

ANNEX 18
ECONOMIC AND FINANCIAL
EVALUATION

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1. INTRODUCTION

In this study, economic and financial evaluation presents mainly project evaluation of proposed projects. The project evaluation is conducted from the three points of view: (1) economic aspect, (2) financial aspect, and (3) social aspect in the study area.

At a beginning stage of the economic evaluation, the priority project is selected through the least-cost method among several alternatives. For the priority project, it is inspected whether or not it is viable from the points of socio-economic viewpoint, that is, viability of social investment in the national economy. In the evaluation, the factors for evaluation indices are Economic Internal Rate of Return (EIRR) for a main index, and Net Present Value (NPV) and Benefit-Cost Ratio (B/C) for supplementary indices.

The financial evaluation is to inspect the proposed project from the financial point of view, that is, tests of earning capacity and fund management. For the proposed project, financial issues are discussed in terms of relation between financial sources and water rates for sound management. In addition, water rates are discussed from the viewpoint of affordable water for domestic users. Finally, a financial simulation for the management of the proposed project is presented on the basis of information about “existing financial system of water supply business” and “financial conditions for water sector”. It makes the financial problems clear and to find fund requirement on the way of the project management.

The social impact describes socio-economic issues and recommendations for waterworks concerned. In addition, the impacts to the people in the areas of the proposed project and the stakeholders of the project are explained from the socio-economic viewpoints.

2. ECONOMIC EVALUATION

2.1 Overview of Economic Evaluation

The project proposed in this study is analysed on the basis of two quantitative analyses: (1) economic analysis, and (2) financial analysis. In the economic analysis, an economic evaluation is a major part. The economic evaluation is to examine the proposed project from the economic point of view, that is, viability of social investment in the national economy. In other words, the system alternatives are prioritised from the economic point of view through the economic evaluation. The financial evaluation is to inspect the proposed project from the financial point of view, that is, tests of earning capacity and financial efficiency. This is the fundamental difference between the two analyses. The procedure of these project analyses is illustrated in Figure 21-1.

The project evaluation is conducted in accordance with the conventional methodology that is commonly applied for evaluation of development project under finance of the World Bank and other international agencies Asian Development Bank (ADB). The methodology suggests that the project evaluation have two steps for quantifying evaluation factors in general. At first, the project cost and benefit are identified and quantified in monetary terms, which arise from implementation of the proposed project. Then, they are compared and condensed into evaluation factors. The factors are Economic Internal Rate of Return (EIRR) for a main index, and Net Present Value (NPV) and Benefit-Cost Ratio (B/C) for supplementary indices.

The EIRR is defined as a special rate of discount that settles the following conditions to the satisfaction:

- 1) The present value of cost is obtained through discounting the all costs incurred during the economic life of the proposed project at the special rate.
- 2) The present value of benefit is obtained through discounting the all benefits accruing from the project during the same lifetime at the special rate.
- 3) As a result, the present value of cost is equal to the present value of benefit.

In the case that this EIRR exceeds the opportunity cost of capital, the proposed project could be judged as viable economically. The NPV shows the magnitude of project incremental benefit. The B/C indicates the gap between the project efficiency and the opportunity cost of capital.

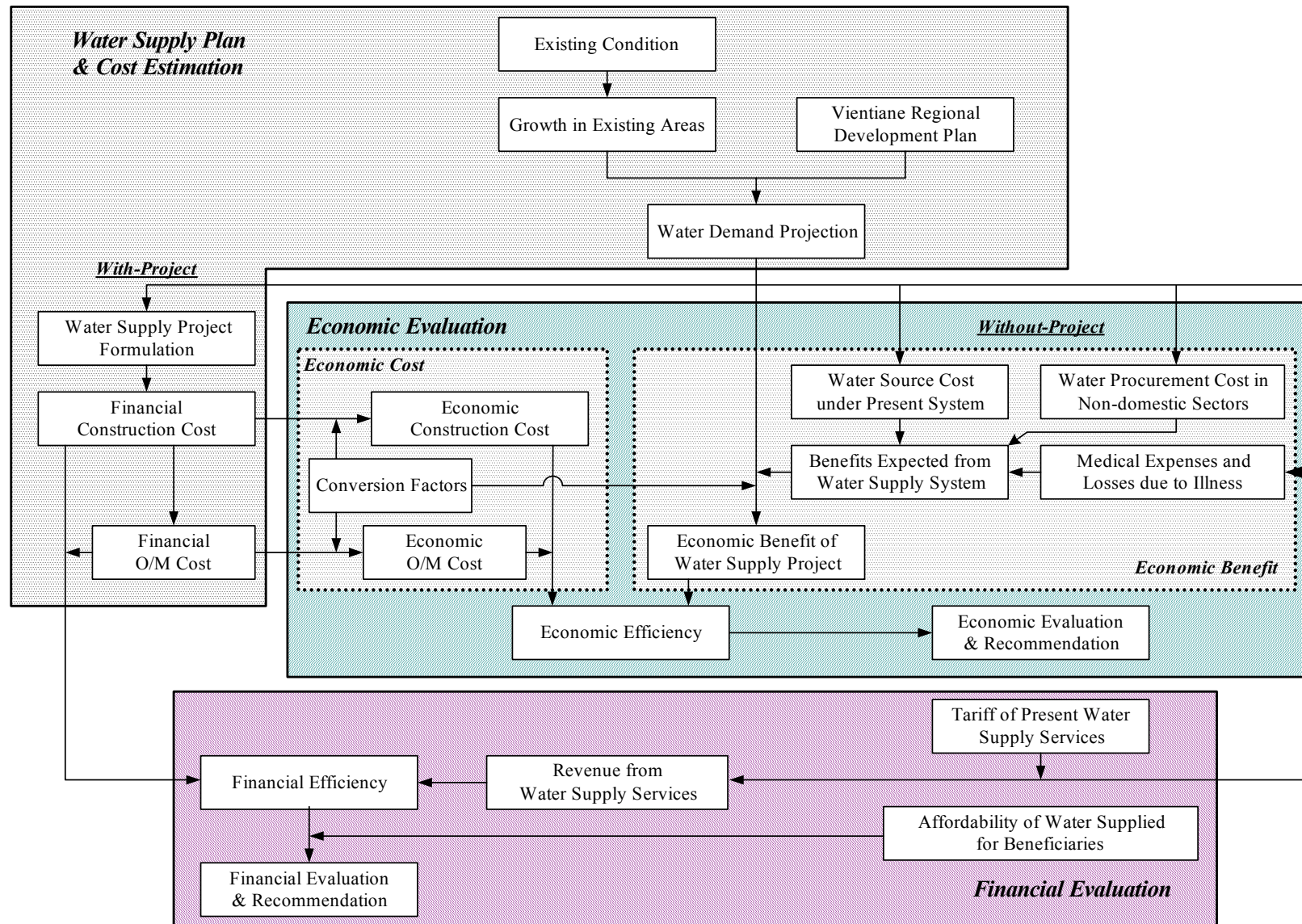


Figure 21-1 Evaluation Procedure of Water Supply Project

Table 21-1 Conversion Factor of Local Currency Portion

Item	1995	1996	1997	1998	1999	2000	2001	2002	Average
A. Import (CIF) in US \$Million	589.0	689.9	648.0	552.8	554.2	535.4	510.3	522.2	575.2
B. Export (FOB) in US\$ Million	311.2	320.7	312.7	336.8	301.4	330.3	319.5	312.5	318.1
1. Import (CIF) in Billion Kip	475.0	637.4	818.9	1,825.1	3,984.7	4,304.8	4,547.8	5,240.4	2,729.3
2. Export (FOB) in Billion Kip	251.0	296.3	395.2	1,112.0	2,167.1	2,655.7	2,847.4	3,136.0	1,607.6
3. Import Tax in Billion Kip	33.8	40.6	47.0	51.4	98.5	134.6	178.9	241.3	103.3
4. Export Tax in Billion Kip	4.9	6.0	6.3	10.4	24.4	41.2	56.7	53.3	25.4
5. Subsidies for Foreign Trade	-	-	-	-	-	-	-	-	-
6. Total of (1) & (2)	726.0	933.7	1,214.1	2,937.1	6,151.8	6,960.5	7,395.2	8,376.4	4,336.9
7. (1)+(2)+(3)-(4)+(5)	754.9	968.3	1,254.8	2,978.1	6,225.9	7,053.9	7,517.4	8,564.4	4,414.7
8. Standard Conversion Factor*1	0.96	0.96	0.97	0.99	0.99	0.99	0.98	0.98	0.982
9. Conversion Factor of Local Portion for Investment and O&M Costs									
Considering Domestic Taxes (5.4%*2 of local materials and services on average) and Shadow Labour Cost (3.6%*3 of local currency portion)									0.90
10. Foreign Exchange Rate (Kip/US\$) *4	806	924	1,264	3,302	7,190	8,040	8,912	10,035	-

Source: Balance of Payment, Bank of the Lao PDR
Fiscal Operation of Government, Ministry of Finance
The Study on Improvement of Roads in The Southern Region in Lao PDR, Dec. 2002, JICA

Note: *1 Conversion Factor = (6)/(7)

*2 Quoted from "The Study on Improvement of Roads in the Southern Region, December 2002, JICA"

*3 Assumed as 30% (labour portion) of the total cost X 20% (unskilled labour) of the total labour cost X 60% (shadow wage rate)

*4 International Financial Statistics, IMF (Refer Table 47-2)

2.3 Selection of Priority Projects

There are five alternatives for the comparative study, as discussed in the engineering discussion. In this section, these alternatives are analysed from the economic point of view. Then, the priority project is selected through economic evaluation in general. The benefits of the respective alternatives are considered to be almost equal. Thus, a method of “minimum cost comparison” is the best way to select the priority project among them, in stead of a general comparison of benefit and cost. As shown in Figure 23-1 below, the best alternative is selected from the minimum cost comparison among the all alternatives. The costs are valuated in economic terms. Economic cost is discussed in detail in Section 2.4. Anyhow, the project costs are originally estimated based on market prices, so they have to be converted to economic prices applying conversion factors. In addition, operation and maintenance (O&M) costs are also converted to economic costs in the same procedure. These costs are allocated in annual disbursement in conformity with the construction schedule. Table 23-1 shows the economic construction costs and O&M costs of the respective alternatives, which were converted from the market costs applying the conversion factors.

Figure 23-1 Project Evaluation Methodology

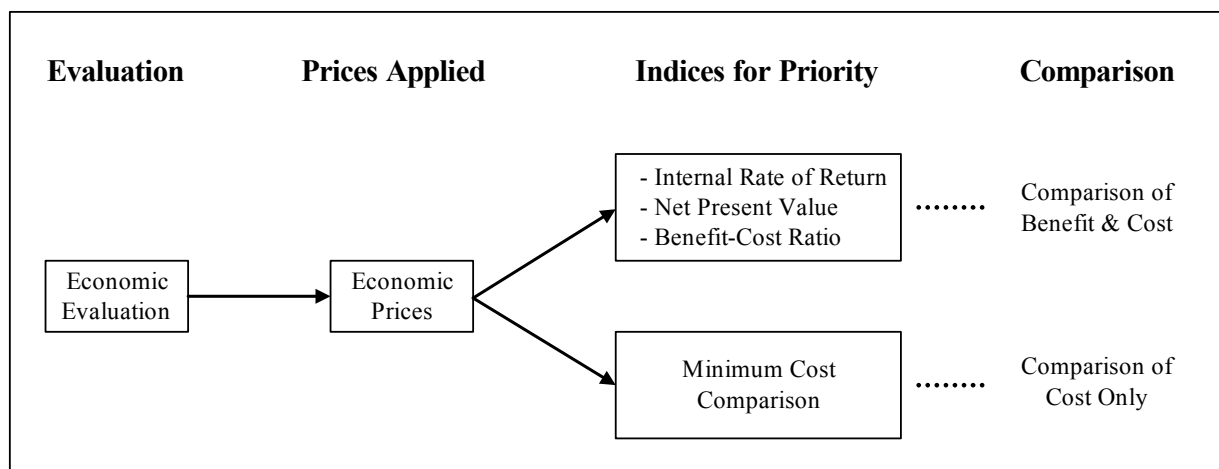


Table 23-1 Financial Costs and Economic Costs of Alternatives (1/3)

	CF: 0.90						CF: 0.90					
	C-1			C-2			C-1			C-2		
	Construction			Construction			O&M			O&M		
	Financial			Economic			Financial			Economic		
	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local
2004	0	0	0	0	0	0	0	0	0	0	0	0
2005	1,873	1,300	573	1,816	1,300	516	1,988	1,410	578	1,930	1,410	520
2006	9,364	6,498	2,866	9,077	6,498	2,579	9,938	7,048	2,890	9,649	7,048	2,601
2007	7,493	5,200	2,293	7,264	5,200	2,064	7,952	5,640	2,312	7,721	5,640	2,081
2008	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0
2010	7,558	5,261	2,297	7,328	5,261	2,067	7,984	5,545	2,439	7,740	5,545	2,195
2011	18,891	13,149	5,742	18,317	13,149	5,168	19,955	13,859	6,096	19,345	13,859	5,486
2012	11,335	7,889	3,446	10,990	7,889	3,101	11,972	8,315	3,657	11,606	8,315	3,291
2013	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0	0	0	0	0
Total	56,514	39,297	17,217	54,792	39,297	15,495	59,789	41,817	17,972	57,992	41,817	16,175

Note: It should be noted that construction costs shown on above table are costs only for alternative comparison. Common costs for all alternatives such as Rehabilitation of Kaolieo Treatment Plant, improvement of Chinaimo Treatment Plant (including expansion of reservoir, additional distribution pumps, and installation of transmission pipelines), small diameter distribution pipeline, house connections, contingencies, and administration costs are excluded from the construction costs for alternative comparison. Therefore, construction costs shown above do not represent Total Project Costs.

Table 23-1 Financial Costs and Economic Costs of Alternatives (2/3)

	CF: 0.90						CF: 0.90					
	K-1			T-2								
	Construction			Construction								
	Financial			Economic			Financial			Economic		
	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local
2004	0	0	0	0	0	0	0	0	0	0	0	0
2005	1,799	1,205	594	1,740	1,205	535	2,472	1,743	729	2,399	1,743	656
2006	8,993	6,023	2,970	8,696	6,023	2,673	12,372	8,722	3,650	12,007	8,722	3,285
2007	7,197	4,820	2,377	6,959	4,820	2,139	9,898	6,978	2,920	9,606	6,978	2,628
2008	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0
2010	7,370	5,091	2,279	7,142	5,091	2,051	7,029	4,811	2,218	6,807	4,811	1,996
2011	18,422	12,724	5,698	17,852	12,724	5,128	17,569	12,024	5,545	17,015	12,024	4,991
2012	11,054	7,634	3,420	10,712	7,634	3,078	10,542	7,215	3,327	10,209	7,215	2,994
2013	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0	0	0	0	0
Total	54,835	37,497	17,338	53,101	37,497	15,604	59,882	41,493	18,389	58,043	41,493	16,550

	CF: 0.90						CF: 0.90					
	O&M			O&M								
	Financial			Economic			Financial			Economic		
	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local
2004	53	0	53	48	0	48	53	0	53	48	0	48
2005	53	0	53	48	0	48	53	0	53	48	0	48
2006	53	0	53	48	0	48	53	0	53	48	0	48
2007	433	99	334	400	99	301	498	55	443	454	55	399
2008	448	104	344	414	104	310	519	59	460	473	59	414
2009	461	108	353	426	108	318	538	61	477	490	61	429
2010	459	107	352	424	107	317	534	61	473	487	61	426
2011	459	107	352	424	107	317	534	61	473	487	61	426
2012	922	160	762	846	160	686	999	143	856	913	143	770
2013	905	168	737	831	168	663	985	149	836	901	149	752
2014	938	174	764	862	174	688	1,024	156	868	937	156	781
2015	973	181	792	894	181	713	1,062	162	900	972	162	810
Total	6,157	1,208	4,949	5,662	1,208	4,454	6,852	907	5,945	6,258	907	5,351

Note: It should be noted that construction costs shown on above table are costs only for alternative comparison. Common costs for all alternatives such as Rehabilitation of Kaolieo Treatment Plant, improvement of Chinaimo Treatment Plant (including expansion of reservoir, additional distribution pumps, and installation of transmission pipelines), small diameter distribution pipeline, house connections, contingencies, and administration costs are excluded from the construction costs for alternative comparison. Therefore, construction costs shown above do not represent Total Project Costs.

Table 23-1 Financial Costs and Economic Costs of Alternatives (3/3)

CF: 0.90

	T-3 Construction					
	Financial			Economic		
	Total	Foreign	Local	Total	Foreign	Local
2004	0	0	0	0	0	0
2005	2,538	1,801	737	2,464	1,801	663
2006	12,696	9,009	3,687	12,327	9,009	3,318
2007	10,156	7,207	2,949	9,861	7,207	2,654
2008	0	0	0	0	0	0
2009	0	0	0	0	0	0
2010	8,347	5,908	2,439	8,103	5,908	2,195
2011	20,870	14,770	6,100	20,260	14,770	5,490
2012	12,520	8,861	3,659	12,154	8,861	3,293
2013	0	0	0	0	0	0
2014	0	0	0	0	0	0
2015	0	0	0	0	0	0
Total	67,127	47,556	19,571	65,170	47,556	17,614

	O&M					
	Financial			Economic		
	Total	Foreign	Local	Total	Foreign	Local
2004	53	0	53	48	0	48
2005	53	0	53	48	0	48
2006	53	0	53	48	0	48
2007	498	55	443	454	55	399
2008	519	59	460	473	59	414
2009	538	61	477	490	61	429
2010	534	61	473	487	61	426
2011	534	61	473	487	61	426
2012	1,075	122	953	980	122	858
2013	1,062	128	934	969	128	841
2014	1,101	133	968	1,004	133	871
2015	1,139	138	1,001	1,039	138	901
Total	7,159	818	6,341	6,525	818	5,707

Note: It should be noted that construction costs shown on above table are costs only for alternative comparison. Common costs for all alternatives such as Rehabilitation of Kaolieo Treatment Plant, improvement of Chinaimo Treatment Plant (including expansion of reservoir, additional distribution pumps, and installation of transmission pipelines), small diameter distribution pipeline, house connections, contingencies, and administration costs are excluded from the construction costs for alternative comparison. Therefore, construction costs shown above do not represent Total Project Costs.

The present values of the respective alternatives are tabulated in Table 23-3. The present value is calculated applying the discount rate of 12% and the evaluation period of 30 years after the completion of the projects. The cashflow statements are tabulated in Table 23-2 and summarised in Table 23-3 and Figure 23-2 below. Accordingly, the alternative K-1 is selected as the best project among these five alternatives from the economic point of view.

Table 23-3 Present Values of Preliminary Alternatives

Alternative	Present Value (US\$ Million in Economic Terms)	Index (K-1 = 100)
1. C-1	31.4	103
2. C-2	33.3	110
3. K-1	30.4	100
4. T-2	34.7	114
5. T-3	37.9	125

Figure 23-2 Net Present Value of Each Alternative

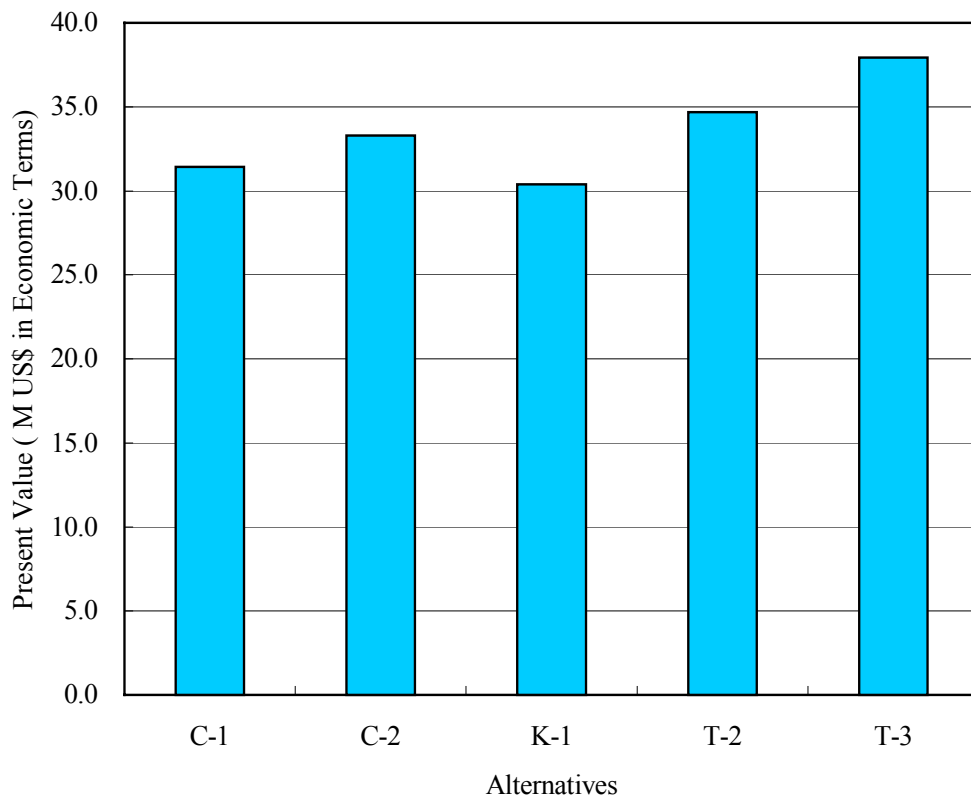


Table 23-2 Cashflow Statements and Present Values of Preliminary Alternatives

Alternative: C-1		PV: US\$31,426 Million		
Year	Cost (US\$1000)			Total
	Construction	O&M		
1	2004	0	48	48
2	2005	1,816	48	1,863
3	2006	9,077	48	9,125
4	2007	7,264	425	7,689
5	2008	0	440	440
6	2009	0	453	453
7	2010	7,328	451	7,779
8	2011	18,317	451	18,768
9	2012	10,990	867	11,858
10	2013	0	854	854
11	2014	0	886	886
12	2015	0	918	918
13	2016		918	918
:	:	:	:	:
:	:	:	:	:
41	2044		918	918
42	2045		918	918

Alternative: C-2		PV: US\$33,285 Million		
Year	Cost (US\$1000)			Total
	Construction	O&M		
1	2004	0	48	48
2	2005	1,930	48	1,978
3	2006	9,649	48	9,697
4	2007	7,721	425	8,146
5	2008	0	440	440
6	2009	0	453	453
7	2010	7,740	451	8,191
8	2011	19,345	451	19,796
9	2012	11,606	944	12,551
10	2013	0	929	929
11	2014	0	961	961
12	2015	0	993	993
13	2016		993	993
:	:	:	:	:
:	:	:	:	:
41	2044		993	993
42	2045		993	993

Alternative: K-1		PV: US\$30,382 Million		
Year	Cost (US\$1000)			Total
	Construction	O&M		
1	2004	0	48	48
2	2005	1,740	48	1,787
3	2006	8,696	48	8,744
4	2007	6,959	400	7,359
5	2008	0	414	414
6	2009	0	426	426
7	2010	7,142	424	7,566
8	2011	17,852	424	18,276
9	2012	10,712	846	11,558
10	2013	0	831	831
11	2014	0	862	862
12	2015	0	894	894
13	2016		894	894
:	:	:	:	:
:	:	:	:	:
41	2044		894	894
42	2045		894	894

Alternative: T-2		PV: US\$34,681 Million		
Year	Cost (US\$1000)			Total
	Construction	O&M		
1	2004	0	48	48
2	2005	2,399	48	2,447
3	2006	12,007	48	12,055
4	2007	9,606	454	10,060
5	2008	0	473	473
6	2009	0	490	490
7	2010	6,807	487	7,294
8	2011	17,015	487	17,501
9	2012	10,209	913	11,123
10	2013	0	901	901
11	2014	0	937	937
12	2015	0	972	972
13	2016		972	972
:	:	:	:	:
:	:	:	:	:
41	2044		972	972
42	2045		972	972

Alternative: T-3		PV: US\$37,942 Million		
Year	Cost (US\$1000)			Total
	Construction	O&M		
1	2004	0	48	48
2	2005	2,464	48	2,512
3	2006	12,327	48	12,375
4	2007	9,861	454	10,315
5	2008	0	473	473
6	2009	0	490	490
7	2010	8,103	487	8,590
8	2011	20,260	487	20,747
9	2012	12,154	980	13,134
10	2013	0	969	969
11	2014	0	1,004	1,004
12	2015	0	1,039	1,039
13	2016		1,039	1,039
:	:	:	:	:
:	:	:	:	:
41	2044		1,039	1,039
42	2045		1,039	1,039

2.4 Economic Benefits

2.4.1 Benefits of Proposed Projects

One of important main goals of water supply project is to improve public health and well-being. In particular, the urban poor would receive benefit from the project. They rely on turbid groundwater or polluted streams, rivers and lakes in the project site. Besides these basic benefits, the water supply project gives various advantages to the people and the regional economy in and around the project areas. The following table listed up the benefits accruing from the water supply project.

Table 24-1 Benefits Accruing from Water Supply Project

(1) Improvement of Public Health	(a) Elimination of poor quality water source in service areas
	(b) Elimination of poor quality water source during stoppage of water supply during dry season
	(c) Reduction of water related diseases
	(d) Reduction of medical expenses
(2) Enhancement of Amenity and Well-being	(a) Elimination of equipment for procuring water source
	(b) Time-savings associated with procuring water source
	(c) Energy-savings associated with boiling water for disinfection
	(d) Elimination of stoppage of water supply during dry season
	(e) Reduction of absence from work because of water related illness
(3) Social Issues Related to Water Supply	(a) Effective use of alternative water resources
	(b) Efficient operation of water supply equipment
	(c) Stimulation of the project investment to regional economy
	(d) Prevention of urban disaster by means of fire hydrant
	(e) Improvement of degree of freedom for urban planning
	(f) Increase of land values

Among these benefits above, benefits in lines with (1) and (2) are considered as direct benefits, which the proposed project directly brings about those benefits to the beneficiaries. Benefits in line with (3) are considered as indirect benefits. The project has ripple effects on people or regional environment in relation to the project. On the other hand, the proposed project may bring about negative effects to the people and the regional socio-economy.

2.4.2 Quantifiable Direct Benefits

The benefits listed in the table above are furthermore classified into two categories. They are quantifiable

or tangible, and non-quantifiable or intangible. To calculate evaluation indicators for economic evaluation, only tangible benefits are quantified as project benefits. In this study, the following benefits are selected as tangible benefit, and they are bound into three components.

- | | |
|--|---|
| 1) Benefits of (2)-(a), (b) and (c) | Water source saving benefit for residents |
| 2) Benefits of (1)-(b) & (c) and (2)-(d) | Public health improvement benefit for residents |
| 3) Benefit of (2)-(a) | Water source saving benefit for non-residential water consumers |

The benefit of water supply project is captured as the difference between a situation with a with-project condition, and a without-project condition. Under the with-project condition, the beneficiaries within the service areas can enjoy the effects of the proposed water supply project. Under without-project condition, on the other hand, the people outside the service areas of the water supply system have to get water sources by means of the present water procurement methods as discussed in the household survey conducted by the JICA study team in March 2003. Then, the difference between the two cases is identified as project benefit.

Benefit includes various factors not only tangible benefits but also intangible ones. The tangible benefits selected above are only some parts of the various components. In this study, the project benefit is estimated on the basis of the tangible benefits above. Benefit is estimated for two main categories, i.e., (a) domestic water for domestic use and (b) water for non-domestic use.

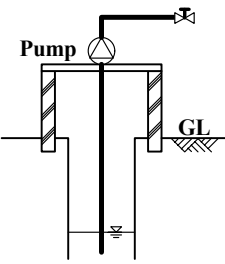
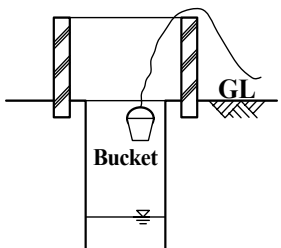
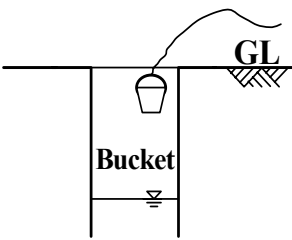
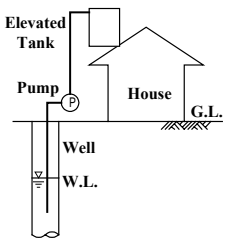
The benefit of domestic use is assumed as a sum of (i) water source saving benefit, (ii) public health improvement benefit and (iii) other intangible direct benefits. Hence, other intangible direct benefits are assumed as 10% of the sum of benefit (i) and (ii). The benefit of non-domestic use is assumed as a sum of (i) water source saving benefit and (ii) other intangible direct benefits. In the same manner, other direct benefits are assumed as 10% of the sum of benefit (i).

2.4.3 Estimate of Unit Economic Benefits

(1) Benefits of Domestic Water

The water source saving benefit is estimated based on the facts how the people in the project areas procure water source at present. According to “Household Survey” by the JICA Study Team in March 2003, procurement ways of water source in Vientiane Capital City are classified into five types. They are (1) protected well with a motor pump (Type A); (2) protected well (Type B); (3) shallow open well (Type C); (4) deep well with pump (Type D); and (5) surface water intake (Type E). They are illustrated in Table 24-2.

Table 24-2 Systems' Specification of Potable Water Source Procurement in Residence in Urban Areas of Vientiane Capital City

Item	Type A	Type B	Type C	Type D	Type E
System	Protected Well with Pump	Protect Well without Pump	Unprotected Well	Deep Well with Pump	Surface Water
Well	Depth: 5 ~ 10 m Diameter: 1.0 ~ 1.5 mφ	Depth: 5 ~ 10 m Diameter: 1.0 ~ 1.5 mφ	Depth: 3 ~ 5 m Diameter: 1.0 ~ 1.5 mφ	Depth: 10 ~ 20 m Diameter: 200 ~ 300 mmφ	-
Pump	1m ³ /h×10m×100W	-	-	2m ³ /h×30m×400W	-
Pump Operation	Manual Only	-	-	Manual On/Off Switching (Without Automatic Control)	-
Water Tank	-	-	-	Steel Made Tank of 800 litres	-
Potable Water	Bottled Water	Bottled Water	Boiled with Firewood	Bottled Water	Boiled with Firewood
Family Labour for Fetching Water per Day*1	Wet Season: 15 minuets-man Dry Season: 15 minuets-man	Wet Season: 20 minuets-man Dry Season: 30 minuets-man	Wet Season: 20 minuets-man Dry Season: 30 minuets-man		Wet Season: 30 minuets-man Dry Season: 45 minuets-man
System Flow Chart					
Composition *2	35%	35%	20%	8%	2%

Source: Socio-economic Survey, April 2003, JICA Study Team

Remark: *1 Assumed on the basis of the survey above.

*2 Assumed the composition in the service area on the basis of the survey above.

The water source costs consist of two main factors: investment cost and operation cost. In the case of Type A, for instance, the investment cost includes a protected well, an electric pump, an elevated tank, and connection pipes linking these facilities. The operation cost composes electric power, firewood for boiling to disinfect groundwater water, and some maintenance cost. On the other hand, Type E has no investment cost. However, it needs family labour to procure water source to their house from the source place. It also needs firewood for boiling to disinfect source water. The water source costs under present conditions were estimated as follows: 4,930 kip/m³ for Type A; 3,150 kip/m³ for Type B; 1,260 kip/m³ for Type C; 16,820 kip/m³ for Type D; and 1,090 kip/m³ for Type E. The details of estimation are tabulated in Table 24-3. Figure 24-1 illustrates source costs of the respective types.

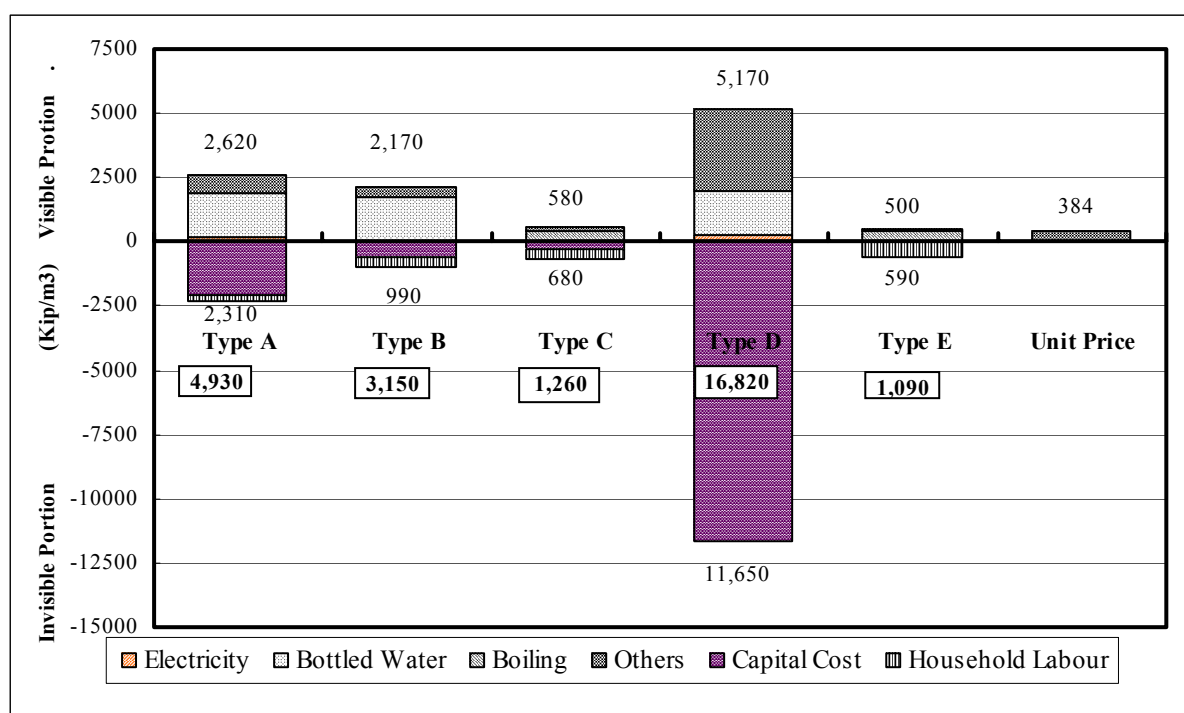


Figure 24-1 Water Unit Cost of Domestic Use by Type

The cost components are furthermore classified into two parts: visible portion and invisible portion. In type A, for example, the operation costs such as electric power and bottled water are paid every month. The family realizes these costs usually. These costs are perceived as visible portion. This portion is estimated as 2,620 kip/m³ for Type A. For Type E, that becomes only 500 kip/m³. The water source cost of visible portion even for Types E, however, is higher than the present average water price (384 kip/m³) for category 1 (domestic user) approved in December 2001.

Table 24-3 Water Source Cost of Potable Water in Residence by Type

(Unit: in Market Prices)

Item	Type A	Type B	Type C	Type D	Type E
	Well w/ Pump	Well wo Pump	Unprotected Well	Deep Well w/ Pump	Surface Water
1. Equipment Costs (1000 Kip)					
1) Well Digging	1,200	1,200	600	7,000	-
2) Pumping System	1,900	-	-	8,000	-
3) Piping in Yard	90	-	-	170	-
4) Water Tank	-	-	-	3,975	-
5) Piping to Tank	-	-	-	110	-
6) Miscellaneous (10% of 1) to 5))	320	120	60	1,930	-
Total	3,510	1,320	660	21,185	0
2. Operation & Maintenance Costs (1000Kip/year)					
1) Electricity *1	59	-	-	88	-
2) Maintenance *2	176	66	33	1,059	-
3) Potable Water of Bottled Water *3	690	690	-	690	-
4) Boiling for Potable Water*4	-	-	158	-	158
5) Household Labour for Fetching Water *5	91	152	152	-	228
6) Miscellaneous (10% of 1) to 4))	102	91	34	184	39
Total	1,117	999	377	2,021	424
3. Annual Costs for Water of Domestic Use (1000Kip/year)					
1) Annualized Equipment Costs (Invisible Costs) *4	812	234	117	4,553	-
a. Facilities except Pump	285	234	117	2,334	-
b. Pump	527	-	-	2,219	-
2) O&M cost	1,117	999	377	2,021	424
a. Visible O&M Costs	1,016	831	210	2,021	173
b. Invisible O&M Costs	100	167	167	-	251
Total	1,929	1,232	494	6,574	424
4. Annual Water Demand (m3/year) *5	391	391	391	391	391
5. Water Source Cost (Kip/m3) under Present Conditions	4,934	3,152	1,263	16,816	1,085

Remarks: *1 Type A: 170 lit/capita X 6.3 persons/family / 1,000 lit/h X 0.20 kW / 60% X 365 days/year X 450 kip/kW

Type E: 170 lit/capita X 6.3 persons/family / 2,000 lit/h X 0.6 kW / 60% X 365 days/year X 450 kip/kWh

*2 Assumed at the 5% of equipment costs in a year

*3 2 lit/capita X 6.3 persons/family / 20 lit/bottle X 3,000 kip/bottle X 365 days/year

*4 Assumed that 2% of the total volume was boiled by using firewood for Type C and E..

The volume above includes water for directly drinking purposes except for hot water purposes.

Energy consumption = 170 lit/capita X 6.3 persons/family X 365 days/year/1000 X 0.5% X (100°C - 25°C) = 147,000 kcal/year

Firewood cost = 147,000 kcal/year / 20% (efficiency) / 3,500 kcal/kg * 15000 Kip/20kg

*5 Minimum wage 140,000 kip/month / 20 days/month / y hrs/day = 1,000 kip/hr

Assumed as a half of the above rate for economically inactive persons: 500 Kip/hr

*4 In order to calculate annualized costs, Capital Recovery Factor (CRF) is applied on condition that an economic life (n) is 5 years for pump and 10 years for other equipment, and an interest rate (r) is 12%.

Hence, $CRF = r/(1-1/(1+r)^n)$

Then, CRF of equipment = 0.1770 and CRF of pump = 0.2774

*5 Estimated on the basis of average family size of 6.3 persons and unit consumption of 170 liter/day/capita

Yet, the capital cost is paid at the first investment time, so it is not conceived as monthly charges. However, it should be counted as a part of water source costs. It is converted to annualized cost, applying Capital Recovery Factor (CRF). For Type A, the annualized capital cost is estimated at 2,310 kip/m³. Furthermore, the cost of family labour (233 kip/m³) is not charged as water procurement cost in general. Thus, these costs are conceived as invisible portion. For Type E, the family labour cost is estimated at 590 kip/m³.

As mentioned above, the total water source costs are estimated as 4,930 kip/m³ for Type A; 3,150 kip/m³ for Type B; 1,260 kip/m³ for Type C; 16,820 kip/m³ for Type D; and 1,090 kip/m³ for Type E. These costs could be eliminated once the water supply project is introduced in the service areas of the proposed project. According to the household survey in 2003, these types are composed as follows: 35% for Type A, 35% for Type B, 20% for Type C, 8% for Type D and 2% for Type E. Finally, the weighted average water source cost was estimated as 4,450 kip/m³. However, the water source value was estimated in market prices. In economic evaluation, these values are converted to economic value. Applying conversion factors of 0.90 for the market prices, the economic source water value was converted to 4,005 kip/m³ in economic terms.

In addition to water source saving benefit, the public health improvement benefit was estimated as reduction of medical expenses by beneficiaries and as the same time reduction of labour opportunity losses due to illness. The amounts of these losses are estimated on the basis of medical data which were provided in “Summary Report of Patients in Outpatients, Inpatients and Died 2001, 2000 and 1999”, Ministry of Health, Headquarters and capital city information which came from and Provincial Department of Public Health in Vientiane Capital City and Medical Affair Department of Setthathirath Hospital. The medical annual expenses were estimated at around 882 kip per household in 2003. The annual labour losses were estimated at around 2,750 kip per household. Then, the total annual losses due to ill conditions were estimated at 1,030 kip per household. Then, the real total loss is assumed to be a half of the total health losses, because even if the water supply system is introduced in the project areas, the system could not completely eliminate the water-borne diseases in the project areas. Thus, its benefit is estimated at 2,040 kip per household. This estimation is shown in Table 24-4. Since the household consumes 391 m³ per year, the unit benefit is calculated at 5.2 kip/m³ only. Applying conversion factors of 0.90 for the market prices, the economic health improvement benefit was converted to 4.9 kip/m³ in economic terms.

Table 24-4 Household Medical Expenses and Losses due to Ill Health in Urban Areas

I. Information of Medical Treatment					
1. Number of Patients and Morbidity Rate of Water-borne Diseases (Case/100,000 population) in Vientiane					
	<u>Average Morbidity of '98-2002</u>		Morbidity Rate (Case/100,000 Persons)	Average Cost of In-patient Treatment (Kip/Case)	Average Days of Hospital Treatment (days)
	Out-patient	In-patient			
(1) Diarrhoea	1,506	406	342	241,000	3
(2) Dysentery	6	120	21	321,000	6
(3) Typhoid	178	74	30	402,000	3
2. Population of Vientiane Capital City in 1995 Census (1000)					
(1) Total Population		524			
(2) 10 Years Old & Over		394			
3. Household Expenditure and Consumption Survey 1997/98 (LECS2)					
(1) Household Size		6.3	Persons/Household on Average in Vientiane		
(2) Household Income in Urban *1		284,600			
(3) Number of Income Earners (Assumptior		4.0			
4. Price Index (as times of original value) *2					
(1) Between 2002 and 2003		1.1			
(2) Between 1997/98 and 2003		7.4			
II. Annual Medical Expenses for Water-borne Diseases per Household					
1. In-patient Treatment (Kip/Household) *3					
(1) Diarrhoea		1,100			
(2) Dysentery		405			
(3) Typhoid		220			
Sub-total		1,724			
2. Out-patient Treatment (Kip/Household) *4					
(1) Diarrhoea		737			
(2) Dysentery		5			
(3) Typhoid		52			
Sub-total		795	Total	<u>Value in 2002</u> 2,519	<u>Value in 2003</u> 2,747
III. Annual Losses due to Absence from Working because of Water-borne Diseases (Kip/Household)					
	Out-patient*6	In-patient*5			
(1) Diarrhoea	91	49			
(2) Dysentery	1	27		<u>Value in 1997/98</u>	<u>Value in 2003</u>
(3) Typhoid	7	6	Total	180	1,330
IV. Household Medical Expenses and Losses due to Ill Health in Urban Areas (Kip/Household)					
					4,077
V. Benefit from Water Supply System (Kip/Household) *7					
					2,038

Source: Department of Public Health, Vientiane Capital City Government
Medical Affair Department, Setthathirath Hospital
Households of Lao PDR, Social & Economic Indicators, Lao Expenditure and Consumption Survey, 1997/98 (LECS2)

Note: *1 Average monthly income was assumed as the same as expenditure.

*2 Refer to Table 24-20 Price Index in Socio-economic Study

*3 (Morbidity Rate) * (In-patient Ratio) * (Average Cost per Case) * Household Size

*4 (Morbidity Rate) * (Out-patient Ratio) * (Average Cost per Case) * Household Size

Average cost for out-patient was assumed as 10% of the in-patient case.

*5 (Morbidity Rate) * (Working Age Population Rate) * (Monthly Income per Capita) / (30 days/month) * (Average Days of Sick Leave)

Average days for recuperation were assumed as the same period as days for medical care treatment.

*6 Average days for treatment and recuperation were assumed as a half of in-patient case.

*7 Water-borne diseases' incidence were assumed to reduce to a half of the present conditions owing to the water supply system.

Accordingly, the benefit of domestic water in Vientiane Capital City was estimated as at least 4,010 kip/m³, which includes not only water source saving benefit but also public health improvement benefit. In other words, the people in Vientiane Capital City pay for around US\$ 0.37/m³ on average to procure water. Once the people recognize the water resource cost and conceive intangible benefits shown in the benefit table, the project benefit could become more than this estimated value of US\$ 0.37/m³. In this study, it was assumed from the economic point of view that other benefits might be 10% more than the estimated value, taking intangible direct benefits into consideration. Thus, it resulted in US\$ 0.41/m³. Since a household consumes 39m³ per month on average, the project benefit was estimated at around US\$16 per month per household in economic terms.

(2) Benefits from Non-domestic Water

At present, water demand for the NPVC comprises as follows: annual consumption of 14.7 million m³ or 58% of the total demand for category 1 (domestic consumer); 4.9 million m³ or 19% for category 1 (non-domestic consumer); 3.7 million m³ or 15% for category 2; 1.5 million m³ or 6% for category 3; and 0.6 million m³ or 0.6% for category 4. Thus, non-domestic user consisting of categories 1, 2, 3 and 4 consumed NPVC's water 10.8 million m³ per annum or 42% of the total consumption, as shown in Figure 24-2.

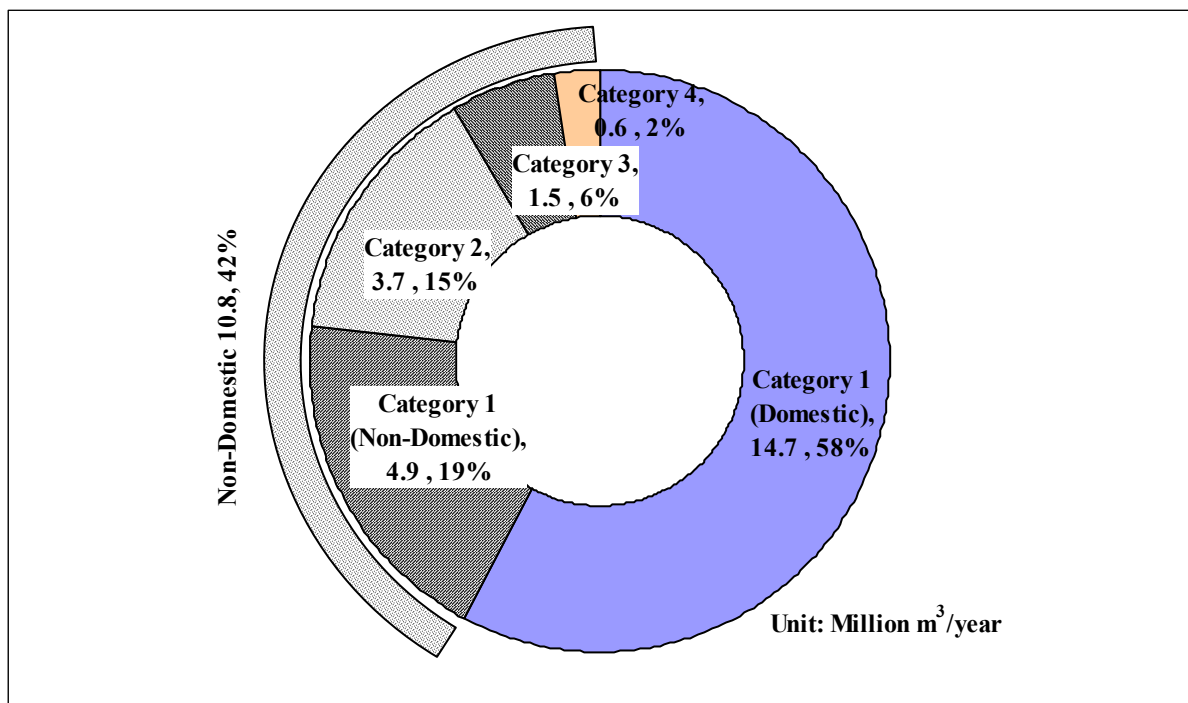


Figure 24-2 Composition of Non-domestic Water in NPVC Water Sales

Manufacturing industry is one of the large water consumers among the NPVC's customers. It is classified into category 2 or 3. The respective establishments procure water from Nam Papa (water supply

companies). In addition, they procure water from their own water sources such as wells or surface waters for back-up source in emergency and some sort of raw materials. Figure 24-3 shows gross output establishment by type of manufacturing industry broken down to value added and intermediate including water. The original information and data in 1999 were tabulated in Table 42-4 and 42-5 in Socio-economic Study. Water expense for all establishments accounted for 0.14% of the total intermediate expenses. For the respective types of manufacturing establishments, water expense ranges from 1.92% of intermediate expense in maximum to 0.01% of fabricated metal products in minimum. Thus, percentage of water expense in intermediate expenses is quite small. On the other hand, this water expense does not include costs of their own water sources, since the latter costs cannot be brought out because of any measuring installation. Then, the water expense does not mean the total water costs for themselves. However, the respective establishments spend at least the water expense counted above in a year.

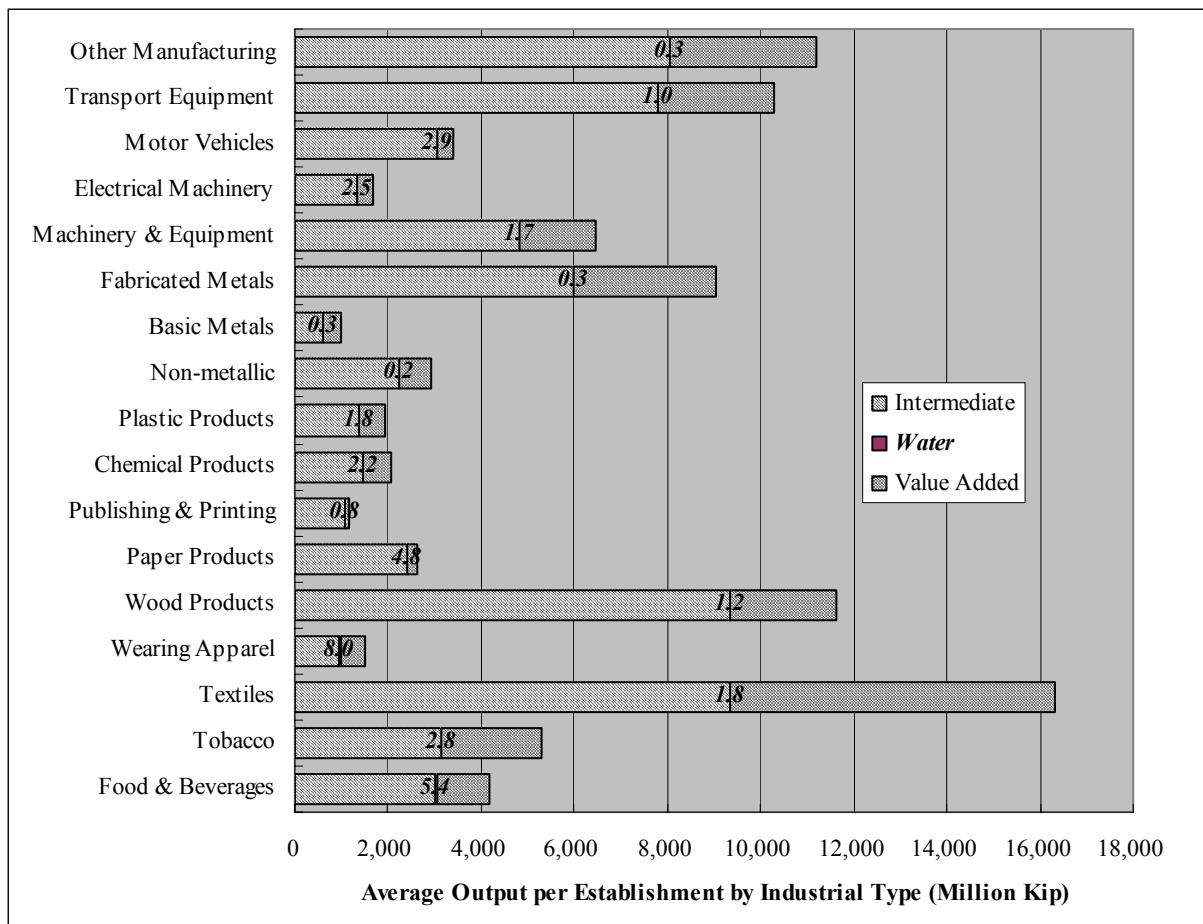


Figure 24-3 Composition of Water Expenses in Manufacturing Production

The NPVC supplies water to manufacturing establishments as category 2 or 3, as mentioned above. According to its sales records in 2002, average water sales were 0.3 million kip per connection for category

2 and 3.0 million kip per connection for category 3. These average sales amounts correspond to the water expense in the figure above. As mentioned before, the water expense does not include their own procured water costs, although the latter costs can not be counted up. At least, they spend the amount above for water. In this study, thus, the water costs are considered as water procurement cost for non-domestic consumers.

In 2002, unit prices of the non-domestic users were calculated at: 462 kip/m³ for category 1 (Non-domestic), 586 kip/m³ for category 2; 1,269 kip/m³ for category 3 and 3,507 kip/m³ for category 4, as illustrated in the figure below. The weighted average was calculated at 770 kip/m³.

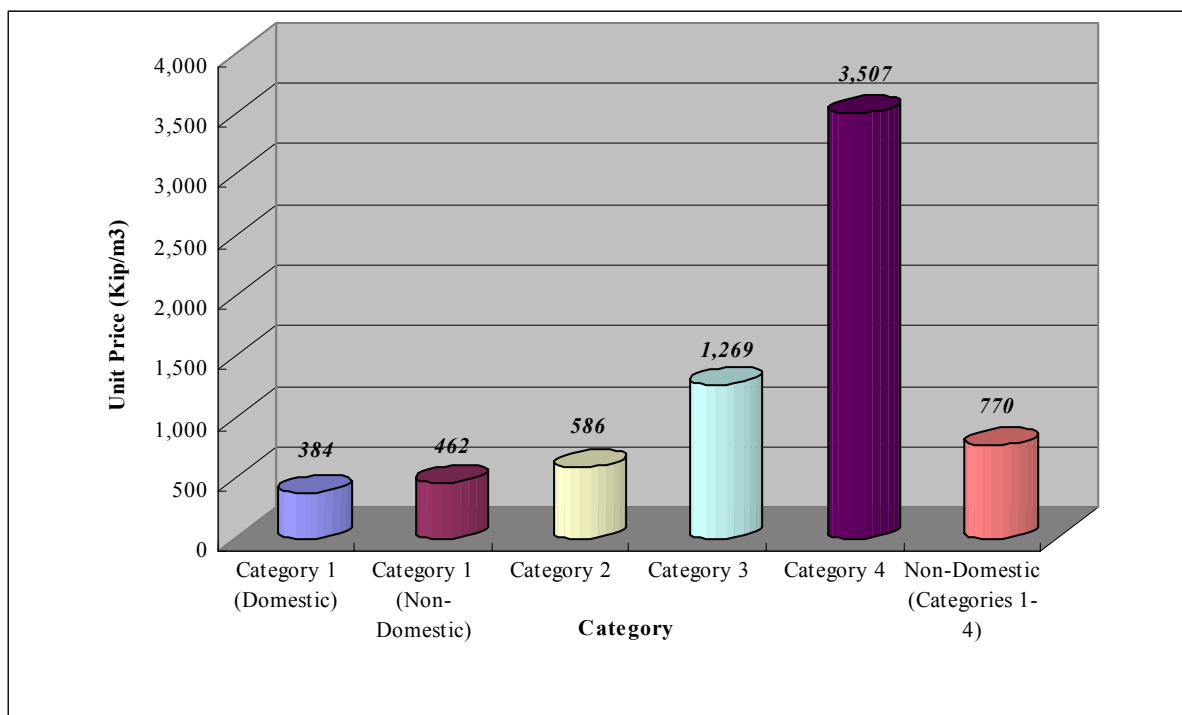


Figure 24-4 Average Prices of Respective Categories in NPVC Water Supply as of May 2003

According to the hearing survey for manufacturing establishments in May 2003, some of them consume groundwater as raw material and/or cleaning their production facilities. Their consuming volume of groundwater was estimated at around 10% of the total water consumption. Supposing that a unit cost of groundwater was considered as a similar system of Type D in Table 23-2, the procurement cost of groundwater might be around 16,820 kip/m³. As estimated in the previous section, the city water was procured at a unit cost of 770 kip/m³. The average unit cost for non-domestic water was calculated as 2,270 kip/m³, i.e., $770 \text{ kip/m}^3 \times 90\% + 16,820 \text{ kip/m}^3 \times 10\% = 2,375 \text{ kip/m}^3$.

Accordingly, the benefit of non-domestic water in Vientiane Capital City was estimated as at least 2,375 kip/m³ in market prices. In this study, it was assumed from the economic point of view that other benefits

might be 10% more than the estimated value, taking intangible direct benefits into consideration. Then, the water source value was estimated 2,600 kip/m³ in market prices. Furthermore, it was converted to 2,300 kip/m³ in economic terms, applying the conversion factor of 0.90. Finally, it was re-converted to US\$0.21 per m³ in economic terms.

2.4.4 Estimate of Economic Benefits

The benefit of water supply services is calculated as a product of water volume consumed and unit economic benefit. As discussed in the previous section, unit benefits are US\$ 0.41 per m³ for domestic water and US\$ 0.21 per m³ for non-domestic water. The total water consumption volume for the respective years during the project life is estimated in “Water Demand Projection”. Actual water demand of beneficiaries is illustrated in Figure 24-5. It was calculated on the basis of water demand of incremental beneficiaries and water supply capacities of the project proposed.

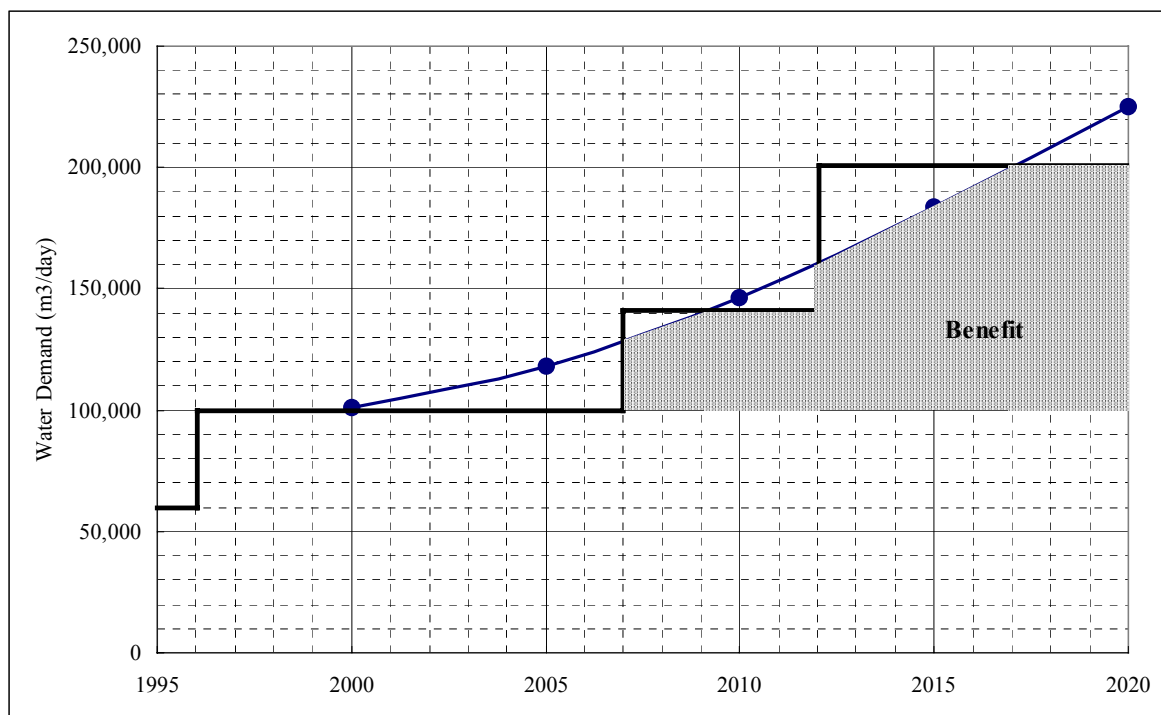


Figure 24-5 Range of Benefit of Project Proposed

The total benefits were calculated as a product of unit economic benefits of the respective categories and total consumption volumes of the corresponding categories. Finally, the total economic benefits were estimated at US\$ 3.03 million in 2007 and US\$ 9.29 million in 2020, as shown in Table 24-5. Table 24-6 summarised the economic benefits.

Table 24-5 Water Demand and Benefit Accruing from Project Proposed: 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	11,660	12,849	14,159	15,603	16,661	16,807	16,807	16,807	16,807
(3) Total	18,947	20,042	20,392	20,360	20,360	25,033	26,222	27,532	28,976	30,035	30,180	30,180	30,180	30,180
2. 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	7,497	8,326	9,247	10,270	11,150	11,434	11,434	11,434	11,434
(3) Total	14,823	15,480	15,618	15,618	15,618	18,578	19,408	20,329	21,352	22,232	22,516	22,516	22,516	22,516
3. Grand Total	33,770	35,522	36,009	35,978	35,978	43,612	45,630	47,861	50,328	52,266	52,696	52,696	52,696	52,696
II. Annual Benefit (US\$1000/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	2,247	2,708	2,865	2,865	2,865	4,781	5,268	5,805	6,397	6,831	6,891	6,891	6,891	6,891
(3) Total	2,247	2,708	2,865	2,865	2,865	4,781	5,268	5,805	6,397	6,831	6,891	6,891	6,891	6,891
2. Domestic Water Consumers														
(1) Existing Demand	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2) Increment after 2007	786	924	953	953	953	1,574	1,748	1,942	2,157	2,341	2,401	2,401	2,401	2,401
(3) Total	786	924	953	953	953	1,574	1,748	1,942	2,157	2,341	2,401	2,401	2,401	2,401
3. Grand Total	3,032	3,632	3,817	3,817	3,817	6,355	7,017	7,747	8,554	9,173	9,292	9,292	9,292	9,292

Table 24-6 Estimate of Economic Benefits

Item	2007	2010	2015	2020
I. Water Demand (Million m³/Year)				
Domestic Demand	18.9	20.4	29.0	29.8
Base Demand	13.5	13.4	13.4	13.4
Increment Demand	5.5	7.1	15.6	16.4
Non-residential Demand* ¹	14.8	17.2	21.4	22.9
Base Demand	11.1	11.1	11.1	11.1
Increment Demand	3.7	4.5	10.3	11.8
Total	33.8	36.0	50.3	52.7
II. Benefit (US\$1000/Year)				
Domestic Demand	2,247	2,865	6,397	6,891
Base Demand	0	0	0	0
Increment Demand	2,247	2,865	6,397	6,891
Non-residential Demand	786	953	2,157	2,401
Base Demand	0	0	0	0
Increment Demand	786	953	2,157	2,401
Total	3,032	3,817	8,553	9,292

Note: *1 Category 4 is included in this category in economic analysis.

*2 Plant capacity is not enough for water demand in the years of 2009 to 2011 and 2016 to 2020.

2.4.5 Estimate of Economic Benefits under Future Growth Conditions

As mentioned in GDP projection, GDP per capita in the target year 2020 will increase to 2.5 times more than that in 2001. In accordance with this economic growth, people's living standard would be improved in the future. In 2020, GDP per capita is estimated at 7,060 million kip at 2001 constant prices against 2,914 million kip in 2001. Even outside areas of the water supply system, then, water source procurement systems could be improved more than those at present system.

It was assumed that GDP per capita in 2001 was distributed into quintile in proportion to that of real consumption per capita in 1997/98, which was analysed in "Poverty in Lao PDR during the 1990's, 2002, NSC". The respective GDP per capita was assumed to grow at the similar rates estimated for the each quintile in the said report. The distribution of GDP per capita was illustrated in Table 24-7. The respective types of water source procurement system in 2001 are considered to be applied to the same economic level in 2020. As a result, the distribution of the types was changed as shown in the table below in 2020.

Year	Type A	Type B	Type C	Type D	Type E
2003	35%	35%	20%	8%	2%
2020	40%	15%	15%	30%	0%

Table 24-7 Change of Water Source Procurement System under Future Growth Scenario: 2001 and 2020

Quintile	GDP per Capita Projection*1 Distribution Assumed*2		Distribution of Real Consumption per Capita*3		
	2001*2	2020*4	1992-93	1997-98	Growth Rate
1. First	235	248	2,356	2,325	-0.3
2. Second	350	476	3,296	3,466	1.0
3. Third	453	756	4,125	4,486	1.7
4. Fourth	604	1,021	5,489	5,982	1.7
5. Fifth	1,274	4,560	10,228	12,623	4.3
All Quintiles	2,914	7,060	25,494	28,886	2.5

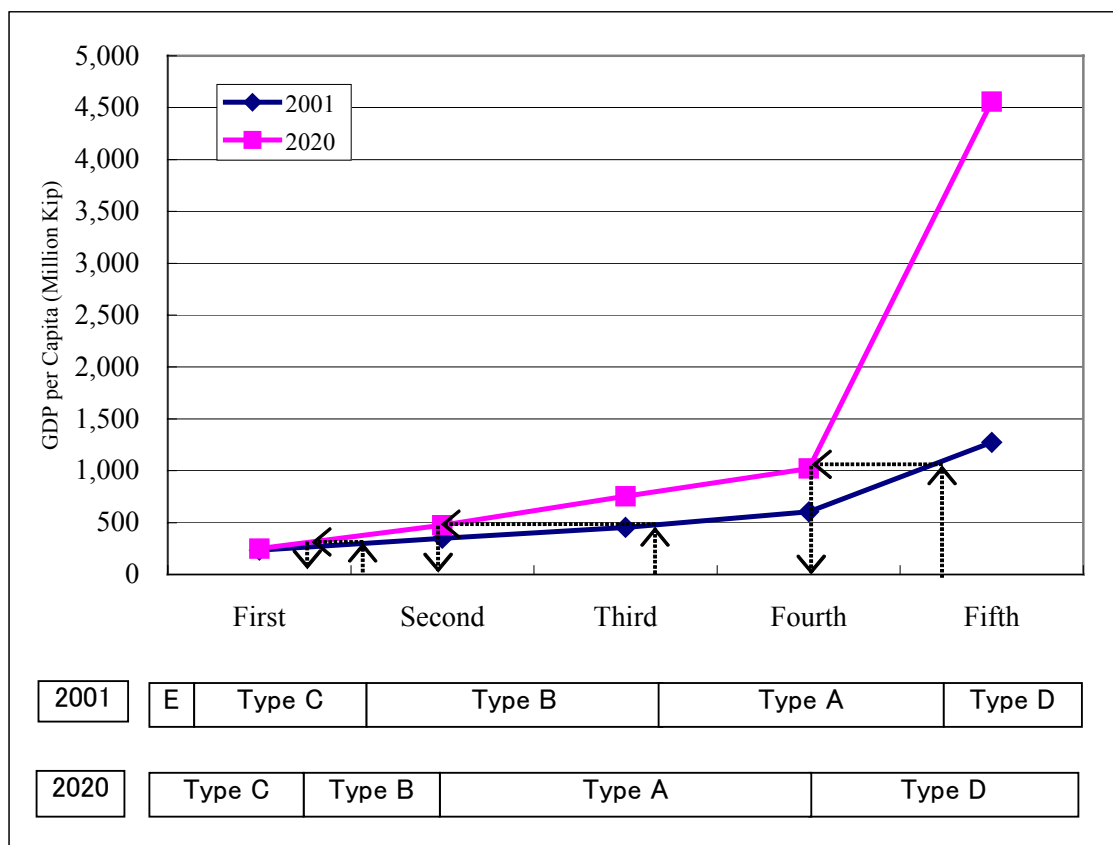
Source: Poverty in Lao PDR during the 1990's, 2002, NSC, CPC

Note: *1 Refer to Table 54-1.

*2 Assumed to be the same distribution as that in 1997/98 distribution of real consumption per capita.

*3 Quoted from the source above.

*4 Estimated applying the similar growth rates of the respective quintiles calculated in the source above.



	Type A	Type B	Type C	Type D	Type E
2001 (2003)	35%	35%	20%	8%	2%
2020	40%	15%	15%	30%	0%

As mentioned in Section 2.4.3, the total water source costs are estimated as 4,930 kip per m³ for Type A; 3,150 kip per m³ for Type B; 1,260 kip per m³ for Type C; 16,820 kip per m³ for Type D; and 1,090 kip per m³ for Type E. These costs could be eliminated once the water supply project is introduced in the service areas of the proposed project. In the target year, these types are composed as follows, as discussed above: 40% for Type A, 15% for Type B, 15% for Type C, 30% for Type D and 0% for Type E. Finally, the weighted average water source cost was estimated as 7,681 kip per m³. However, the water source value was estimated in market prices. In economic evaluation, these values are converted to economic value. Applying conversion factors of 0.90 for the market prices, the economic source water value was converted to 6,913 kip per m³ in economic terms.

Accordingly, the benefit of domestic water in Vientiane Capital City with future growth projection was estimated as at least 6,913 kip per m³ in economic terms, which includes not only water source saving benefit but also public health improvement benefit. In other words, the people in Vientiane Capital City pay for around US\$ 0.65 per m³ on average to procure water in 2020. Once the people recognize the water resource cost and conceive intangible benefits shown in the benefit table, the project benefit could become more than this estimated value of US\$ 0.65 per m³. In this study, it was assumed from the economic point of view that other benefits might be 10% more than the estimated value, taking intangible direct benefits into consideration. Thus, it resulted in US\$ 0.71 per m³ in 2020. Between 2003 and 2020, the unit benefit is increased in proportion to the economic growth.

In the same manner as estimated in Table 24-5, the total benefits were estimated at US\$ 3.34 million in 2007 and US\$ 14.3 million in 2020, as shown in the table below. The details are shown in Table 24-8. Hence, the benefit of non-domestic water was assumed to be the same as under the present conditions.

Item	2007	2010	2015	2020
Benefit (US\$1000/Year)				
Domestic Demand	2,556	3,592	9,426	11,933
Non-residential Demand	786	953	2,159	2,401
Total	3,342	4,544	11,583	14,334

Table 24-8 Water Demand and Benefit under Future 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	11,660	12,849	14,159	15,603	16,661	16,807	16,807	16,807	16,807
(3) Total	18,947	20,042	20,392	20,360	20,360	25,033	26,222	27,532	28,976	30,035	30,180	30,180	30,180	30,180
2. 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	7,497	8,326	9,247	10,270	11,150	11,434	11,434	11,434	11,434
(3) Total	14,823	15,480	15,618	15,618	15,618	18,578	19,408	20,329	21,352	22,232	22,516	22,516	22,516	22,516
3. Grand Total	33,770	35,522	36,009	35,978	35,978	43,612	45,630	47,861	50,328	52,266	52,696	52,696	52,696	52,696
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	2,556	3,183	3,477	3,592	3,710	6,394	7,277	8,282	9,426	10,396	10,831	11,186	11,553	11,933
(3) Total	2,556	3,183	3,477	3,592	3,710	6,394	7,277	8,282	9,426	10,396	10,831	11,186	11,553	11,933
2. Domestic Water Consumers														
(1) Existing Demand	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2) Increment after 2007	786	924	953	953	953	1,574	1,748	1,942	2,157	2,341	2,401	2,401	2,401	2,401
(3) Total	786	924	953	953	953	1,574	1,748	1,942	2,157	2,341	2,401	2,401	2,401	2,401
3. Grand Total	3,342	4,107	4,430	4,544	4,662	7,968	9,025	10,224	11,583	12,737	13,232	13,587	13,955	14,334

2.5 Economic Costs

The estimate of the proposed project was already described in Annex 16. The estimate, however, was enumerated in market prices, what is called “financial value”. In economic evaluation, the financial value has to be converted into economic value. The procedure of this conversion was already discussed in Section 2.2. The total economic cost of the priority project was calculated at US\$ 79.4 million. The financial and economic costs are broken down in Table 25-2.

The construction costs are annually disbursed in compliance with the construction schedule. In these investment costs, the installation costs of connection works such as service pipes and water meter are included in the construction costs and disbursed in accordance with the increase of new consumers. The annual disbursement is tabulated in Table 25-2.

Table 25-1 Economic and Financial Costs of Proposed Project

(Unit: US\$ 1000)		
Item	Financial Cost	Economic Cost
1. Construction Cost	64,726	62,701
2. Administration Cost	4,832	4,349
3. Engineering Services	5,327	5,244
4. Physical Contingency	7,294	7,069
5. Price Contingency	4,832	0
Total	98,553	79,362

The pipeline facilities of the respective projects are considered to last 30 years long. Then, the evaluation period (corresponding to economic life) is set up as 30 years after the completion of the project construction. On the other hand, the machinery such as circulating pump and booster pump is considered to last 15 years. These machines have to be replaced during the system’s life, as mentioned above. In the disbursement schedule, the replacement costs of these machines are appropriated every 15 years. Thus, these replacement costs were estimated in economic terms as follows: US\$ 5.36 million in 2022 and 2037, and US\$ 7.06 million in 2027 and 2042.

After the evaluation period of 30 years, the replaced machines will still be able to work well, because they are in their durable period after the replacement. In the evaluation procedure, however, these residual values were neglected because they were quite small at the end of evaluation period.

The operation and maintenance (O&M) cost is annually required during the economic life of the proposed project. The O&M unit cost was estimated at US\$2.05 million at market prices after the completion of the project. It was converted to US\$ 1.38 million in economic terms. The annual O&M costs of both financial and economic values are enumerated in Table 25-3.

Table 25-2 Financial Costs and Economic Costs of Initial Investment

Financial Costs		(Unit: US\$1000)											
Item	Total	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1. Construction Cost	64,726	263	2,600	12,146	9,795	405	396	7,756	18,819	11,442	378	368	358
(1) Treatment Plants	28,508	0	1,507	7,541	6,033	0	0	2,686	6,713	4,028	0	0	0
(2) Clear Water Transmission Pipelines	7,930	0	41	204	164	0	0	1,505	3,760	2,256	0	0	0
(3) Distribution Center	4,376	0	0	0	0	0	0	875	2,188	1,313	0	0	0
(4) Booster Pump Station	1,103	0	74	368	295	0	0	73	183	110	0	0	0
(5) Distribution Trunk Mains	18,375	0	722	3,609	2,888	0	0	2,231	5,578	3,347	0	0	0
(6) Secondary & Tirtially Distribution Mains	1,808	115	108	196	187	177	168	158	159	150	140	130	120
(7) House Connection Installation	2,626	148	148	228	228	228	228	228	238	238	238	238	238
2. Consulting Sercvices	5,327	364	547	547	364	595	582	873	873	582	0	0	0
3. Condingencies	23,668	128	578	2,628	2,483	349	376	3,123	7,836	5,303	268	289	307
(1) Physical Constingencies	7,294	97	346	1,301	1,043	127	120	885	1,991	1,218	56	56	54
(2) Price Contingencies	16,374	31	232	1,327	1,440	222	256	2,238	5,845	4,085	212	233	253
4. Administration	4,832	55	202	782	646	81	79	599	1,388	874	42	42	42
Total	98,553	810	3,927	16,103	13,288	1,430	1,433	12,351	28,916	18,201	688	699	707

Economic Costs													
Item	Total	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1. Construction Cost	62,701	259	2,515	11,734	9,464	398	389	7,522	18,243	11,093	372	362	352
(1) Treatment Plants	27,432	0	1,447	7,240	5,792	0	0	2,591	6,476	3,886	0	0	0
(2) Clear Water Transmission Pipelines	7,791	0	40	200	161	0	0	1,479	3,694	2,216	0	0	0
(3) Distribution Center	4,237	0	0	0	0	0	0	847	2,118	1,271	0	0	0
(4) Booster Pump Station	1,083	0	73	362	290	0	0	72	179	108	0	0	0
(5) Distribution Trunk Mains	17,800	0	703	3,515	2,813	0	0	2,154	5,384	3,231	0	0	0
(6) Secondary & Tirtially Distribution Mains	1,779	113	106	193	184	174	165	156	157	148	138	128	118
(7) House Connection Installation	2,580	145	145	224	224	224	224	224	234	234	234	234	234
2. Consulting Sercvices	5,244	358	539	539	358	585	573	859	859	573	0	0	0
3. Condingencies	7,069	94	335	1,257	1,008	124	117	859	1,931	1,182	54	54	53
(1) Physical Constingencies	7,069	94	335	1,257	1,008	124	117	859	1,931	1,182	54	54	53
(2) Price Contingencies	0	0	0	0	0	0	0	0	0	0	0	0	0
4. Administration	4,349	50	182	704	581	73	71	539	1,249	787	38	38	38
Total	79,362	761	3,570	14,233	11,412	1,180	1,151	9,779	22,282	13,635	464	454	442

Table 25-3 Financial Costs and Economic Costs of Operation and Maintenance

Financial Costs		(Unit: US\$1000)									
Item	Total	2007	2008	2009	2010	2011	2012	2013	2014	2015	
1. Electricity	5,903	437	455	472	469	469	888	870	904	939	
(1) Expanded Kaolieo T.P.	1,944	215	225	234	233	233	188	197	205	214	
(2) Imported Chinaimo T.P.	1,590	176	184	192	190	190	154	161	168	175	
(3) Thangone T.P.	1,030	0	0	0	0	0	241	252	263	274	
(4) Distribution Centre	809	0	0	0	0	0	230	185	193	201	
(5) Booster Pump Station	530	46	46	46	46	46	75	75	75	75	
2. Chemical Cost	1,208	99	104	108	107	107	160	168	174	181	
(1) Expanded Kaolieo T.P.	895	99	104	108	107	107	87	91	94	98	
(2) Thangone T.P.	313	0	0	0	0	0	73	77	80	83	
3. Salary	2,042	102	108	114	119	126	346	361	376	391	
(1) Expanded Kaolieo T.P.	36	4	4	4	4	4	4	4	4	4	
(2) Thangone T.P.	96	0	0	0	0	0	24	24	24	24	
(3) Meter Reader	326	17	18	19	20	21	54	57	59	62	
(4) Administration/Engineering	1,584	81	86	91	96	101	264	276	289	301	
4. Others	2,898	154	162	169	177	185	483	503	523	543	
Total	12,051	792	828	863	872	887	1,877	1,902	1,977	2,054	
Economic Costs											
Item	Total	2007	2008	2009	2010	2011	2012	2013	2014	2015	
1. Electricity	5,313	393	410	425	422	422	799	783	814	845	
(1) Expanded Kaolieo T.P.	1,750	194	203	211	210	210	169	177	185	193	
(2) Imported Chinaimo T.P.	1,431	158	166	173	171	171	139	145	151	158	
(3) Thangone T.P.	927	0	0	0	0	0	217	227	237	247	
(4) Distribution Centre	728	0	0	0	0	0	207	167	174	181	
(5) Booster Pump Station	477	41	41	41	41	41	68	68	68	68	
2. Chemical Cost	1,208	99	104	108	107	107	160	168	174	181	
(1) Expanded Kaolieo T.P.	895	99	104	108	107	107	87	91	94	98	
(2) Thangone T.P.	313	0	0	0	0	0	73	77	80	83	
3. Salary	1,838	92	97	102	107	113	311	325	338	352	
(1) Expanded Kaolieo T.P.	32	4	4	4	4	4	4	4	4	4	
(2) Thangone T.P.	86	0	0	0	0	0	22	22	22	22	
(3) Meter Reader	293	15	16	17	18	19	49	51	53	56	
(4) Administration/Engineering	1,426	73	77	82	86	91	238	248	260	271	
4. Others	0	0	0	0	0	0	0	0	0	0	
Total	8,359	584	610	635	636	642	1,271	1,276	1,326	1,378	

2.6 Economic Efficiency

Economic costs and benefits during the economic evaluation period are shown in Table 26-1. The table shows an economic and cost stream under present socio-economic conditions. The evaluation indices were 8.5% of EIRR, minus US\$ 10.9 million of NPV and 0.77 of B/C. Then, the priority 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. The economic benefits and costs under the future growth conditions are tabulated in Table 26-2. As shown in the table, the evaluation indices were 12.8% of EIRR, US\$2.96 million of NPV and 1.06 of B/C. Thus, the priority 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	8.5	-10.9	0.77
With Economic Growth Conditions	12.8	3.0	1.06

3. FINANCIAL ANALYSIS

3.1 Overview of Financial Overview

Financial analysis is carried out on the basis of market values of project costs and incomes from the water supply services of the proposed projects. The project costs are estimated in Annex 16. These costs reflect the actual present market conditions. The revenue of water sales is calculated as a product of a volume of water sold and water rates lay down by the NPVC, Vientiane Capital City. Finally, the projects are examined in financial efficiency and evaluated taking into account of financial situation.

In the master plan stage, financial viability of the proposed project is examined by means of an evaluation indicator of “financial internal rate of return (FIRR)”. If the FIRR were not good to implement from the financial point of view, financial constraints would be analyzed and identified, and some countermeasures would be proposed in this stage.

The analysis above is conducted mainly on the supply side. The project management is also evaluated from the viewpoint of demand side. Affordability-to-pay as well as willingness-to-pay of water consumers for the proposed projects is important constraint for the project to be accepted by the consumers. Through these analyses, this financial study proposes financial solutions and recommendations in the sectoral conclusion of the master plan study. On the basis of these solutions and recommendations, finally, a financial simulation for the most appropriate system is conducted to identify the management issues in the future.

3.2 Revenue from Water Supply Services

The revenue of the proposed project accrues from expenses of the water consumers. The consumers pay for water charges in accordance with their water volume consumed. The NPVC lay down the new water tariff on water consumption in their service areas in December 2001. Its details are shown in Table 32-1. An 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).

Table 32-1 Water Demand, New Connection and Income Accruing from Project Proposed: 2007 - 2020

Item	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
I. Water Requirement and Consumers														
1. Water Requirement (1000m ³ /year)														
(1) Domestic Water Consumers	5,479	6,606	6,987	6,987	6,987	11,660	12,849	14,159	15,603	16,661	16,807	16,807	16,807	16,807
(2) Non-domestic Water Consumers	3,742	4,398	4,536	4,536	4,536	7,497	8,326	9,247	10,270	11,150	11,434	11,434	11,434	11,434
(3) Total	9,221	11,004	11,523	11,523	11,523	19,157	21,175	23,407	25,873	27,811	28,241	28,241	28,241	28,241
2. Increment of Water Meter Installation (nos.)														
(1) Domestic Water Consumers	1,130	1,198	1,271	1,349	1,117	2,925	3,064	3,209	3,362	2,870	2,981	3,096	3,216	3,340
(2) Non-domestic Water Consumers	118	124	129	135	141	368	385	402	420	439	458	479	500	522
(3) Total	1,248	1,322	1,401	1,484	1,258	3,293	3,448	3,611	3,782	3,308	3,439	3,575	3,716	3,863
3. Number of Water Meters (nos.)														
(1) Domestic Water Consumers	1,130	2,328	3,599	4,948	6,065	8,989	12,053	15,262	18,624	21,493	24,474	27,570	30,786	34,127
(2) Non-domestic Water Consumers	118	242	371	506	647	1,016	1,401	1,803	2,223	2,661	3,120	3,598	4,098	4,621
(3) Total	1,248	2,570	3,971	5,454	6,712	10,005	13,454	17,065	20,846	24,155	27,594	31,168	34,885	38,747
II. Annual Income (US\$1000/year)														
1. Water Requirement														
(1) Domestic Water Consumers	196	236	250	250	250	417	460	507	559	596	602	602	602	602
(2) Non-domestic Water Consumers	269	316	326	326	326	538	598	664	737	801	821	821	821	821
(3) Total	465	552	576	576	576	956	1,058	1,171	1,296	1,397	1,423	1,423	1,423	1,423
2. Water Meter Installation	131	139	147	156	132	347	363	380	398	348	362	376	391	406
3. Water Meter Rental	3	7	10	14	17	26	34	44	53	62	71	80	89	99
4. Grand Total	599	698	733	746	725	1,328	1,455	1,594	1,747	1,807	1,855	1,878	1,903	1,928

Note: *1 Average rates were set as US\$0.0718/m³ for domestic users and US\$ 0.0718/m³ for non-domestic users, quoted from the average unit prices in 2002.

*2 New connection fee was set as 105.22/unit on average, quoted from the average unit price in 2002.

*3 Meter rental fee was set as US\$2.56/unit/year on average, quoted from the average unit price in 2002.

The revenue from water supply services is calculated as a product of water volume consumed and unit rates settled in the water tariff. As discussed in the previous section, the average unit volume of water consumption in the year 2007 was set up and the consumption volumes were already calculated in forms of monthly and annual figures. The details of water demand are explained in Section 2.4.4. The unit revenue is calculated as a product of unit rate (kip/m³) and an average volume of water consumption by consumer types. Table 32-2 shows the annual average unit revenue of the respective consumers in the beginning year of the project in 2007.

Table 32-2 Average Water Consumption and Water Charge from Project Proposed

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
Monthly Charge	US\$ Million	196	269	465
2. Annual Consumption in 2020				
Consumption Volume	m ³	16,807	11,434	28,241
Annual Charge	US\$ Million	602	821	1,423

As mentioned before, the total revenue of the proposed project is estimated as a product of unit rate of the water tariff and total volume of the water supply scheme. The unit rate is assumed to be constant during the evaluation period, which was set as of May 2003. The total annual revenue from water supply services is tabulated in Table 32-1.

In addition to the water sales, the NPVC can receive the connection charges from new consumers. The number of the new consumers is estimated at 38,700 between 2002 and 2020. The NPVC, therefore, will collect the connection charge of US\$ 4,000 in total at 2003 constant prices. The annual distribution of this revenue is enumerated in Table 32-1 and summarised in Table 32-3.

Table 32-3 New Connections and Connection Fee from Project Proposed

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	5,118
Monthly Charge	US\$ Million	131
2. New Connection in 2020		
Number of Connections	Unit	17,901
Annual Charge	US\$ Million	406

Furthermore, the NPVC collects the meter rental charge from water consumers. Water meter rental rates were tabulated in Table 51-2 in Annex 4-2, which is effective as of May 2003. The average rate was calculated at 2,280 kip/unit (equivalent to US\$2.56/unit) in 2002. Applying this average rate in the

project, the expected income from meter rental was estimated as shown in the table below. The annual increment of the meter rental charges is enumerated in Table 32-1 and summarised in Table 32-4.

Table 32-4 Water Meter Rental Fee from Project Proposed

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\$ Million	3
2. New Connection in 2020		
Number of Connections	Unit	38,747
Annual Charge	US\$ Million	99

3.3 Costs for Water Production

The financial construction cost of the proposed 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 work types of the main construction cost comprise (i) treatment plants facilities, (ii) supplementary facilities, (iii) water pipe lines and (iii) circulation pumps. The supplementary facilities include treatment plant house, clear water reservoirs, pumps and other machinery. Other costs are estimated as some proportions to the main construction cost. The details of cost estimate were described in Annex 16. The financial costs of the proposed project were summarized as follows.

Table 33-1 Investment Costs of Project Proposed

Description	Investment Costs (US\$ 1000)
1. Construction Cost	64,726
2. Administration Cost	4,832
3. Engineering Services	5,327
4. Physical Contingency	7,294
5. Price Contingency	4,832
Total	98,553

Note: The costs above exclude all costs taking part in the whole NPVC management such as “UFW Reduction” and “Human Resource Development”. 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.

Then, the disbursement of construction costs is tabulated as financial costs in Table 25-2.

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

As mentioned in economic cost, the replacement costs are required for the evaluation period of the project proposed. The machinery in the plants has 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 were estimated in market values as follows: US\$ 5.44 million in 2022 and 2037, and US\$ 7.16 million in 2027 and 2042.

The operation and maintenance (O&M) cost is annually required during the economic life of the proposed project. The O&M cost was estimated at US\$ 792,000 in the start year 2007 and US\$ 2,054,000 at the target year 2015 at 2003 price level. The details of the O&M cost are described in the financial costs part in Table 25-3.

3.4 Financial Analysis

Financial expenditure and revenue during the evaluation period are shown as an annual stream in Table 34-1. The table also shows evaluation indices. The indices were 0.13 of B/C and minus US\$ 52.3 million of the NPV. FIRR was not calculated because of too small revenue compared with its expenditure. From the financial point of view, accordingly, the proposed project is not said to be viable.

Table 34-1 Cost and Revenue Stream of Proposed Project Applying Present Tariff

(Unit: US\$1000)

Year	Cost				Benefit			Total	Balance
	Construc- tion	O&M	Replace- ment	Total	Water Charge	Connec- tion	Meter Rental		
-11 2004	810			810	0	0	0	0	-810
-10 2005	3,927			3,927	0	0	0	0	-3,927
-9 2006	16,103			16,103	0	0	0	0	-16,103
-8 2007	13,288	792		14,080	465	131	3	599	-13,480
-7 2008	1,430	828		2,258	552	139	7	698	-1,560
-6 2009	1,433	863		2,296	576	147	10	733	-1,562
-5 2010	12,351	872		13,223	576	156	14	746	-12,477
-4 2011	28,916	887		29,803	576	132	17	725	-29,077
-3 2012	18,201	1,877		20,078	956	347	26	1,328	-18,750
-2 2013	688	1,902		2,590	1,058	363	34	1,455	-1,135
-1 2014	699	1,977		2,676	1,171	380	44	1,594	-1,082
0 2015	707	2,054		2,761	1,296	398	53	1,747	-1,014
1 2016		2,054		2,054	1,397	348	62	1,807	-247
2 2017		2,054		2,054	1,423	362	71	1,855	-199
3 2018		2,054		2,054	1,423	376	80	1,878	-176
4 2019		2,054		2,054	1,423	391	89	1,903	-151
5 2020		2,054		2,054	1,423	406	99	1,928	-126
6 2021		2,054		2,054	1,423	0	99	1,522	-532
7 2022		2,054	5,444	7,498	1,423	0	99	1,522	-5,976
8 2023		2,054		2,054	1,423	0	99	1,522	-532
9 2024		2,054		2,054	1,423	0	99	1,522	-532
10 2025		2,054		2,054	1,423	0	99	1,522	-532
11 2026		2,054		2,054	1,423	0	99	1,522	-532
12 2027		2,054	7,162	9,216	1,423	0	99	1,522	-7,695
13 2028		2,054		2,054	1,423	0	99	1,522	-532
14 2029		2,054		2,054	1,423	0	99	1,522	-532
15 2030		2,054		2,054	1,423	0	99	1,522	-532
16 2031		2,054		2,054	1,423	0	99	1,522	-532
17 2032		2,054		2,054	1,423	0	99	1,522	-532
18 2033		2,054		2,054	1,423	0	99	1,522	-532
19 2034		2,054		2,054	1,423	0	99	1,522	-532
20 2035		2,054		2,054	1,423	0	99	1,522	-532
21 2036		2,054		2,054	1,423	0	99	1,522	-532
22 2037		2,054	5,444	7,498	1,423	0	99	1,522	-5,976
23 2038		2,054		2,054	1,423	0	99	1,522	-532
24 2039		2,054		2,054	1,423	0	99	1,522	-532
25 2040		2,054		2,054	1,423	0	99	1,522	-532
26 2041		2,054		2,054	1,423	0	99	1,522	-532
27 2042		2,054	7,162	9,216	1,423	0	99	1,522	-7,695
28 2043		2,054		2,054	1,423	0	99	1,522	-532
29 2044		2,054		2,054	1,423	0	99	1,522	-532
30 2045		2,054		2,054	1,423	0	99	1,522	-532

FIRR: --

NPV: -52,732 thousand US\$

B/C: 0.12

The reason why the proposed project is not financially viable is too small revenue as compared with the investment and O&M costs. Based on this result of financial expenditure and revenue, hence, the relation between water tariff and financial cost is delineated as shown in Figure 34-1 below. In this figure, the following assumptions are set forth as a premise. Namely, the charges to new connection installation and water meter rental are kept at the same level as the present rates. Their average rates were US\$105/unit for new connection and US\$2.56/unit/year as of May 2003.

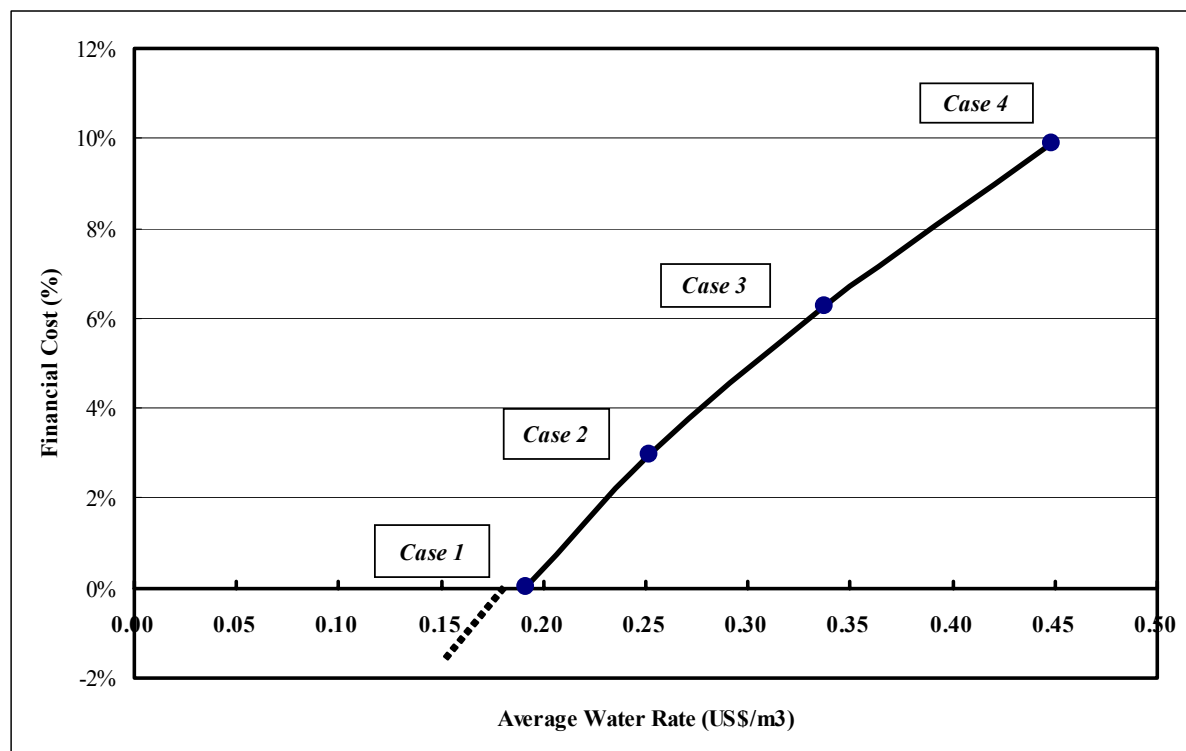


Figure 34-1 Relation between Average Water Rates and Financial Costs

According to the figure above, the following relations are analysed for making the proposed project viable from financial point of view. The cases are summarised in Table 34-2.

Table 34-2 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	0.19	3.8 times	Table 34-3
Case 2	3.0%	Chinaimo Expansion	0.25	5.0 times	Table 34-4
Case 3	6.3%	International Loan	0.34	6.8 times	Table 34-5
Case 4	9.9%	Private Bank Loan	0.45	9.0 times	Table 34-6

If the initial investment costs were granted completely, an average water cost could be around US\$0.19/m³ (equivalent to 2,010 kip/m³) or 3.8 times of the present average water rate, as shown in the table above. The annual flow of this case (names as Case 1) is enumerated in Table 34-3.

In case 2, if the financial cost was set up to lower interest case of 3.3%, the average water rate could be around US\$0.25/m³ (equivalent to 2,700 kip/m³) or 5.0 times of the present average water rate, as shown in the table above. The annual flow of this case is enumerated in Table 34-4.

In case 3, if the financial cost was set up to a standard public interest rate of 6.5% like loan from any international financial organizations such as World Bank or ADB, the average water rate could be around US\$0.34/m³ (equivalent to 3,640 kip/m³) or 6.8 times of the present average water rate, as shown in the table above. The annual flow of this case is enumerated in Table 34-5.

In case 4, if the financial cost was set up to an interest rate of 9.9% from a private bank which is applied in the NPVC, the average water rate could be around US\$0.45/m³ (equivalent to 4,820 kip/m³) or 9.0 times of the present average water rate, as shown in the table above. The annual flow of this case is enumerated in Table 34-6.

Table 34-3 Cost and Benefit Stream of Proposed Project
Case 1: Average Water Rate: US\$0.19/m³

(Unit: US\$1000)

Year	Cost				Benefit			Total	Balance	
	Construc- tion	O&M	Replace- ment	Total	Water Charge	Connec- tion	Meter Rental			
-11	2004	810			810	0	0	0	-810	
-10	2005	3,927			3,927	0	0	0	-3,927	
-9	2006	16,103			16,103	0	0	0	-16,103	
-8	2007	13,288	792		14,080	1,766	131	3	1,901	-12,179
-7	2008	1,430	828		2,258	2,099	139	7	2,244	-14
-6	2009	1,433	863		2,296	2,188	147	10	2,346	50
-5	2010	12,351	872		13,223	2,188	156	14	2,358	-10,865
-4	2011	28,916	887		29,803	2,188	132	17	2,338	-27,465
-3	2012	18,201	1,877		20,078	3,632	347	26	4,004	-16,074
-2	2013	688	1,902		2,590	4,020	363	34	4,417	1,827
-1	2014	699	1,977		2,676	4,449	380	44	4,873	2,197
0	2015	707	2,054		2,761	4,925	398	53	5,376	2,615
1	2016		2,054		2,054	5,309	348	62	5,719	3,665
2	2017		2,054		2,054	5,406	362	71	5,839	3,785
3	2018		2,054		2,054	5,406	376	80	5,862	3,808
4	2019		2,054		2,054	5,406	391	89	5,886	3,832
5	2020		2,054		2,054	5,406	406	99	5,912	3,858
6	2021		2,054		2,054	5,406	0	99	5,505	3,451
7	2022		2,054	5,444	7,498	5,406	0	99	5,505	-1,993
8	2023		2,054		2,054	5,406	0	99	5,505	3,451
9	2024		2,054		2,054	5,406	0	99	5,505	3,451
10	2025		2,054		2,054	5,406	0	99	5,505	3,451
11	2026		2,054		2,054	5,406	0	99	5,505	3,451
12	2027		2,054	7,162	9,216	5,406	0	99	5,505	-3,711
13	2028		2,054		2,054	5,406	0	99	5,505	3,451
14	2029		2,054		2,054	5,406	0	99	5,505	3,451
15	2030		2,054		2,054	5,406	0	99	5,505	3,451
16	2031		2,054		2,054	5,406	0	99	5,505	3,451
17	2032		2,054		2,054	5,406	0	99	5,505	3,451
18	2033		2,054		2,054	5,406	0	99	5,505	3,451
19	2034		2,054		2,054	5,406	0	99	5,505	3,451
20	2035		2,054		2,054	5,406	0	99	5,505	3,451
21	2036		2,054		2,054	5,406	0	99	5,505	3,451
22	2037		2,054	5,444	7,498	5,406	0	99	5,505	-1,993
23	2038		2,054		2,054	5,406	0	99	5,505	3,451
24	2039		2,054		2,054	5,406	0	99	5,505	3,451
25	2040		2,054		2,054	5,406	0	99	5,505	3,451
26	2041		2,054		2,054	5,406	0	99	5,505	3,451
27	2042		2,054	7,162	9,216	5,406	0	99	5,505	-3,711
28	2043		2,054		2,054	5,406	0	99	5,505	3,451
29	2044		2,054		2,054	5,406	0	99	5,505	3,451
30	2045		2,054		2,054	5,406	0	99	5,505	3,451

FIRR: 0.0%

NPV: -36,818 thousand US\$

B/C: 0.38

Table 34-4 Cost and Benefit Stream of Proposed Project
Case 2: Average Water Rate: US\$0.25/m³

(Unit: US\$1000)

Year	Cost				Benefit			Balance		
	Construc- tion	O&M	Replace- ment	Total	Water Charge	Connec- tion	Meter Rental		Total	
-11	2004	810		810	0	0	0	0	-810	
-10	2005	3,927		3,927	0	0	0	0	-3,927	
-9	2006	16,103		16,103	0	0	0	0	-16,103	
-8	2007	13,288	792	14,080	2,324	131	3	2,459	-11,621	
-7	2008	1,430	828	2,258	2,761	139	7	2,907	649	
-6	2009	1,433	863	2,296	2,879	147	10	3,037	741	
-5	2010	12,351	872	13,223	2,879	156	14	3,049	-10,174	
-4	2011	28,916	887	29,803	2,879	132	17	3,029	-26,774	
-3	2012	18,201	1,877	20,078	4,778	347	26	5,150	-14,928	
-2	2013	688	1,902	2,590	5,289	363	34	5,686	3,096	
-1	2014	699	1,977	2,676	5,854	380	44	6,278	3,602	
0	2015	707	2,054	2,761	6,480	398	53	6,931	4,170	
1	2016		2,054	2,054	6,985	348	62	7,395	5,341	
2	2017		2,054	2,054	7,113	362	71	7,546	5,492	
3	2018		2,054	2,054	7,113	376	80	7,569	5,515	
4	2019		2,054	2,054	7,113	391	89	7,593	5,539	
5	2020		2,054	2,054	7,113	406	99	7,619	5,565	
6	2021		2,054	2,054	7,113	0	99	7,212	5,158	
7	2022		2,054	5,444	7,498	7,113	0	99	7,212	-286
8	2023		2,054	2,054	7,113	0	99	7,212	5,158	
9	2024		2,054	2,054	7,113	0	99	7,212	5,158	
10	2025		2,054	2,054	7,113	0	99	7,212	5,158	
11	2026		2,054	2,054	7,113	0	99	7,212	5,158	
12	2027		2,054	7,162	9,216	7,113	0	99	7,212	-2,004
13	2028		2,054	2,054	7,113	0	99	7,212	5,158	
14	2029		2,054	2,054	7,113	0	99	7,212	5,158	
15	2030		2,054	2,054	7,113	0	99	7,212	5,158	
16	2031		2,054	2,054	7,113	0	99	7,212	5,158	
17	2032		2,054	2,054	7,113	0	99	7,212	5,158	
18	2033		2,054	2,054	7,113	0	99	7,212	5,158	
19	2034		2,054	2,054	7,113	0	99	7,212	5,158	
20	2035		2,054	2,054	7,113	0	99	7,212	5,158	
21	2036		2,054	2,054	7,113	0	99	7,212	5,158	
22	2037		2,054	5,444	7,498	7,113	0	99	7,212	-286
23	2038		2,054	2,054	7,113	0	99	7,212	5,158	
24	2039		2,054	2,054	7,113	0	99	7,212	5,158	
25	2040		2,054	2,054	7,113	0	99	7,212	5,158	
26	2041		2,054	2,054	7,113	0	99	7,212	5,158	
27	2042		2,054	7,162	9,216	7,113	0	99	7,212	-2,004
28	2043		2,054	2,054	7,113	0	99	7,212	5,158	
29	2044		2,054	2,054	7,113	0	99	7,212	5,158	
30	2045		2,054	2,054	7,113	0	99	7,212	5,158	

FIRR: 3.0%

NPV: -29,997 thousand US\$

B/C: 0.50

Table 34-5 Cost and Benefit Stream of Proposed Project
Case 3: Average Water Rate: US\$0.34/m³

(Unit: US\$1000)

Year	Cost				Benefit			Balance		
	Construc- tion	O&M	Replace- ment	Total	Water Charge	Connec- tion	Meter Rental		Total	
-11	2004	810		810	0	0	0	0	-810	
-10	2005	3,927		3,927	0	0	0	0	-3,927	
-9	2006	16,103		16,103	0	0	0	0	-16,103	
-8	2007	13,288	792	14,080	3,114	131	3	3,249	-10,831	
-7	2008	1,430	828	2,258	3,700	139	7	3,846	1,588	
-6	2009	1,433	863	2,296	3,858	147	10	4,015	1,720	
-5	2010	12,351	872	13,223	3,858	156	14	4,028	-9,195	
-4	2011	28,916	887	29,803	3,858	132	17	4,007	-25,795	
-3	2012	18,201	1,877	20,078	6,403	347	26	6,775	-13,303	
-2	2013	688	1,902	2,590	7,087	363	34	7,485	4,895	
-1	2014	699	1,977	2,676	7,845	380	44	8,268	5,592	
0	2015	707	2,054	2,761	8,683	398	53	9,134	6,373	
1	2016		2,054	2,054	9,360	348	62	9,770	7,716	
2	2017		2,054	2,054	9,532	362	71	9,964	7,910	
3	2018		2,054	2,054	9,532	376	80	9,988	7,934	
4	2019		2,054	2,054	9,532	391	89	10,012	7,958	
5	2020		2,054	2,054	9,532	406	99	10,037	7,983	
6	2021		2,054	2,054	9,532	0	99	9,631	7,577	
7	2022		2,054	5,444	7,498	9,532	0	99	9,631	2,133
8	2023		2,054	2,054	9,532	0	99	9,631	7,577	
9	2024		2,054	2,054	9,532	0	99	9,631	7,577	
10	2025		2,054	2,054	9,532	0	99	9,631	7,577	
11	2026		2,054	2,054	9,532	0	99	9,631	7,577	
12	2027		2,054	7,162	9,216	9,532	0	99	9,631	415
13	2028		2,054	2,054	9,532	0	99	9,631	7,577	
14	2029		2,054	2,054	9,532	0	99	9,631	7,577	
15	2030		2,054	2,054	9,532	0	99	9,631	7,577	
16	2031		2,054	2,054	9,532	0	99	9,631	7,577	
17	2032		2,054	2,054	9,532	0	99	9,631	7,577	
18	2033		2,054	2,054	9,532	0	99	9,631	7,577	
19	2034		2,054	2,054	9,532	0	99	9,631	7,577	
20	2035		2,054	2,054	9,532	0	99	9,631	7,577	
21	2036		2,054	2,054	9,532	0	99	9,631	7,577	
22	2037		2,054	5,444	7,498	9,532	0	99	9,631	2,133
23	2038		2,054	2,054	9,532	0	99	9,631	7,577	
24	2039		2,054	2,054	9,532	0	99	9,631	7,577	
25	2040		2,054	2,054	9,532	0	99	9,631	7,577	
26	2041		2,054	2,054	9,532	0	99	9,631	7,577	
27	2042		2,054	7,162	9,216	9,532	0	99	9,631	415
28	2043		2,054	2,054	9,532	0	99	9,631	7,577	
29	2044		2,054	2,054	9,532	0	99	9,631	7,577	
30	2045		2,054	2,054	9,532	0	99	9,631	7,577	

FIRR: 6.3%

NPV: -20,335 thousand US\$

B/C: 0.66

Table 34-6 Cost and Benefit Stream of Proposed Project
Case 4: Average Water Rate: US\$0.45/m³

(Unit: US\$1000)

Year	Cost				Benefit			Balance	
	Construc- tion	O&M	Replace- ment	Total	Water Charge	Connec- tion	Meter Rental		Total
-11	2004	810		810	0	0	0	0	-810
-10	2005	3,927		3,927	0	0	0	0	-3,927
-9	2006	16,103		16,103	0	0	0	0	-16,103
-8	2007	13,288	792	14,080	4,137	131	3	4,271	-9,808
-7	2008	1,430	828	2,258	4,915	139	7	5,061	2,803
-6	2009	1,433	863	2,296	5,125	147	10	5,282	2,986
-5	2010	12,351	872	13,223	5,125	156	14	5,295	-7,928
-4	2011	28,916	887	29,803	5,125	132	17	5,274	-24,529
-3	2012	18,201	1,877	20,078	8,506	347	26	8,878	-11,200
-2	2013	688	1,902	2,590	9,414	363	34	9,812	7,222
-1	2014	699	1,977	2,676	10,421	380	44	10,844	8,168
0	2015	707	2,054	2,761	11,534	398	53	11,986	9,225
1	2016		2,054	2,054	12,434	348	62	12,843	10,789
2	2017		2,054	2,054	12,662	362	71	13,094	11,040
3	2018		2,054	2,054	12,662	376	80	13,118	11,064
4	2019		2,054	2,054	12,662	391	89	13,142	11,088
5	2020		2,054	2,054	12,662	406	99	13,167	11,113
6	2021		2,054	2,054	12,662	0	99	12,761	10,707
7	2022		2,054	5,444	7,498	0	99	12,761	5,263
8	2023		2,054	2,054	12,662	0	99	12,761	10,707
9	2024		2,054	2,054	12,662	0	99	12,761	10,707
10	2025		2,054	2,054	12,662	0	99	12,761	10,707
11	2026		2,054	2,054	12,662	0	99	12,761	10,707
12	2027		2,054	7,162	9,216	0	99	12,761	3,545
13	2028		2,054	2,054	12,662	0	99	12,761	10,707
14	2029		2,054	2,054	12,662	0	99	12,761	10,707
15	2030		2,054	2,054	12,662	0	99	12,761	10,707
16	2031		2,054	2,054	12,662	0	99	12,761	10,707
17	2032		2,054	2,054	12,662	0	99	12,761	10,707
18	2033		2,054	2,054	12,662	0	99	12,761	10,707
19	2034		2,054	2,054	12,662	0	99	12,761	10,707
20	2035		2,054	2,054	12,662	0	99	12,761	10,707
21	2036		2,054	2,054	12,662	0	99	12,761	10,707
22	2037		2,054	5,444	7,498	0	99	12,761	5,263
23	2038		2,054	2,054	12,662	0	99	12,761	10,707
24	2039		2,054	2,054	12,662	0	99	12,761	10,707
25	2040		2,054	2,054	12,662	0	99	12,761	10,707
26	2041		2,054	2,054	12,662	0	99	12,761	10,707
27	2042		2,054	7,162	9,216	0	99	12,761	3,545
28	2043		2,054	2,054	12,662	0	99	12,761	10,707
29	2044		2,054	2,054	12,662	0	99	12,761	10,707
30	2045		2,054	2,054	12,662	0	99	12,761	10,707

FIRR: 9.9%

NPV: -7,831 thousand US\$

B/C: 0.87

3.5 Issues of Affordable Water for Domestic Consumers

According to LECS2, a household expenditure in urban areas of Vientiane Capital City was estimated at 284,600 kip/month on average in the survey year 1997/98. An expense for water was 2,860 kip/month on average, accounting for 1.0%. In 2003, the total household expenditure was converted to 1,679,000 kip/month, applying the inflation rate of 5.9 calculated through price indices between 166 of March 1998 and 980 of February 2003 as shown in Table 24-20. In the same manner, expense for water was converted to 16,900 kip/month, also accounting for 1.0% of the total expenditure.

In the household survey conducted by the JICA study team in March 2003, an average expenditure for public water supply was estimated at around 26,000 kip/month on average. In the same survey, a family income was estimated at 1,600,000 kip/month on average. Then, the water expense accounted for 1.6% of the family income. Around 70% of the interviewees answered that the current amount of water charge was fair. Around 20% responded the water charge was expensive. On the other hand, around 10% answered that was cheap.

Willingness-to-pay for water charge was questioned to interviewees who do not consume the piped water supply system in the said survey. The willingness-to-pay was estimated at around 14,000 kip/month on average. Their family income was estimated at 1,000,000 kip/month on average. Then, the willingness-to-pay accounted for 1.4% of the average family income.

Accordingly, the water charge of water supply system in Vientiane Capital City is said to range from 1.0% to 1.6% of the total household income, referring to the discussion above. Thus, the people in these areas would be satisfied with the water charge ranging between around 1.5% of the household income. Supposing that an average family income was 1,600,000 kip/month in 2003, the water charge of 24,000 kip/month would satisfy the family.

In Prime Ministerial Decision (37/PM), a domestic water charge for low-income people should be set up to not more than 3% of household income. In case that a water supply company sets up a higher water rate in its service areas, the charge of domestic water should be not more than 5% of household income taking into consideration of internal subsidisation among categories in the areas. It must be effective for water resources conservation.

It should be remembered that the World Bank report of "Investing in Development, 1985" insisted that the price of the minimum block of water is commonly set at 3 to 5 percent of household income, which experience suggests is affordable. This insistence is still persistent among the agencies concerned. Once this ratio was applied to the people in urban areas in Vientiane Capital City, the affordability of water could be estimated at 48,000 to 80,000 kip/month for their average monthly income of 1,600,000 kip.

As discussed in the previous section, the water cost of the project proposed was estimated at a range of US\$0.19/m³ (equivalent to 2,010 kip/m³) for Case 1 and US\$0.45/m³ (4,820 kip/m³) for Case 4, as shown in Table 34-2. If these water costs applied simply to water charge for the family in service areas of the NPVC, their water charge would be calculated as shown in Table 35-1.

Table 35-1 Affordability of Water Charge Corresponding to Case 1 to 4 of Financial Cost

Case	Water Unit Cost		Water Charge (Kip/month)	Percentage of Water Charge to Income (%)	Affordability*1
	(US\$/m ³)	(Kip/m ³)			
Case 1	0.19	2,010	64,000	4.0	○
Case 2	0.25	2,680	86,000	5.4	
Case 3	0.34	3,640	117,000	7.3	
Case 4	0.45	4,820	154,900	9.7	×

Note: *1 Signs mean: ○ - fair, – hard, and × - impossible

A percentage of water charge in Case 1 was 4.0% which is within the affordable block of 3% to 5%, so it would be considered as Case 1 is fair for the people. In Case 2, however, the percentage was 5.4% which is over the block, so it would not be affordable unless the water tariff for domestic users is arranged for them to accept taking their affordability into account. In Case 3, it would be much more difficult than that of Case 2, because of the high percentage of 7.3%. In Case 4, it might be almost impossible to apply the water cost simply to the water consumers in the service areas of the NPVC. The water tariff system for the new project proposed would be discussed in the feasibility study stage in more precise analysis.

Incidentally, the water tariff of the NPVC has revised six times since 1994, as shown in the table below. In January 1994, an average water rate was revised at 74 kip/m³. As of 2003, the average water rate was 550 kip/m³ or around 7.4 times more than that in 1994, as discussed in “Present Management Conditions of NPVC”.

Table 35-2 Transition of Water Tariff Revision: 1994-2003

Effective Period: From	Through	Average Unit Rate
January 1994	April 1995	92 kip/m ³
May 1995	June 1996	135 kip/m ³
July 1996	May 1998	162 kip/m ³
June 1998	May 2001	195 kip/m ³
April 2001	October 2002	387 kip/m ³
November 2002	Present	550 kip/m ³

On the other hand, consumer price index in January 1994 was 72 (base: 1995=100) and rose up to 980 in February 2003. Then, an inflation rate during the period was around 13.3 times. The inflation rate of

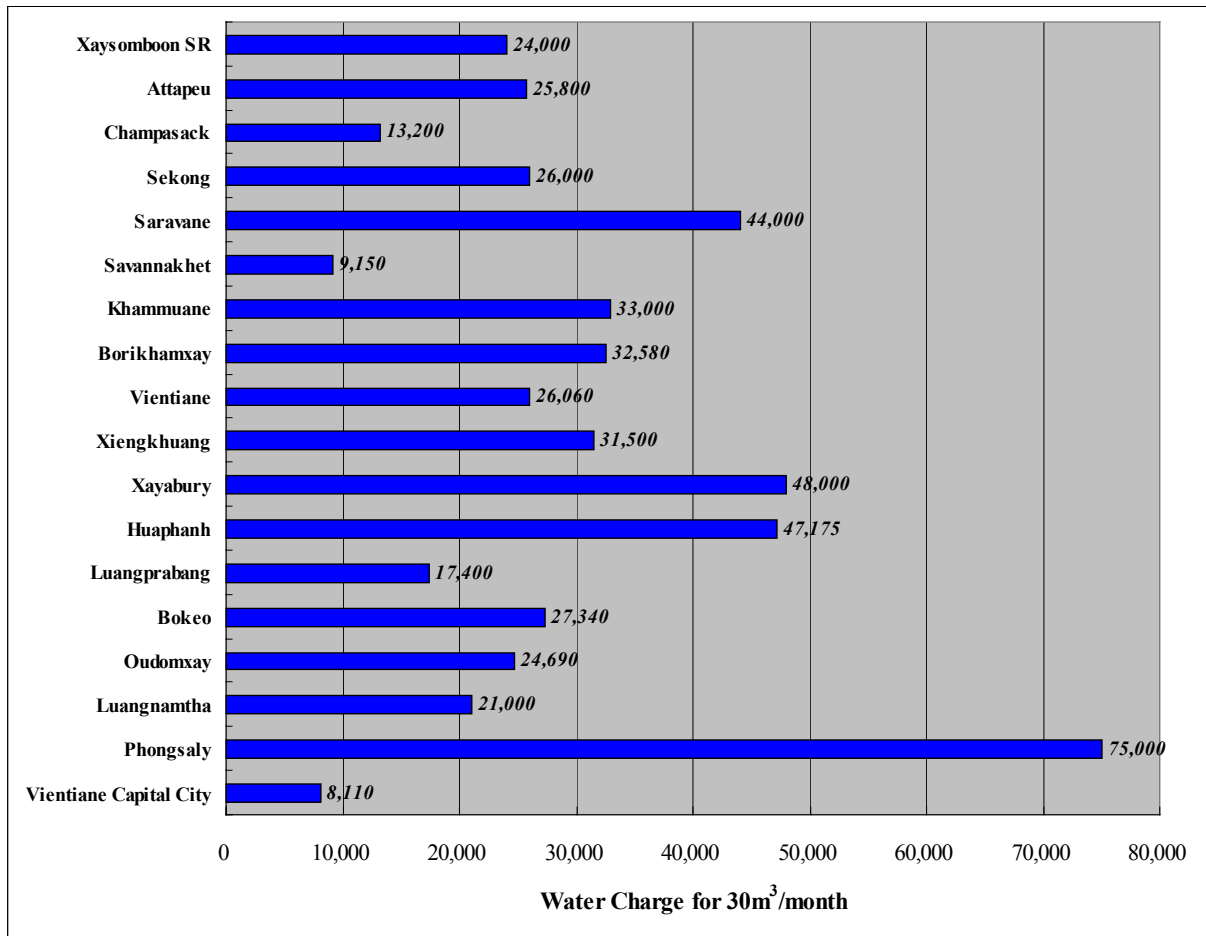
13.3 times was higher than the revision of the average water rate of 7.4 times. The water rate is undesirably behind the inflation speed. The water consumers have felt happy about water comparatively declining in price. They have enjoyed their lives with the low-priced water.

Furthermore, the water rate for domestic water consumer is known to be cheaper than those of other provinces. Figure 35-1 shows water charges for an average household consuming 30 m³/month in the respective provinces. The monthly charge in Vientiane Capital City was calculated at 8,110 kip/month only, which is the lowest among 18 provinces, as shown in the figure. An average water charge of 18 provinces was calculated at 29,700 kip/month. That of Vientiane Capital City accounted for only 27% of the national average.

Yet, in order that the people in the service areas receive the new project, they have to accept a rise of price increase in the future. According to the household survey, around 70% of the interviewees answered that the current amount of water charge was fair. Furthermore, if the NPVC improves the service level such as water quality and elimination of water supply stoppage, they would accept the increase of water charge. Their affordability-to-pay is considered to be higher than the present water charge level, so the price increase of water rate could be negotiable for them. Thus, the NPVC has to manage a campaign to educate the water consumers on the need for rational water costs and to set up a reasonable water tariff through a consultation with them.

It is said that the installation charges are heavy burden for a new connection of water supply services. As shown in Table 32-2, a new water consumer has to pay for US\$105 for connection installations on average at the time of application, although an installation charge for a domestic consumer is smaller than the average cost. In particular, the connection charge seems to be serious for the new connection of low-income earner. Thus, it would be recommendable that a system of lending and/or subsidizing to new connection fee is established with some regulations such as loan program in accordance with household income. The system could make lower-income families accessible to the water supply system more easily than the present.

Figure 35-1 Water Charge of Household's Monthly Consumption of 30m³ as of May 2003



4. Financial Simulation

4.1 Financial Plan

In financial simulation analysis, the revenues from the water supply services and the expenditures for operation and maintenance as well as capital investment are estimated on the basis of the proposed water supply system. Besides these data, the following conditions and assumptions are set-up for the financial simulation.

- 1) Projection period: 17 years, from 2004 as the start year of consulting services and then construction works of the proposed project through 2020.
- 2) Prices and cost escalation: Projections of both revenues and expenditures were made without escalation to simplify and to make the simulation clearly understandable.
- 3) Currency and exchange rate: Capital costs, revenues and expenditures are evaluated in US dollar. 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 Implementation: Finances for the financial plans are set as shown in Table 41-1.

Table 41-1 Finances of Financial Plan 1 and 2

Financial Source	Amount (US\$ Million)	
	Financial Plan 1	Financial Plan 2
1. Loan ^{*1} (International Agency)	45	0
2. Loan ^{*2} (International Agency)	0	85
3. Grant (Foreign Country)	50	0
4. Local Government (Capital Infusion)	3	13
Average Financial Cost	3%/annum	3%/annum

Note: *1 Terms of loan by international agency are as follows: 6.5% of annual interest rate, and 20 years of repayment period with 5 years of grace period.
 *2 Terms of loan by international agency are as follows: 3.5% of annual interest rate, and 20 years of repayment period with 5 years of grace period.
 *3 Financial shortage during the simulation period is assumed to be financed by the government as done for the present waterworks so far.

- 5) Taxes: Profit tax or Minimum tax will be levied. In addition, Turnover tax is levied just after inauguration.
- 6) Water tariff structure: The present water tariff is constituted of two parts in this study: water charges by type of water consumer, i.e., Category 1 or domestic consumers such as residential users and Category 2 to 5 or non-domestic consumers. In addition, installation charge for new consumers and meter rental for every consumer are charged to consumers connected to water supply system. The water tariff is set-up as shown in Table 41-2 and 41-3:

Table 41-2 Water Tariff of Water Supply Services

	Average Water Rate		US\$0.25/m ³
(i)	Category 1	Domestic Use	US\$0.18/m ³ *1
(ii)	Category 2 to 5	Non-domestic Use	US\$0.36/m ³ *1

Note: *1 In case that the present structure is applied.

Table 41-3 Installation Charges of Water Supply Services

(i)	Installation Charge	Average rate of all categories	US\$105/Unit
(ii)	Meter Rental Charge	Average rate of all categories	US\$2.56/Unit/year

7) Water sales: The total amount of water sales is estimated as a product of water consumption volume and unit charge by type of consumers.

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. Regarding administration charges and deficits at the beginning stage of the water supply works, these expenses and losses are assumed to be filled by the government short-term support with no interest, as done in the NPVC at present. In addition to these revenues, the entity could get other earnings from interests on short-term deposits, if it gains a net profit through its management. Interest rate is set as 1.1%/annum on average, which is a quarter of a daily saving deposit rate because of not-constant saving deposit.

9) Depreciation: Fixed assets such as water supply plant and distribution piping network are depreciated using straight-line method over 30 years after they are inaugurated in service. The engineering services are depreciated also using straight-line method in 30 years, because it is regarded as a part of construction. Some machinery such as pumps and power generator are depreciated also using straight-line depreciation in 15 years.

10) Assumptions about accounting and tax: Grants from foreign countries are internalized as a part of equity of the waterworks entity. The facilities established on the basis of the grants are treated as depreciable assets in the accounting system without reduction entry of these facilities.

Tables 41-4 to 41-6 show the results of the financial simulation with regard to the financial plan 1. Tables 41-7 to 41-9 show the results of the financial plan 2. These simulations are based on the given conditions and assumptions mentioned above.

Table 41-4 Profit and Loss Table of Financial Plan 1: 2005-2020

(Unit: US\$1000)

Item	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
I. Operating Revenue	0	0	0	3,618	4,214	4,427	4,503	4,379	8,016	8,785	9,627	10,549	10,909	11,200	11,341	11,488	11,641
1. Water Sales	-	-	-	2,440	2,900	3,023	3,023	3,023	5,017	5,553	6,147	6,804	7,334	7,469	7,469	7,469	7,469
(1) Domestic	-	-	-	1,030	1,242	1,313	1,313	1,313	2,192	2,415	2,661	2,933	3,132	3,159	3,159	3,159	3,159
(2) Non-domestic	-	-	-	1,410	1,658	1,710	1,710	1,710	2,826	3,138	3,486	3,871	4,203	4,310	4,310	4,310	4,310
2. New Connection	-	-	-	689	730	774	820	695	1,819	1,905	1,995	2,089	1,828	1,900	1,975	2,053	2,134
3. Meter Rental	-	-	-	17	34	53	73	90	134	181	229	280	324	370	418	468	520
4. Other Incomes	-	-	-	472	550	577	587	571	1,046	1,146	1,256	1,376	1,423	1,461	1,479	1,498	1,518
II. Operating Costs	0	0	0	2,564	2,629	2,674	2,686	2,695	6,342	6,403	6,543	6,999	7,061	6,489	6,495	6,502	6,510
1. Compensation	-	-	-	21	22	23	24	25	82	85	87	90	90	90	90	90	90
2. Electricity	-	-	-	437	455	472	469	469	888	870	904	939	939	939	939	939	939
3. Chemicals	-	-	-	99	104	108	107	107	160	168	174	181	181	181	181	181	181
5. Depreciation	-	-	-	1,600	1,600	1,600	1,600	1,600	4,083	4,083	4,108	4,133	4,156	3,552	3,552	3,552	3,552
6. Administration	-	-	-	81	86	91	96	101	264	276	289	611	632	650	650	650	650
7. Miscellaneous	-	-	-	154	162	169	177	185	483	503	523	543	543	543	543	543	543
8. Turnover Tax	-	-	-	172	201	211	214	209	382	418	458	502	519	533	540	547	554
9. Bad Debt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
III. Net Operating Income	0	0	0	1,055	1,585	1,754	1,817	1,684	1,675	2,382	3,083	3,550	3,848	4,711	4,846	4,986	5,132
IV. Non-operating Revenue & Costs	0	-20	-134	-623	-1,011	-1,037	-1,062	-1,417	-2,278	-2,742	-2,656	-2,565	-2,470	-2,366	-2,152	-1,937	-1,719
1. Non-operating Revenues	0	4	9	8	23	40	58	78	95	115	131	154	180	215	233	254	276
(1) Non-operating Revenue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(2) Interest Receives	0	4	9	8	23	40	58	78	95	115	131	154	180	215	233	254	276
2. Interest Charges	0	24	143	631	1,034	1,077	1,120	1,495	2,373	2,856	2,787	2,718	2,649	2,580	2,385	2,190	1,995
V. Net Income before Tax	0	-20	-134	432	574	717	755	267	-603	-360	427	985	1,379	2,346	2,694	3,049	3,413
VI. Profit Tax	0	0	0	151	201	251	264	93	80	88	149	345	482	821	943	1,067	1,194
VII. Net Income after Tax	0	-20	-134	281	373	466	491	173	-683	-448	277	640	896	1,525	1,751	1,982	2,218

Table 41-5 Cash Flow Plan of Financial Plan 1: 2005-2020

	(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	-	-	-	1,055	1,585	1,754	1,817	1,684	1,675	2,382	3,083	3,550	3,848	4,711	4,846	4,986	5,132
2. Depreciation	-	-	-	1,600	1,600	1,600	1,600	1,600	4,083	4,083	4,108	4,133	4,156	3,552	3,552	3,552	3,552
3. (Less) Account Receivable*1	-	-	-	305	362	378	378	378	627	694	768	851	917	934	934	934	934
(Writeback) Account Recievable					305	362	378	378	378	627	694	768	851	917	934	934	934
Gross Internal Cash Position	-	-	-	2,349	3,128	3,338	3,417	3,284	5,508	6,398	7,117	7,600	7,938	8,247	8,398	8,538	8,684
1. Capital Infusion	523	586	332	275	34	34	255	590	371	-	-	-	-	-	-	-	-
2. Grant	411	2,030	8,349	6,889	735	738	6,404	15,001	9,442	-	-	-	-	-	-	-	-
3. Foreign Loan	370	1,827	7,514	6,200	662	664	5,764	13,501	8,498	-	-	-	-	-	-	-	-
4. Loan - Local Banks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5. Interest Receivable	-	4	9	8	23	40	58	78	95	115	131	154	180	215	233	254	276
Total Sources	1,305	4,447	16,204	15,722	4,582	4,814	15,898	32,454	23,915	6,512	7,248	7,754	8,118	8,461	8,631	8,792	8,960
II. Disbursement																	
1. Debt Services	0	24	143	631	1,034	1,077	1,120	1,495	3,433	3,917	3,848	3,779	3,710	5,580	5,385	5,190	4,995
(1) Principal Repayment	0	0	0	0	0	0	0	0	1,061	1,061	1,061	1,061	1,061	3,000	3,000	3,000	3,000
(2) Interest Charges	0	24	143	631	1,034	1,077	1,120	1,495	2,373	2,856	2,787	2,718	2,649	2,580	2,385	2,190	1,995
2. Investment	810	3,927	16,103	13,288	1,430	1,433	12,351	28,916	18,201	688	699	707	0	0	0	0	0
(1) New Construction	810	3,927	16,103	13,288	1,430	1,433	12,351	28,916	18,201	688	699	707	-	-	-	-	-
(2) Repairing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Inventory Stock*2	-	-	-	30	31	32	32	32	48	50	52	54	54	54	54	54	54
(Writeback) Inventory Stock					30	31	32	32	48	50	52	54	54	54	54	54	54
4. Profit Tax	0	0	0	151	201	251	264	93	80	88	149	345	482	821	943	1,067	1,194
Total of Disbursement	810	3,951	16,246	14,100	2,667	2,762	13,735	30,504	21,730	4,695	4,698	4,833	4,192	6,401	6,328	6,258	6,190
Net Cash Flow	495	496	-41	1,622	1,915	2,052	2,162	1,949	2,185	1,817	2,550	2,921	3,925	2,060	2,303	2,534	2,770
Opening Cash Balance	0	495	991	949	2,571	4,486	6,538	8,700	10,649	12,834	14,651	17,201	20,122	24,047	26,107	28,410	30,945
Accumulated Cash Position	495	991	949	2,571	4,486	6,538	8,700	10,649	12,834	14,651	17,201	20,122	24,047	26,107	28,410	30,945	33,715

Table 41-6 Balance Sheet of Financial Plan 1: 2005-2020

	(Unit: US\$1000)																
Item	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
I. Assets	1,305	5,728	21,789	35,434	37,238	39,140	52,053	81,318	97,886	96,377	95,594	95,174	95,009	93,534	92,285	91,267	90,485
1. Fixed Assets	810	4,737	20,840	32,528	32,358	32,191	42,942	70,259	84,377	80,982	77,573	74,147	69,991	66,439	62,886	59,334	55,782
(1) Fixed Assets	-	-	-	34,128	34,128	34,128	34,128	34,128	96,459	97,147	97,846	98,553	98,553	98,553	98,553	98,553	98,553
(2) Accumulated Depreciation	0	0	0	1,600	3,200	4,800	6,400	7,999	12,082	16,165	20,273	24,406	28,562	32,114	35,667	39,219	42,771
(3) Works in Progress	810	4,737	20,840	-	1,430	2,863	15,214	44,130	-	-	-	-	-	-	-	-	-
2. Current Assets	495	991	949	2,906	4,880	6,948	9,110	11,059	13,509	15,396	18,021	21,026	25,018	27,095	29,398	31,933	34,703
(1) Cash	100	149	142	386	673	981	1,305	1,597	1,925	2,198	2,580	3,018	3,607	3,916	4,262	4,642	5,057
(2) Bank Deposit	395	842	807	2,186	3,813	5,557	7,395	9,052	10,909	12,453	14,621	17,103	20,440	22,191	24,149	26,303	28,658
(3) Account Receivable	-	-	-	305	362	378	378	378	627	694	768	851	917	934	934	934	934
(4) Inventory Stock	-	-	-	30	31	32	32	32	48	50	52	54	54	54	54	54	54
(6) Prepayment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
II. Equity and Liabilities	1,305	5,728	21,789	35,434	37,238	39,140	52,053	81,318	97,886	96,377	95,594	95,174	95,009	93,534	92,285	91,267	90,485
1. Short-term Liabilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1) Account Payable	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(2) Advanced Receipt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Long-term Liabilities	370	2,197	9,711	15,912	16,573	17,237	23,001	36,502	43,939	42,878	41,818	40,757	39,696	36,696	33,696	30,696	27,696
(1) Foreign Loan	370	2,197	9,711	15,912	16,573	17,237	23,001	36,502	43,939	42,878	41,818	40,757	39,696	36,696	33,696	30,696	27,696
(3) Local Loan - Banks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(4) Creditors	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(5) Interest Payable	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Equity	935	3,531	12,078	19,522	20,665	21,902	29,052	44,816	53,947	53,499	53,776	54,417	55,313	56,838	58,588	60,571	62,789
(1) Enterprise Capital	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(2) Government Capital	523	1,109	1,442	1,716	1,751	1,784	2,039	2,629	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
(3) Grants	411	2,441	10,790	17,680	18,415	19,153	25,557	40,558	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
(4) Profit/Loss for the Year	0	-20	-154	127	500	966	1,456	1,630	947	499	776	1,417	2,313	3,838	5,588	7,571	9,789

Table 41-7 Profit and Loss Table of Financial Plan 2: 2005-2020

(Unit: US\$1000)																	
Item	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
I. Operating Revenue	0	0	0	3,618	4,214	4,427	4,503	4,379	8,016	8,785	9,627	10,549	10,909	11,200	11,341	11,488	11,641
1. Water Sales	-	-	-	2,440	2,900	3,023	3,023	3,023	5,017	5,553	6,147	6,804	7,334	7,469	7,469	7,469	7,469
(1) Domestic	-	-	-	1,030	1,242	1,313	1,313	1,313	2,192	2,415	2,661	2,933	3,132	3,159	3,159	3,159	3,159
(2) Non-domestic	-	-	-	1,410	1,658	1,710	1,710	1,710	2,826	3,138	3,486	3,871	4,203	4,310	4,310	4,310	4,310
2. New Connection	-	-	-	689	730	774	820	695	1,819	1,905	1,995	2,089	1,828	1,900	1,975	2,053	2,134
3. Meter Rental	-	-	-	17	34	53	73	90	134	181	229	280	324	370	418	468	520
4. Other Incomes	-	-	-	472	550	577	587	571	1,046	1,146	1,256	1,376	1,423	1,461	1,479	1,498	1,518
II. Operating Costs	0	0	0	2,564	2,629	2,674	2,686	2,695	6,342	6,403	6,543	6,999	7,061	6,489	6,495	6,502	6,510
1. Compensation	-	-	-	21	22	23	24	25	82	85	87	90	90	90	90	90	90
2. Electricity	-	-	-	437	455	472	469	469	888	870	904	939	939	939	939	939	939
3. Chemicals	-	-	-	99	104	108	107	107	160	168	174	181	181	181	181	181	181
5. Depreciation	-	-	-	1,600	1,600	1,600	1,600	1,600	4,083	4,083	4,108	4,133	4,156	3,552	3,552	3,552	3,552
6. Administration	-	-	-	81	86	91	96	101	264	276	289	611	632	650	650	650	650
7. Miscellaneous	-	-	-	154	162	169	177	185	483	503	523	543	543	543	543	543	543
8. Turnover Tax	-	-	-	172	201	211	214	209	382	418	458	502	519	533	540	547	554
9. Bad Debt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
III. Net Operating Income	0	0	0	1,055	1,585	1,754	1,817	1,684	1,675	2,382	3,083	3,550	3,848	4,711	4,846	4,986	5,132
IV. Non-operating Revenue & Costs	0	-11	-119	-619	-1,017	-1,044	-1,069	-1,434	-2,315	-2,812	-2,748	-2,677	-2,603	-2,520	-2,365	-2,208	-2,049
1. Non-operating Revenues	0	13	26	23	35	52	70	87	99	110	122	140	162	192	198	207	216
(1) Non-operating Revenue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(2) Interest Receives	0	13	26	23	35	52	70	87	99	110	122	140	162	192	198	207	216
2. Interest Charges	0	24	145	642	1,052	1,096	1,140	1,521	2,413	2,922	2,870	2,817	2,765	2,712	2,563	2,415	2,266
V. Net Income before Tax	0	-11	-119	436	568	710	747	250	-640	-430	335	873	1,245	2,191	2,481	2,778	3,082
VI. Profit Tax	0	0	0	152	199	249	262	88	80	88	117	306	436	767	868	972	1,079
VII. Net Income after Tax	0	-11	-119	283	369	462	486	163	-720	-518	218	567	809	1,424	1,613	1,806	2,004

Table 41-8 Cash Flow Plan of Financial Plan 2: 2005-2020

	(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	-	-	-	1,055	1,585	1,754	1,817	1,684	1,675	2,382	3,083	3,550	3,848	4,711	4,846	4,986	5,132
2. Depreciation	-	-	-	1,600	1,600	1,600	1,600	1,600	4,083	4,083	4,108	4,133	4,156	3,552	3,552	3,552	3,552
3. (Less) Account Receivable*1	-	-	-	305	362	378	378	378	627	694	768	851	917	934	934	934	934
(Writeback) Account Receivable	-	-	-	-	305	362	378	378	378	627	694	768	851	917	934	934	934
Gross Internal Cash Position	-	-	-	2,349	3,128	3,338	3,417	3,284	5,508	6,398	7,117	7,600	7,938	8,247	8,398	8,538	8,684
1. Capital Infusion	1,617	1,929	1,662	1,373	172	168	1,273	2,949	1,857	-	-	-	-	-	-	-	-
2. Grant	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-
3. Foreign Loan	699	3,451	14,193	11,712	1,250	1,254	10,887	25,502	16,052	-	-	-	-	-	-	-	-
4. Loan - Local Banks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5. Interest Receivable	-	13	26	23	35	52	70	87	99	110	122	140	162	192	198	207	216
Total Sources	2,316	5,394	15,881	15,457	4,585	4,813	15,647	31,822	23,516	6,508	7,239	7,741	8,100	8,439	8,597	8,745	8,900
II. Disbursement																	
1. Debt Services	0	24	145	642	1,052	1,096	1,140	1,521	3,916	4,425	4,373	4,320	4,267	6,962	6,813	6,665	6,516
(1) Principal Repayment	0	0	0	0	0	0	0	0	1,503	1,503	1,503	1,503	1,503	4,250	4,250	4,250	4,250
(2) Interest Charges	0	24	145	642	1,052	1,096	1,140	1,521	2,413	2,922	2,870	2,817	2,765	2,712	2,563	2,415	2,266
2. Investment	810	3,927	16,103	13,288	1,430	1,433	12,351	28,916	18,201	688	699	707	0	0	0	0	0
(1) New Construction	810	3,927	16,103	13,288	1,430	1,433	12,351	28,916	18,201	688	699	707	-	-	-	-	-
(2) Repairing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Inventory Stock*2	-	-	-	30	31	32	32	32	48	50	52	54	54	54	54	54	54
(Writeback) Inventory Stock	-	-	-	-	30	31	32	32	32	48	50	52	54	54	54	54	54
4. Profit Tax	0	0	0	152	199	249	262	88	80	88	117	306	436	767	868	972	1,079
Total of Disbursement	810	3,951	16,248	14,112	2,682	2,778	13,752	30,524	22,213	5,203	5,191	5,335	4,703	7,729	7,682	7,637	7,595
Net Cash Flow	1,506	1,442	-367	1,345	1,902	2,034	1,895	1,298	1,303	1,304	2,048	2,406	3,397	710	915	1,108	1,306
Opening Cash Balance	0	1,506	2,948	2,581	3,926	5,828	7,863	9,757	11,055	12,358	13,663	15,711	18,117	21,514	22,223	23,138	24,246
Accumulated Cash Position	1,506	2,948	2,581	3,926	5,828	7,863	9,757	11,055	12,358	13,663	15,711	18,117	21,514	22,223	23,138	24,246	25,552

Table 41-9 Balance Sheet of Financial Plan 2: 2005-2020

(Unit: US\$1000)

Item	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
I. Assets	2,316	7,685	23,421	36,789	38,580	40,464	53,110	81,724	97,410	95,389	94,104	93,169	92,476	89,650	87,013	84,568	82,322
1. Fixed Assets	810	4,737	20,840	32,528	32,358	32,191	42,942	70,259	84,377	80,982	77,573	74,147	69,991	66,439	62,886	59,334	55,782
(1) Fixed Assets	-	-	-	34,128	34,128	34,128	34,128	34,128	96,459	97,147	97,846	98,553	98,553	98,553	98,553	98,553	98,553
(2) Accumulated Depreciation	0	0	0	1,600	3,200	4,800	6,400	7,999	12,082	16,165	20,273	24,406	28,562	32,114	35,667	39,219	42,771
(3) Works in Progress	810	4,737	20,840	-	1,430	2,863	15,214	44,130	-	-	-	-	-	-	-	-	-
2. Current Assets	1,506	2,948	2,581	4,261	6,222	8,273	10,167	11,465	13,034	14,407	16,532	19,022	22,485	23,211	24,126	25,234	26,540
(1) Cash	226	442	387	589	874	1,179	1,464	1,658	1,854	2,049	2,357	2,718	3,227	3,334	3,471	3,637	3,833
(2) Bank Deposit	1,280	2,506	2,194	3,337	4,954	6,683	8,294	9,397	10,505	11,613	13,354	15,399	18,287	18,890	19,668	20,609	21,719
(3) Account Receivable	-	-	-	305	362	378	378	378	627	694	768	851	917	934	934	934	934
(4) Inventory Stock	-	-	-	30	31	32	32	32	48	50	52	54	54	54	54	54	54
(6) Prepayment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
II. Equity and Liabilities	2,316	7,685	23,421	36,789	38,580	40,464	53,110	81,724	97,410	95,389	94,104	93,169	92,476	89,650	87,013	84,568	82,322
1. Short-term Liabilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1) Account Payable	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(2) Advanced Receipt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Long-term Liabilities	699	4,150	18,344	30,055	31,305	32,559	43,446	68,948	83,497	81,994	80,492	78,989	77,486	73,236	68,986	64,736	60,486
(1) Foreign Loan	699	4,150	18,344	30,055	31,305	32,559	43,446	68,948	83,497	81,994	80,492	78,989	77,486	73,236	68,986	64,736	60,486
(3) Local Loan - Banks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(4) Creditors	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(5) Interest Payable	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Equity	1,617	3,535	5,078	6,734	7,275	7,905	9,664	12,776	13,913	13,395	13,613	14,180	14,989	16,414	18,026	19,832	21,836
(1) Enterprise Capital	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(2) Government Capital	1,617	3,546	5,208	6,581	6,753	6,921	8,193	11,143	13,000	13,000	13,000	13,000	13,000	13,000	13,000	13,000	13,000
(3) Grants	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(4) Profit/Loss for the Year	0	-11	-130	153	523	984	1,470	1,633	913	395	613	1,180	1,989	3,414	5,026	6,832	8,836

4.2 Financial Simulation

This section presents financial simulation of waterworks for the proposed project. The financial simulation is based on information about “existing financial system of water supply business” and “financial conditions for water sector”. We apply an integrated financial simulation model for this analysis. Through this analysis, we will find the financial problems of the proposed project and fund requirement for the water supply entity.

Figure 42-1 gives an image of income statement trend in the financial simulation. The figure includes the following information: (a) revenue from water sales and installation charges, and interest of saving deposit; (b) expenditure of operation and maintenance; (c) net operating profit, i.e., a difference between revenue and expenditure; (d) annual net profit, i.e., the profit of the net operating profit minus depreciation and interest of loan; and (e) accumulation of profit.

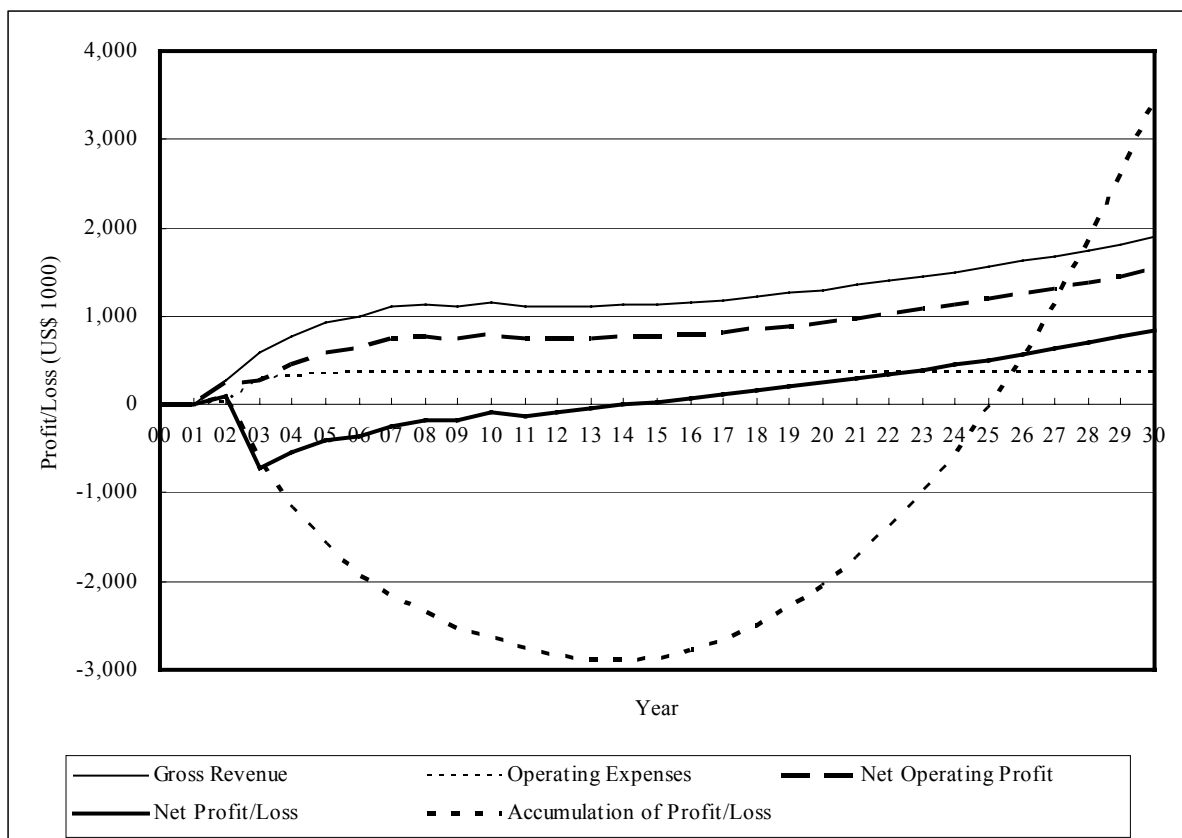


Figure 42-1 Image of Financial Simulation

The image figure indicates that the net loss continues until 2014, and moves toward surplus after 2015. The accumulation of losses continues until 2025 and turns to the black after 2026. The accumulation profit increases rapidly after 2026. It hopefully reaches to the amount for investing the reconstruction of the facilities by the end of economic life. As seen in this figure, anyhow, the profit and loss of the

enterprise are very serious for around 10 years from the beginning, in general. Thus, the financial simulation tables presented in this simulation include the beginning 11 years, i.e., from 2000 to 2010.

4.3 Management Issues and Recommendations

In the financial plan 1, the waterworks will incur a net loss at the beginning, although their operating results record net gains just after the inauguration as shown in Table 41-1. In the target year 2020 of the project, the total revenue is expected to be US\$11.6 million, which comprises the US\$7.5 of water sales, US\$0.5 million of meter rental and US\$2.1 of installation charge. On the other hand, the operating expenses amount to US\$6.5 million in the same year. Then the net operating profit becomes US\$5.1 million. However, the non-operating revenue and expenses including the interest of loans are estimated at US\$2.0 million, so the income before tax results in US\$3.4 million. Since the profit tax is calculated at US\$1.2 million, the net profit after tax is estimated at US\$2.2 million in 2020. The accumulated profit aggregated to US\$9.8 million by the target year 2020.

During the construction period, the waterworks will face a cash flow deficit from 2004 to 2006. Just after the inauguration of the water supply system, however, the waterworks can get sufficient revenue, so the net income turn to black as shown in the table. This is because the water consumers are already living in water service areas. Once the waterworks expand their system, water demand breaks out immediately. This situation is so favourable for the waterworks' management.

In the financial analysis, the relationship of water rate and the years expected to break-even under steady financial costs are indicated in Figure 34-1. Through the simulation analysis, this relationship was furthermore depicted as shown in Figure 43-1. For instance, if the financial cost increased to 5%/year, the year solving accumulated deficit would delay to 2032 from 2007 of the original case. In the case that the average water rate is cut down to US\$0.225/m³ (10% down) and the financial cost goes up to 4.5%/year (around 50% up), the year of solving accumulated deficit will delay to 2040 from 2007. In making a management plan for the project, thus, the procurement of financial sources and setting-up water rates are one of the most important issues.

In the financial plan 2 as well, the waterworks will continue a net loss at the beginning, although their operating results record net profit after 2007 as shown in Table 41-7. In the target year 2020 of the project, the total revenue is expected the same amount of US\$11.6 million as the financial plan 1. The operating expenses amount to US\$6.5 million in the same year. Then the net operating profit becomes US\$5.1 million. However, the income before tax results in US\$3.1 million, which is somewhat lower than that of the financial plan 1. The net income after tax results in US\$2.0 million in 2020. Since the financial cost of the financial plan 2 is almost the same rate of 3.0% per annum as the financial plan 1, the results of

financial simulation look quite similar to those of the financial plan 1.

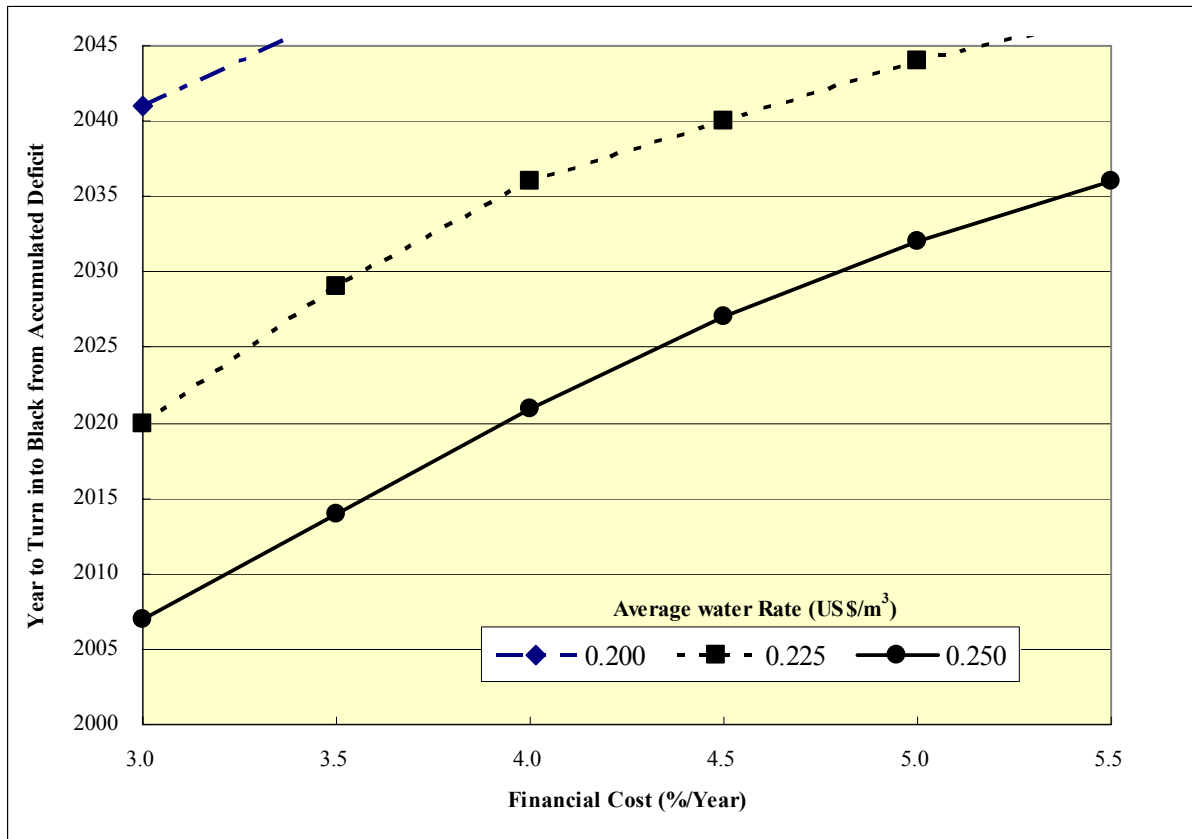


Figure 43-1 Years of Return to Black and Solving Accumulated Deficit

5. Socio-Economic Impacts

5.1 Impact on Regional Economy

It is obvious that commencement of construction works such as water supply project induces regional economy to activate in the sectors related to construction works as well as construction sector itself. In general, one unit of construction work could induce 1.50 to 2.00 units of economic effects in the national and regional economy. In other words, a construction work would bring about 50% to 100% ripple effect on related works in various economic sectors in monetary terms in addition to the said construction work. This effect could stimulate the regional economy in Vientiane Capital City and its surrounding provinces.

According to the 1995 census, 7% of the labour force in Vientiane Capital City is not employed. The investment of the proposed project would activate the regional economy and at the same time create opportunities for temporary jobs during the construction period. Accordingly, it would be clear that the investment proposes new labour opportunities for the people unemployed and underemployed in the province

5.2 Impact on Public Finance

The total investment cost was estimated at around US\$ 100 million or 1.07 trillion kip in total. The total amount of 1.07 trillion kip will be disbursed over a period of 12 years, accounting for 25% of the total expenditure of the central government in the fiscal year 2002/23. It also accounts for 42% of the capital expenditure of the government. Although this amount is not disbursed within a year, it is still heavy burden for the government. The capital expenditure of the central government has relied on the foreign project assistance generally so far. For implementation of this proposed project, there would be no other way that the capital cost would depend on foreign financial assistance. Without the support of the government finance, the project could not be implemented in reality. In this context, the project has a large influence on the public finance sector.

Considering this, the water supply business has to be managed as independent autonomous entity, after the project is implemented. To put this policy into practice, the following basic management principle should be carried out in the management of water supply business.

- (1) As a minimum, the revenue from water sales should cover the full costs of water production, as proclaimed in “Prime Ministerial Decision on Management and Development of Water Supply Sector (37/PM)”.
- (2) Working fund is procured by the water supply entity not through public finance but through

private self-financial options.

- (3) Taking into consideration of re-investment and replacement in the near future, surplus has to be reserved as much as possible in retained earnings as a part of equity in water supply management.

5.3 Impact on Household Economy

According to “Household Survey 1997/98”, the water charge of a family accounted for 1.0% of the total household expenditure in urban areas of Vientiane Capital City. The annual amount of the water charge was estimated at around 16,700 kip at 2003 current prices on average. On the other hand, the annual total expenditure was also estimated at 1,679,000 kip on average. Although the total income was not reported in the survey, it could be assumed as almost the same amount as the expenditure.

As of May 2003, the water rate of domestic use is 384 kip/m³ on average. Annual consumption of domestic water is estimated at 390 m³ per household, so annual charge is calculated as 149,800 kip per household. An annual family income in 2003 is estimated at 20.1 million kip, a water charge of a household is estimated to account for only 0.7% on average. This rate is lower than that of 1.0% in the survey above. The rate is 70% of the survey result of 1.0%.

Yet, domestic water charge for low-income people should be set up to at most 3% of household income in section 4.6 in article 4 in Prime Ministerial Decision (37/PM). Furthermore, the World Bank report of “Investing in Development, 1985” prescribed that the price of the minimum block of water is commonly set at 3 to 5 percent of household income, which experience suggests is affordable. As shown in Table 35-1, the lowest rate of 4.0% in Case 1 seems to be within the block of the World Bank, although it is on the high side. Anyhow, the new tariff might appear to be expensive for the domestic consumers in water supply service areas at present.

As discussed in “Financial Analysis”, the water rate of domestic water might be increased to five times more than the present one, if the capital investment is financed in the same manner of Chinalimo Expansion Project Case. That was financed as follows: a half of the total costs were financed as equity by the government and another half was financed as a loan with 6.5% interest rate and 25 years repayment period including 5 years grace period. In this case, a water charge of a household is estimated to account for 5.4% of the total household expenditure on average. Since this water charge exceeded the affordable level described in the World Bank experience’s viewpoint, it might be serious for every family to accept at once. Thus, the NPVC has to disclose its technical and financial information and bring about a better understanding between water consumers and the NPVC. Through a good mutual understanding, thus, the NPVC has to create a climate of economic and political stability conducive to proper relationship with water consumers.

5.4 Understanding of Rational Utilisation and Reasonable Price

In Vientiane Capital City, people have been in close communion with ample and cheap city water. They have enjoyed their lives with plenty pure water, although the people without water supply services still suffer hardships of water shortage. This disparity regarding water services would be improved as soon as possible. Anyhow, the people with water supply services enjoy mass consumption of water on the basis of mass production by waterworks so far.

After introduction of the project proposed in this study, water produced with the new system can not be produced in cheap manner as supplied as ever. With the progress of economic growth, the people in Vientiane will express their wishes for potable water in steady manner. Fortunately, they understand to share the reasonable costs for the potable water. At the same time, they must understand rational utilisation of potable water in their lives, in stead of mass consumption of water as is occurring now. To realise the reasonable prices of water supplier against rational utilisation of water consumers, the NPVC strives to attain balanced water production based on the mutual understanding between the NPVC and their consumers. This mutual understanding makes equitable society and the effective and steady management of the NPVC for the near future.