Imposed 35% of the profit tax on net profit. In case of deficit, the minimum tax is imposed in stead of the profit tax.

*5 Ratio (%) of water charge to household income.

*6 Ratio of non-domestic water rate to domestic water rate.

Table 2-18 Average Water Rate, Monthly Water Charge and Ratio of Water Charge to Monthly Income: 2007-2037

Year	Average Water Rate*1 (US\$/m ³)	Domestic Consumer			Average Ratio of Water Charge to Income (%)	Average Water Rate of Non-domestic Consumer*2 (US\$/m ³)
		Average Water Rate*2 (US\$/m ³)	Monthly Water Charge*3 (US\$/month)	Average Monthly Income*4		
2003	0.05	0.03	-	149	-	0.06
2004	0.08	0.05	-	156	-	0.10
2005	0.08	0.05	-	164	-	0.10
2006	0.08	0.05	-	172	-	0.10
2007	0.12	0.07	2.4	180	1.3	0.15
2008	0.12	0.07	2.4	188	1.3	0.15
2009	0.12	0.07	2.4	197	1.2	0.15
2010	0.16	0.11	3.4	206	1.6	0.21
2011	0.16	0.11	3.4	217	1.6	0.21
2012	0.16	0.11	3.4	228	1.5	0.21
2013	0.22	0.14	4.6	239	1.9	0.29
2014	0.22	0.14	4.6	251	1.8	0.29
2015	0.22	0.14	4.6	264	1.7	0.29
2016	0.29	0.18	5.9	276	2.1	0.37
2017	0.29	0.18	5.9	289	2.0	0.37
2018	0.29	0.18	5.9	302	1.9	0.37
2019	0.36	0.23	7.3	315	2.3	0.46
2020	0.36	0.23	7.3	330	2.2	0.46
2021	0.36	0.23	7.3	345	2.1	0.46
2022	0.43	0.28	8.9	360	2.5	0.56
2023	0.43	0.28	8.9	377	2.4	0.56
2024	0.43	0.28	8.9	394	2.3	0.56
2025	0.52	0.34	10.8	412	2.6	0.67
2026	0.52	0.34	10.8	430	2.5	0.67
2027	0.52	0.34	10.8	450	2.4	0.67
2028	0.63	0.40	12.9	470	2.7	0.81
2029	0.63	0.40	12.9	491	2.6	0.81
2030	0.63	0.40	12.9	514	2.5	0.81
2031	0.75	0.48	15.3	537	2.9	0.96
2032	0.75	0.48	15.3	561	2.7	0.96
2033	0.75	0.48	15.3	587	2.6	0.96
2034	0.88	0.57	18.1	613	2.9	1.13
2035	0.88	0.57	18.1	641	2.8	1.13
2036	0.88	0.57	18.1	670	2.7	1.13
2037	1.04	0.66	21.3	701	3.0	1.33

Note: *1 Average monthly water was set to increase at the rate of 5 times higher than the growth of GRDP per capita.

*2 Ratio of non-domestic rate to domestic rate was set as 2:1.

*3 Average monthly water consumption was set at 32.0 m³.

*4 Household income was assumed to increase in proportion to GRDP per capita.

Chapter 3 FINANCIAL SIMULATION

The object of the financial simulation is set as the NPVC management during the 1st stage project. The 1st stage project is set to be implemented from 2004, as mentioned in Section 7.2. The water supply services from that project are set to start from September 2007. The simulation terminates at the end of 2037, i.e., the simulation is for the economic life of the 1st stage project.

3.1 Financial Plan and Assumptions

In the financial simulation analysis, the revenues from the water supply services, and the expenditures for the operation and maintenance, as well as capital investment, are estimated on the basis of a full cost recovery management, as mentioned in the previous chapter. Apart from this data, the following conditions and assumptions are made for the financial simulation.

- 1) Projection period: four years of construction period, from 2004 as the initial year of consulting services, and then construction works of the 1st stage project until 2007, and 30 years after the completion through to 2037.
- 2) Prices and cost escalation: Projections of both revenues and expenditures were made without escalation to simplify the calculations, and to make the simulation clearly understandable without being misleading.
- 3) Currency and exchange rate: Capital costs, revenues and expenditures are evaluated in US dollars. Exchange rates of 10,720 kip to US\$ 1.00 and ¥119 per US\$1.00 are applied in the master plan study.
- 4) Finances for capital investment: The finances of the initial investment for the 1st stage project are set as shown in Table 3-1.

Table 3-1 Procurement of Initial Funds

Financial Source	Amount (US\$ Million)
1. Equity (Government)	50
2. Loan (International Agency)	0
3. Grant (Foreign Country)	50
Average Financial Cost	3.3%/annum

Note: *1 Terms of loan by international agency are as follows: 6.6% annual interest rate, and a 30 year repayment period, with a 10 years grace period.
 *2 Interest payment starts not just after the commencement of loan in 2004 but together with the start of the principal repayment in 2014.
 *3 Financial shortages during the simulation period are assumed to be financed by the government, as done for the present waterworks so far.

- 5) Finances for replacement investment: The finances for the replacement of machinery and equipment are set as shown in Table 3-2.

Table 3-2 Procurement of Funds for Replacement

Financial Source	Amount (US\$ Million)	
	Existing Plants	1 st Stage Project
1. Loan (International Agency)	10.8	8.1

Note: *1 Terms of loan by international agency are as follows: 6.6% annual interest rate, and a 20 year repayment period, with a 5 years grace period.

- 6) Taxes: A profit tax or minimum tax will be levied. In addition, a turnover tax will be levied just after inauguration, the rates of which are 5% on water sales, and 10% for installation charges and meter rental charges.
- 7) Water tariff structure: In this study the present water tariff is constituted of two parts: water charges by type of water consumer, the two groups being domestic consumers and non-domestic consumers. The unit tariff rate was set to rise every three years in accordance with the projected economic growth (GDP per capita) in Lao PDR, as shown in Table 3-3. In addition, installation charges for new consumers, and meter rentals for every consumer are to be charged to consumers connected to the water supply system. The water tariff is set as shown in Table 3-4.

Table 3-3 Average Water Tariff of Water Supply Services

		(Unit: US\$/m ³)				
Water Consumer		2004	2010	2020		2037
(i)	Domestic Consumer	0.04	0.08	0.17	.....	0.47
(ii)	Non-domestic Consumer	0.09	0.17	0.34	.....	0.95
(iii)	Average	0.07	0.13	0.26	.....	0.74

Table 3-4 Installation Charges of Water Supply Services

Item	2004	2010	2020		2037
(i) Installation Charge	141	271	549	.....	1,540
(ii) Meter Rental Charge	3.43	6.60	13.39	.....	37.56

- 8) Revenues: The revenues of the water supply entity accrue from water sales, water meter rental and installation charges. These revenue sources are already discussed above. If the management had the deficit at the beginning stage of the water supply works, it is assumed that these expenses and losses will be filled by the government as short-term support with no interest, as is done with the NPVC at present. In addition to these revenues the entity could obtain other earnings from interest on short-term deposits, if it gains a net profit through its management. Interest rates for short term deposits are 1.1%/annum on average, which is a quarter of the daily saving deposit rate. This low interest rate is because of the nature of the non-constant saving deposits.
- 9) Depreciation: Fixed assets such as the water supply plant and the distribution piping network are depreciated using a straight-line method for 30 years after they are

inaugurated into service. The engineering services are also depreciated using the straight-line method over 30 years, because it is regarded as a part of the construction process. Some machinery such as pumps and power generator are also depreciated using straight-line depreciation, but over a 15 year period.

The NPVC has taken over the water supply management from the Nam Papa Lao (NPL), and at the same time inherited some financial problems from the NPL. These problems and present financial are issues which can be improved as follows.

- 1) A turnover of the accounts receivable in 2002 was 3.7. This means that it takes 100 days to collect bills, on average. In the simulation, the turnover is revised to around 8.0 by the year 2010, which means that it will then take around one and a half months to collect bills.
- 2) Account receivable from rural waterworks is to be collected completely by the year 2010.
- 3) Inventory stock should be set as follows:
 - (a) In terms of chemical materials, 30% of the annual amount is stocked as inventory stock after 2004.
 - (b) Stocks of construction materials such as pipes and other commodities are reduced to 30% of the annual amount after 2004. They are to be incorporated in construction works, but these works will be recorded as operating expenses because of an individual work is small.
- 4) Products in progress are to be gradually reduced to zero by the year 2010.
- 5) Interest payable is to be paid completely by the year 2010.
- 6) Short-term borrowings such as (a) overseas accounts payable, (b) local accounts payable, (c) accounts payable of reparation, and (d) advanced receipts, are to be paid back completely by the year 2010.

3.2 Financial Simulation

The financial simulation is conducted applying a simulation model to the NPVC with the 1st stage project, on the basis of the financial conditions and assumptions mentioned above. The simulation results could clarify financial problems of the management, and fund requirements during the project life.

Tables 3-5 to 3-7 show the results of the financial simulation with regard to the NPVC with the 1st stage project, which constitute a profit and loss table, a cash flow statement and a balance sheet. Figure 3-1 gives the results of the income statement in the simulation. The figure includes the following line items: (a) operating revenue, (b) operating cost, (c) net operating income, (d) net income before tax, and (e) net income after tax.

Table 3-5 Profit and Loss Table of NPVC with 1st Stage Project: 2005-2037 (1/2)

	(Unit: US\$1000)																
Item	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
I. Operating Revenue	2,013	2,030	2,102	3,325	4,155	4,222	5,248	5,252	5,261	6,887	6,897	6,907	8,648	8,658	8,668	10,584	10,595
1. Water Sales	1,537	1,536	1,535	2,735	3,491	3,534	4,771	4,771	4,771	6,283	6,283	6,283	7,901	7,901	7,901	9,683	9,683
(1) Domestic	583	581	580	1,045	1,370	1,394	1,880	1,880	1,880	2,475	2,475	2,475	3,113	3,113	3,113	3,815	3,815
(2) Non-domestic	955	955	955	1,690	2,122	2,141	2,892	2,892	2,892	3,808	3,808	3,808	4,789	4,789	4,789	5,868	5,868
2. New Connection	237	249	310	251	266	281	0	0	0	0	0	0	0	0	0	0	0
3. Meter Rental	106	112	120	122	126	130	134	137	145	154	163	173	181	190	199	209	219
4. Other Incomes	132	133	138	218	272	276	343	344	344	451	451	452	566	566	567	692	693
II. Operating Costs	2,042	2,106	2,207	2,210	4,200	4,250	3,993	3,953	4,056	4,225	4,366	4,506	4,724	4,720	4,716	4,802	4,790
1. Compensation	89	91	93	97	102	105	105	105	105	105	105	105	105	105	105	105	105
2. Electricity	625	625	625	553	919	946	946	946	946	946	946	946	946	946	946	946	946
3. Chemicals	306	306	306	289	393	407	407	407	407	407	407	407	407	407	407	407	407
5. Depreciation	221	251	260	301	1,697	1,654	1,616	1,576	1,678	1,771	1,910	2,050	2,186	2,182	2,177	2,172	2,160
6. Administration	172	180	192	193	215	227	227	227	227	227	227	227	227	227	227	227	227
7. Miscellaneous	534	558	633	603	660	693	440	440	440	440	440	440	440	440	440	440	440
8. Turnover Tax	95	95	99	174	214	218	252	252	253	330	330	331	413	414	415	505	506
9. Bad Debt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
III. Net Operating Income	-29	-76	-105	1,115	-45	-29	1,256	1,299	1,205	2,662	2,532	2,402	3,924	3,937	3,951	5,783	5,804
IV. Non-operating Revenue & Costs	-74	-70	-64	-46	-27	-7	19	45	72	111	-940	-1,017	-2,196	-2,706	-2,727	-2,736	-2,750
1. Non-operating Revenues	22	21	20	33	46	59	80	99	120	153	182	200	229	242	254	279	299
(1) Non-operating Revenue	14	14	15	23	29	30	37	37	37	48	48	48	61	61	61	74	74
(2) Interest Receives	8	7	6	10	17	30	43	63	83	105	134	151	169	181	193	204	225
2. Interest Charges	96	91	85	79	73	67	61	54	48	42	1,122	1,217	2,426	2,948	2,980	3,014	3,049
(1) Long-term Loan	96	91	85	79	73	67	61	54	48	42	1,122	1,217	2,426	2,948	2,980	3,014	3,049
(2) Short-term Borrowing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
V. Net Income before Tax	-103	-145	-170	1,069	-71	-36	1,275	1,344	1,277	2,773	1,591	1,385	1,728	1,232	1,224	3,047	3,055
VI. Profit Tax	20	20	21	374	42	42	446	470	447	970	557	485	605	431	429	1,066	1,069
VII Net Income after Tax	-124	-166	-191	695	-113	-78	829	874	830	1,802	1,034	900	1,123	801	796	1,980	1,986

Table 3-5 Profit and Loss Table of NPVC with 1st Stage Project: 2004-2037 (2/2)

	(Unit: US\$1000)																
Item	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
I. Operating Revenue	10,595	12,630	12,630	12,630	14,955	14,955	14,955	17,610	17,610	17,610	20,643	20,643	20,643	24,107	24,107	24,107	28,064
1. Water Sales	9,683	11,718	11,718	11,718	14,043	14,043	14,043	16,698	16,698	16,698	19,731	19,731	19,731	23,195	23,195	23,195	27,152
(1) Domestic	3,815	4,616	4,616	4,616	5,532	5,532	5,532	6,578	6,578	6,578	7,773	7,773	7,773	9,138	9,138	9,138	10,697
(2) Non-domestic	5,868	7,102	7,102	7,102	8,511	8,511	8,511	10,120	10,120	10,120	11,958	11,958	11,958	14,057	14,057	14,057	16,456
2. New Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3. Meter Rental	219	219	219	219	219	219	219	219	219	219	219	219	219	219	219	219	219
4. Other Incomes	693	693	693	693	693	693	693	693	693	693	693	693	693	693	693	693	693
II. Operating Costs	4,758	4,758	4,428	4,536	4,644	4,868	4,832	4,688	4,677	4,533	4,389	4,541	4,541	4,541	4,714	4,714	4,714
1. Compensation	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
2. Electricity	946	946	946	946	946	946	946	946	946	946	946	946	946	946	946	946	946
3. Chemicals	407	407	407	407	407	407	407	407	407	407	407	407	407	407	407	407	407
5. Depreciation	2,128	2,128	1,696	1,804	1,912	2,020	1,984	1,840	1,696	1,552	1,408	1,408	1,408	1,408	1,408	1,408	1,408
6. Administration	227	227	227	227	227	227	227	227	227	227	227	227	227	227	227	227	227
7. Miscellaneous	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440
8. Turnover Tax	506	506	608	608	608	724	724	724	857	857	857	1,008	1,008	1,008	1,182	1,182	1,182
9. Bad Debt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
III. Net Operating Income	5,836	7,872	8,202	8,094	10,310	10,086	10,122	12,921	12,933	13,077	16,254	16,102	16,102	19,566	19,393	19,393	23,350
IV. Non-operating Revenue & Costs	-1,909	-1,791	-1,687	-457	-337	-233	-735	-683	-651	-618	-612	14	106	166	202	237	301
1. Non-operating Revenues	321	335	335	335	351	351	351	370	370	370	391	391	391	415	415	415	443
(1) Non-operating Revenue	74	88	88	88	105	105	105	123	123	123	144	144	144	169	169	169	196
(2) Interest Receives	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247
2. Interest Charges	2,230	2,126	2,022	792	688	584	1,086	1,053	1,021	988	1,003	377	285	249	214	178	142
(1) Long-term Loan	2,230	2,126	2,022	792	688	584	1,086	1,053	1,021	988	1,003	377	285	249	214	178	142
(2) Short-term Borrowing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
V. Net Income before Tax	3,927	6,081	6,514	7,637	9,973	9,853	9,388	12,238	12,282	12,459	15,642	16,116	16,208	19,732	19,595	19,630	23,651
VI. Profit Tax	1,375	2,128	2,280	2,673	3,491	3,449	3,286	4,283	4,299	4,360	5,475	5,641	5,673	6,906	6,858	6,871	8,278
VII Net Income after Tax	2,553	3,952	4,234	4,964	6,483	6,405	6,102	7,955	7,983	8,098	10,167	10,476	10,535	12,826	12,737	12,760	15,373

Table 3-6 Cash Flow Management Plan of NPVC with 1st Stage Project: 2004-2037 (1/2)

	(Unit: US\$1000)																
Item	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
I. Procurement																	
1. Operating Revenue	-29	-76	-105	1,115	-45	-29	1,256	1,299	1,205	2,662	2,532	2,402	3,924	3,937	3,951	5,783	5,804
2. Non-operating Revenue	22	21	20	33	46	59	80	99	120	153	182	200	229	242	254	279	299
3. Depreciation	221	251	260	301	1,697	1,654	1,616	1,576	1,678	1,771	1,910	2,050	2,186	2,182	2,177	2,172	2,160
4. Account Receivable*1	26	27	25	-71	-95	-5	-155	0	0	-189	0	0	-202	0	0	-223	0
Gross Internal Cash Position	240	224	200	1,379	1,604	1,680	2,797	2,974	3,003	4,397	4,624	4,651	6,138	6,361	6,382	8,010	8,263
1. Capital Infusion	248	2,375	7,027	7,417	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Collection of Acc. Receivables from WS	21	21	21	21	21	21	21	0	-	-	-	-	-	-	-	-	-
3. Increment of Other Assets	29	29	29	29	29	29	29	0	-	-	-	-	-	-	-	-	-
4. Foreign Loan	248	2,375	7,027	7,417	0	0	0	2,160	2,160	2,160	2,160	2,160	-	-	-	-	-
5. Loan - Local Banks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6. Short-term Borrowing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Sources	786	5,023	14,305	16,263	1,654	1,730	2,847	5,134	5,163	6,557	6,784	6,811	6,138	6,361	6,382	8,010	8,263
II. Disbursement																	
1. Debt Services	214	208	202	202	196	190	184	178	172	165	2,099	2,193	4,123	4,644	4,654	4,688	4,722
(1) Principal Repayment (Existing)	87	87	87	94	94	94	94	94	94	94	94	94	94	93	70	70	70
(2) Principal Payment (New Loans)	0	0	0	0	0	0	0	0	0	0	853	853	1,573	1,573	1,573	1,573	1,573
(3) Interest Charges (Existing)	96	91	85	79	73	67	61	54	48	42	36	30	23	17	11	7	2
(4) Interest Charges (New Loans)	0	0	0	0	0	0	0	0	0	0	1,087	1,187	2,402	2,930	2,969	3,008	3,047
(5) Extinguishment of Interest Payable	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
2. Investment	496	4,749	14,055	14,834	0	0	0	2,160	2,160	2,160	2,160	2,160	0	0	0	0	0
(1) New Construction	496	4,749	14,055	14,834	0	0	0	0	0	0	0	0	0	0	0	0	0
(2) Replacement	-	-	-	-	-	-	-	2,160	2,160	2,160	2,160	2,160	-	-	-	-	-
3. Debt Services for Short Financing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1) Principal Repayment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2) Interest Charges	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4. Inventory Stock*2	10	13	13	197	7	14	0	0	0	0	0	0	0	0	0	0	0
5. Other Disbursement	36	42	38	223	28	27	26	1	1	1	1	1	0	0	0	0	0
6. Profit Tax	20	20	21	374	42	42	446	470	447	970	557	485	605	431	429	1,066	1,069
Total of Disbursement	756	5,007	14,303	15,437	258	245	657	2,809	2,779	3,296	4,817	4,839	4,728	5,076	5,083	5,754	5,791
Net Cash Flow	30	16	2	826	1,396	1,484	2,190	2,325	2,384	3,260	1,967	1,972	1,410	1,285	1,299	2,256	2,472
Opening Cash Balance	1,060	1,090	1,106	1,108	1,934	3,330	4,814	7,005	9,330	11,714	14,974	16,941	18,914	20,323	21,609	22,908	25,164
Accumulated Cash Position	1,090	1,106	1,108	1,934	3,330	4,814	7,005	9,330	11,714	14,974	16,941	18,914	20,323	21,609	22,908	25,164	27,635

Note: *1 Turnover of account receivable was assumed at 8.1.

*2 Inventory Stock ws assumed as 30% of annual consumption.

Table 73-6 Cash Flow Management Plan of NPVC with 1st Stage Project: 2004-2037 (2/2)

(Continuation)																	(Unit: US\$1000)
Item	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
I. Procurement																	
1. Operating Revenue	5,836	7,872	8,202	8,094	10,310	10,086	10,122	12,921	12,933	13,077	16,254	16,102	16,102	19,566	19,393	19,393	23,350
2. Non-operating Revenue	321	335	335	335	351	351	351	370	370	370	391	391	391	415	415	415	443
3. Depreciation	2,128	2,128	1,696	1,804	1,912	2,020	1,984	1,840	1,696	1,552	1,408	1,408	1,408	1,408	1,408	1,408	1,408
4. Account Receivable*1	0	-254	0	0	-291	0	0	-332	0	0	-379	0	0	-433	0	0	-495
Gross Internal Cash Position	8,285	10,080	10,233	10,233	12,283	12,457	12,457	14,799	14,998	14,998	17,673	17,901	17,901	20,956	21,216	21,216	24,706
1. Capital Infusion	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Collection of Acc. Receivables from WS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Increment of Other Assets	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4. Foreign Loan	-	1,619	1,619	1,619	1,619	1,619	-	-	-	-	-	-	-	-	-	-	-
5. Loan - Local Banks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6. Short-term Borrowing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Sources	8,285	11,699	11,851	11,851	13,902	14,076	12,457	14,799	14,998	14,998	17,673	17,901	17,901	20,956	21,216	21,216	24,706
II. Disbursement																	
1. Debt Services	3,873	3,770	3,666	2,435	2,332	2,228	3,269	3,236	3,204	3,134	2,396	1,770	1,678	789	753	718	682
(1) Principal Repayment (Existing)	70	70	70	70	70	70	70	70	70	33	0	0	0	0	0	0	0
(2) Principal Payment (New Loans)	1,573	1,573	1,573	1,573	1,573	1,573	2,113	2,113	2,113	2,113	1,393	1,393	1,393	540	540	540	540
(3) Interest Charges (Existing)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(4) Interest Charges (New Loans)	2,230	2,126	2,022	792	688	584	1,086	1,053	1,021	988	1,003	377	285	249	214	178	142
(5) Extinguishment of Interest Payable	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2. Investment	0	1,619	1,619	1,619	1,619	1,619	0	0	0	0	0	0	0	0	0	0	0
(1) New Construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2) Replacement	-	1,619	1,619	1,619	1,619	1,619	-	-	-	-	-	-	-	-	-	-	-
3. Debt Services for Short Financing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1) Principal Repayment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2) Interest Charges	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4. Inventory Stock*2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5. Other Disbursement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6. Profit Tax	1,375	2,128	2,280	2,673	3,491	3,449	3,286	4,283	4,299	4,360	5,475	5,641	5,673	6,906	6,858	6,871	8,278
Total of Disbursement	5,248	7,517	7,565	6,727	7,441	7,295	6,555	7,520	7,502	7,495	7,871	7,411	7,351	7,695	7,611	7,588	8,960
Net Cash Flow	3,037	4,182	4,287	5,124	6,461	6,781	5,903	7,279	7,496	7,504	9,803	10,490	10,550	13,261	13,605	13,628	15,746
Opening Cash Balance	27,635	30,508	34,690	38,977	44,101	50,562	57,343	63,245	70,525	78,020	85,524	95,327	105,818	116,368	129,629	143,233	156,861
Accumulated Cash Position	30,672	34,690	38,977	44,101	50,562	57,343	63,245	70,525	78,020	85,524	95,327	105,818	116,368	129,629	143,233	156,861	172,607

Note: *1 Turnover of account receivable was assumed at 8.1.

*2 Inventory Stock ws assumed as 30% of annual consumption.

Table 3-7 Balance Sheet of NPVC with 1st Stage Project: 2004-2037 (1/2)

(Unit: US\$1000)

Item	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
I. Assets	4,266	8,690	22,400	37,583	37,319	37,090	37,769	40,679	43,545	47,383	49,600	51,682	51,108	50,212	49,334	49,641	49,952
1. Fixed Assets	2,188	6,686	20,481	35,014	33,317	31,662	30,046	30,631	31,113	31,501	31,751	31,861	29,675	27,493	25,316	23,144	20,985
(1) Fixed Assets	3,058	3,058	3,058	37,192	37,192	37,192	37,192	39,352	41,512	43,672	45,832	47,992	47,992	47,992	47,992	47,992	47,992
(2) Accumulated Depreciation	1,366	1,617	1,877	2,178	3,876	5,530	7,146	8,722	10,400	12,171	14,081	16,131	18,317	20,499	22,676	24,848	27,008
(3) Works in Progress	496	5,246	19,301	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Current Assets	2,078	2,004	1,919	2,569	4,002	5,428	7,723	10,048	12,432	15,881	17,849	19,821	21,433	22,719	24,018	26,496	28,968
(1) Cash	163	166	166	290	500	722	1,051	1,399	1,757	2,246	2,541	2,837	3,049	3,241	3,436	3,775	4,145
(2) Bank Deposit	926	940	942	1,644	2,831	4,092	5,954	7,930	9,957	12,728	14,400	16,077	17,275	18,368	19,472	21,389	23,490
(3) Account Receivable	323	296	271	342	436	442	596	596	596	785	785	785	988	988	988	1,210	1,210
(4) Account Receivable from Rural WS	128	107	85	64	43	21	0	0	-	-	-	-	-	-	-	-	-
(5) Inventory Stock	366	353	340	143	136	122	122	122	122	122	122	122	122	122	122	122	122
(6) Products in Progress	171	143	114	86	57	29	0	0	-	-	-	-	-	-	-	-	-
II. Equity and Liabilities	4,266	8,690	22,400	37,583	37,319	37,090	37,769	40,679	43,545	47,383	49,600	51,682	51,108	50,212	49,334	49,641	49,952
1. Short-term Liabilities	480	437	400	177	150	123	96	96	95	94	94	93	93	92	92	92	91
(1) Short-term Borrowing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(2) Overseas Account Payable	119	108	98	38	33	28	24	24	23	23	23	23	23	22	22	22	22
(3) Local Account Payable	238	217	196	77	67	57	48	47	47	46	46	46	45	45	45	44	44
(4) Account Payable of Reparation	39	37	37	30	28	27	25	25	25	25	25	25	25	25	25	25	25
(5) Account Payable for Rural WS	65	54	43	33	22	11	0	-	-	-	-	-	-	-	-	-	-
(6) Advanced Receipt	20	21	25	0	0	0	0	-	-	-	-	-	-	-	-	-	-
2. Long-term Liabilities	2,876	5,134	12,044	19,338	19,214	19,091	18,967	21,004	23,040	25,077	26,260	27,443	25,746	24,050	22,377	20,703	19,030
(1) Foreign Loan (Existing)	2,076	1,989	1,902	1,808	1,715	1,621	1,528	1,434	1,341	1,247	1,154	1,060	966	873	803	733	663
(2) Foreign Loan (New Loans)	248	2,623	9,650	17,067	17,067	17,067	17,067	19,227	21,387	23,547	24,854	26,161	24,587	23,014	21,441	19,867	18,294
(3) Local Loan - Banks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(4) Endowment	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73
(5) Interest Payable	479	449	419	389	359	329	299	269	239	210	180	150	120	90	60	30	0
3. Equity	910	3,119	9,956	18,068	17,955	17,877	18,706	19,579	20,409	22,211	23,246	24,146	25,269	26,069	26,865	28,846	30,831
(1) Own Equity	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
(2) Government Equity	1,024	3,399	10,426	17,843	17,843	17,843	17,843	17,843	17,843	17,843	17,843	17,843	17,843	17,843	17,843	17,843	17,843
(3) Grants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(4) Profit/Loss for the Year	-252	-418	-609	86	-27	-105	724	1,598	2,428	4,230	5,264	6,164	7,287	8,088	8,884	10,864	12,850

Table 3-7 Balance Sheet of NPVC with 1st Stage Project: 2004-2037 (2/2)

(Unit: US\$1000)

Item	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
I. Assets	50,697	54,625	58,835	63,774	70,232	76,612	80,531	86,303	92,103	98,055	106,830	115,912	125,055	137,341	149,538	161,758	176,592
1. Fixed Assets	18,857	18,348	18,271	18,086	17,793	17,392	15,408	13,569	11,873	10,322	8,914	7,506	6,099	4,691	3,283	1,876	468
(1) Fixed Assets	47,992	49,611	51,230	52,849	54,468	56,086	56,086	56,086	56,086	56,086	56,086	56,086	56,086	56,086	56,086	56,086	56,086
(2) Accumulated Depreciation	29,135	31,263	32,959	34,763	36,675	38,694	40,678	42,518	44,213	45,765	47,172	48,580	49,988	51,395	52,803	54,211	55,618
(3) Works in Progress	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Current Assets	31,840	36,277	40,564	45,688	52,439	59,220	65,123	72,734	80,230	87,733	97,916	108,406	118,956	132,650	146,255	159,882	176,123
(1) Cash	4,576	5,204	5,847	6,615	7,584	8,601	9,487	10,579	11,703	12,829	14,299	15,873	17,455	19,444	21,485	23,529	25,891
(2) Bank Deposit	25,932	29,487	33,130	37,486	42,977	48,741	53,758	59,946	66,317	72,696	81,028	89,945	98,912	110,184	121,748	133,332	146,716
(3) Account Receivable	1,210	1,465	1,465	1,465	1,755	1,755	1,755	2,087	2,087	2,087	2,466	2,466	2,466	2,899	2,899	2,899	3,394
(4) Account Receivable from Rural WS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(5) Inventory Stock	122	122	122	122	122	122	122	122	122	122	122	122	122	122	122	122	122
(6) Products in Progress	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
II. Equity and Liabilities	50,697	54,625	58,835	63,774	70,232	76,612	80,531	86,303	92,103	98,055	106,830	115,912	125,055	137,341	149,538	161,758	176,592
1. Short-term Liabilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1) Short-term Borrowing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(2) Overseas Account Payable	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(3) Local Account Payable	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(4) Account Payable of Reparation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(5) Account Payable for Rural WS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(6) Advanced Receipt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Long-term Liabilities	17,314	17,289	17,264	17,240	17,215	17,190	15,007	12,824	10,641	8,495	7,103	5,710	4,317	3,777	3,238	2,698	2,158
(1) Foreign Loan (Existing)	593	523	453	383	313	243	173	103	33	0	0	0	0	0	0	0	0
(2) Foreign Loan (New Loans)	16,720	16,766	16,811	16,857	16,902	16,948	14,835	12,722	10,609	8,496	7,103	5,710	4,317	3,777	3,238	2,698	2,158
(3) Local Loan - Banks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(4) Endowment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(5) Interest Payable	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Equity	33,384	37,336	41,570	46,534	53,017	59,422	65,524	73,478	81,462	89,560	99,727	110,202	120,738	133,564	146,300	159,060	174,433
(1) Own Equity	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
(2) Government Equity	17,843	17,843	17,843	17,843	17,843	17,843	17,843	17,843	17,843	17,843	17,843	17,843	17,843	17,843	17,843	17,843	17,843
(3) Grants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(4) Profit/Loss for the Year	15,402	19,355	23,589	28,553	35,035	41,440	47,542	55,497	63,480	71,578	81,745	92,221	102,756	115,582	128,319	141,079	156,452

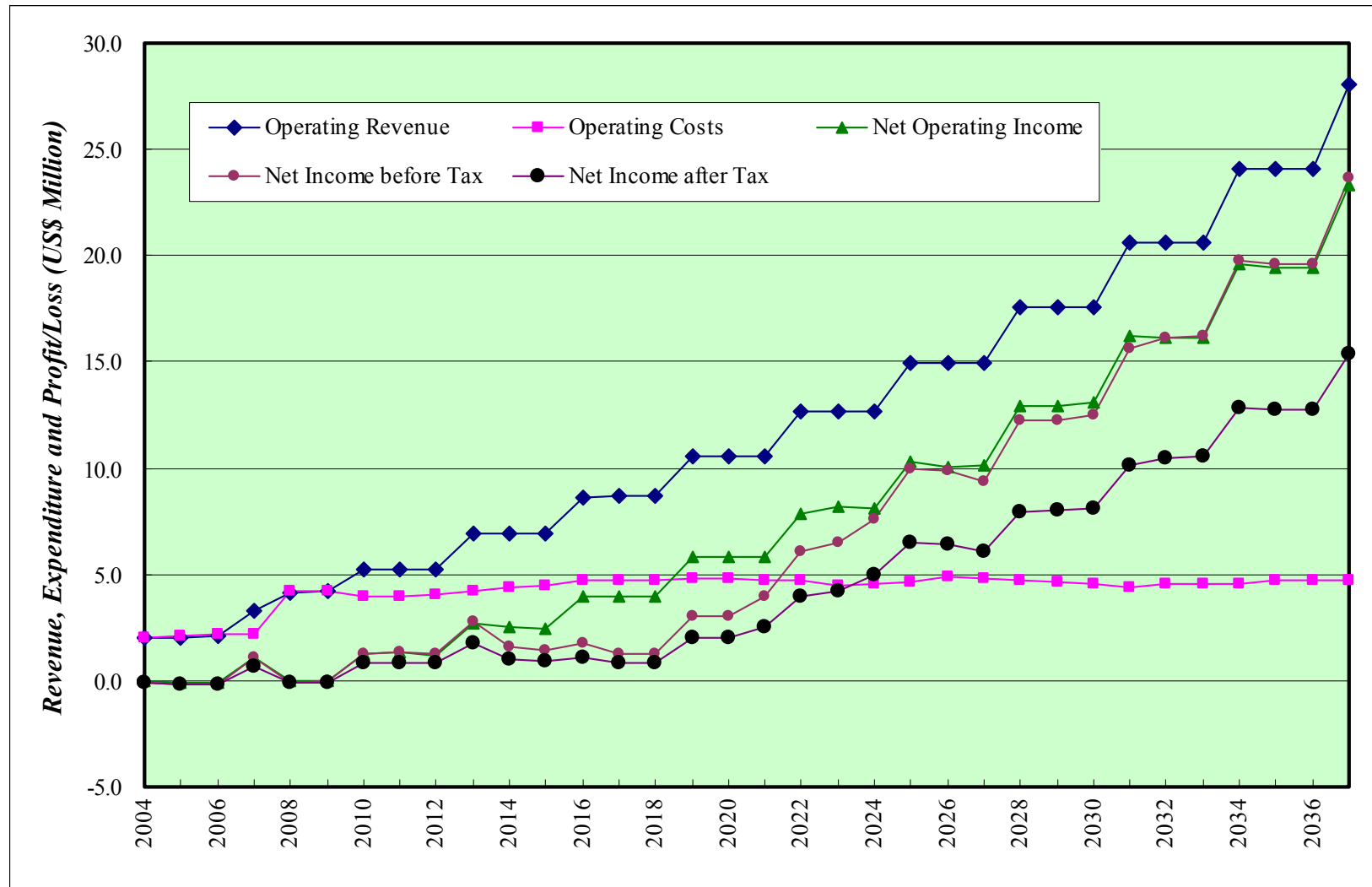


Figure 3-1 Profit and Loss Based on Financial Simulation of NPVC with 1st Stage Project

3.3 Financial Issues and Recommendations

The unit rate of water sales revenue of the simulation was set on the basis of full cost recovery principle for the 1st stage project. The average rate is nearly five times more than the present tariff rate. Although the water charge to domestic consumers was verified as less than the affordable level, the consumers familiar with the present water supply conditions might consider that the water charge in the future is too expensive.

According to the balance sheet in Table 3-7, the accumulation of net profit was estimated at US\$156 million in 2037, which could be preserved as retained earnings. This was because the revenue from water sales was enough to cover the management costs of the NPVC with the 1st stage of the project. As shown in the cash flow statement in Table 3-6, the replacement investment for machinery and equipment in the existing plants, between 2011 and 2015, and the expansion of the plants between 2022 and 2026, were procured through foreign funds with terms mentioned in Table 3-2. Within this simulation period however, the existing plants such as Kaolieo and Chinaimo might be rebuilt due to their physical lives. These reinvestment costs were not considered in the simulation. At the end of the simulation period furthermore, the 1st stage project plant might be rebuilt due to its physical life. As a matter of course, the retained earnings of US\$156 million in 2037 will not be enough to cover the reinvestment costs of these all water supply systems. Thus, the financial requirement schedule for reinvestment should be planned to attain the sustainable management through applying this kind of simulation model.

It is said that there are two standards in the decision making process of deciding water tariffs: (1) costs and (2) the affordability or willingness-to-pay of the beneficiaries. The water tariff is a matter of controversial issue among the stakeholders, and thus can not be decided in a simple way. Therefore it should be decided through the consensus of the stakeholders. From the financial point of view, the water tariff in this simulation was set on the basis of a full cost recovery principle, taking the affordability of domestic consumers into consideration. This is one of the best solutions for the stable and sound management of the NPVC. The management of the NPVC has to establish a rational logic for tariff design, and create a climate of financial stability conducive to sustainable conditions for the water supply business.