

The present budget of VM highly depends on foreign aids and foreign long term loans. On foreign loan, the average repayment term is 41 years, the average grace period is 21 years and average interest is 0.6 percent in 1989. This indicates the critical situation Lao P.D.R. is in, in terms of foreign debts.

Cash flows of the project both in cases of loan and grant aid are prepared, and shown in Fig. 11.4-2 and 11.4-3, respectively. As shown in the figures, if the initial investment is to be financed by foreign aids, the project will be financially well off and the balance will change to black in 1997. The total amount for the repayment and interest of foreign long term loans is 208 million kips, about 40 percent of the depreciation values, in spite of a total debt of 2,207 million kips in 2000 (see Table 11.4-11).

Conclusively, the financial situation in 2010 will be improved through an aid.

#### e. Sensitivity analysis

A sensitivity analysis is done regarding financial sources, amounts of investments, collection fees, conditions of loans and inflation rates as follows.

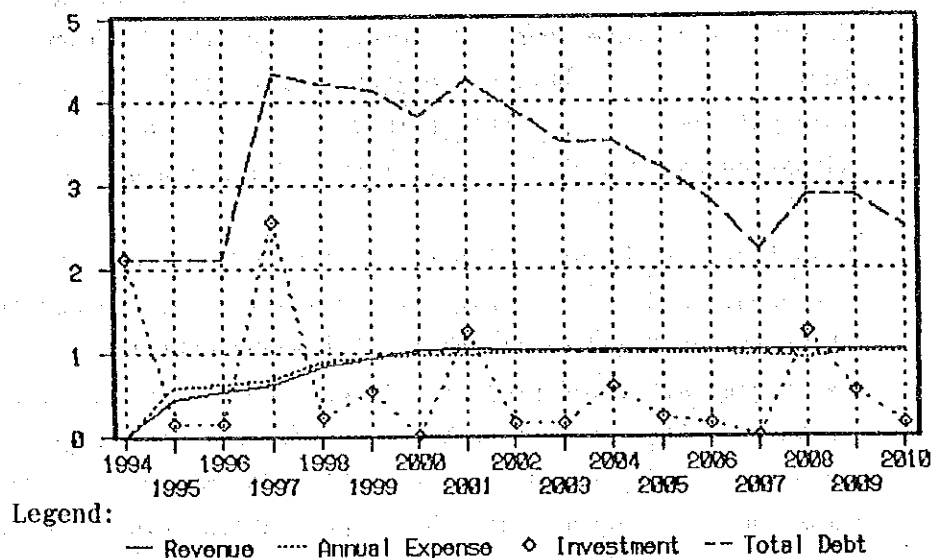
##### i. financial sources

As described in the previous section d., a comparison study is done regarding the initial investment by a loan and aid. The results are shown in Fig. 11.4-2 and Fig. 11.4-3.

##### ii. amounts of investments

- Case 1 : Comparison of Initial Investment Amount (by Loan)

Cash Flow of Feasibility Study  
(in case of FL, Inner Fund 1996-)  
Unit: billion kips



Note : 20 years repayment with three years grace period and 3% of interest ratio

Fig. 11.4-2 Cash Flow of Project in Case of Loan

Cash Flow of Feasibility Study  
(in case of FA, Inner Fund 1996-)  
Unit: billion kips

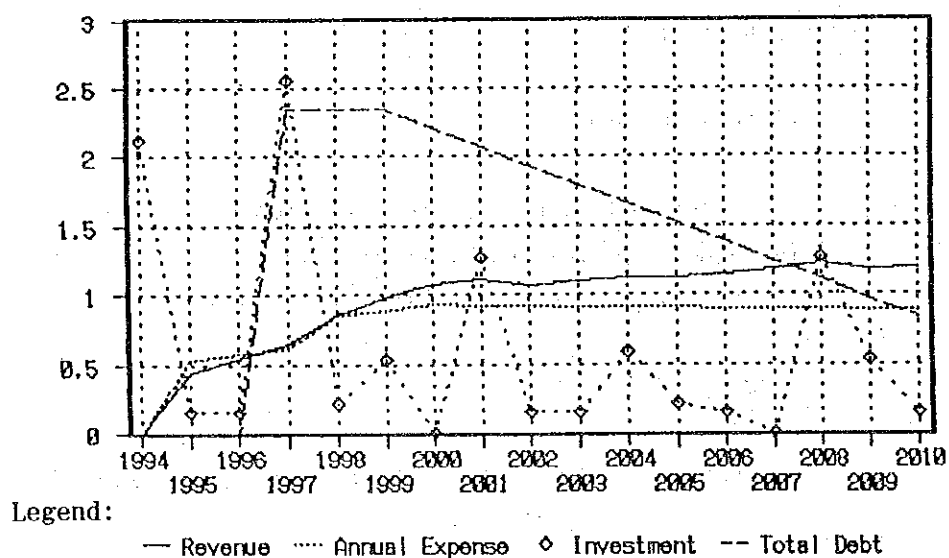


Fig. 11.4-3 Cash Flow of Project in Case of Grant Aid

The cases, of which the initial investment amount is 80%, 100% and 120% of the estimated cost, are studied and shown in Fig. 11.4-4.

As the results, it indicates that the balance of revenue and expenditure after 2000 will not be affected so much by the amount of initial investment.

- Case 2 : Comparison of Initial Investment Amount (by Grant)

The cases, of which the initial investment amount is 80%, 100% and 120% of the estimated cost, are studied and shown in Fig. 11.4-5.

The results show that the balance after 2000 will not be influenced very much by the amount of initial investment.

- Case 3 : Comparison of Investment Amount for Disposal Site Development (by Grant)

The cases, of which the level of disposal site development in 1997 is level 2 and level 3, are studied and shown in Fig. 11.4-6.

There will not be so much difference between the balances of level 2 and level 3 of site development after 2000.

iii. collection fees

- Case 4 : Comparison of Basic Fee (by Loan)

The cases, of which the basic fee for collection is 80%, 90% and 100% of the proposed fee (1,000 kips/month/household), are studied and shown in Fig. 11.4-7. The other modes of fee are supposed to be the same price as proposed.

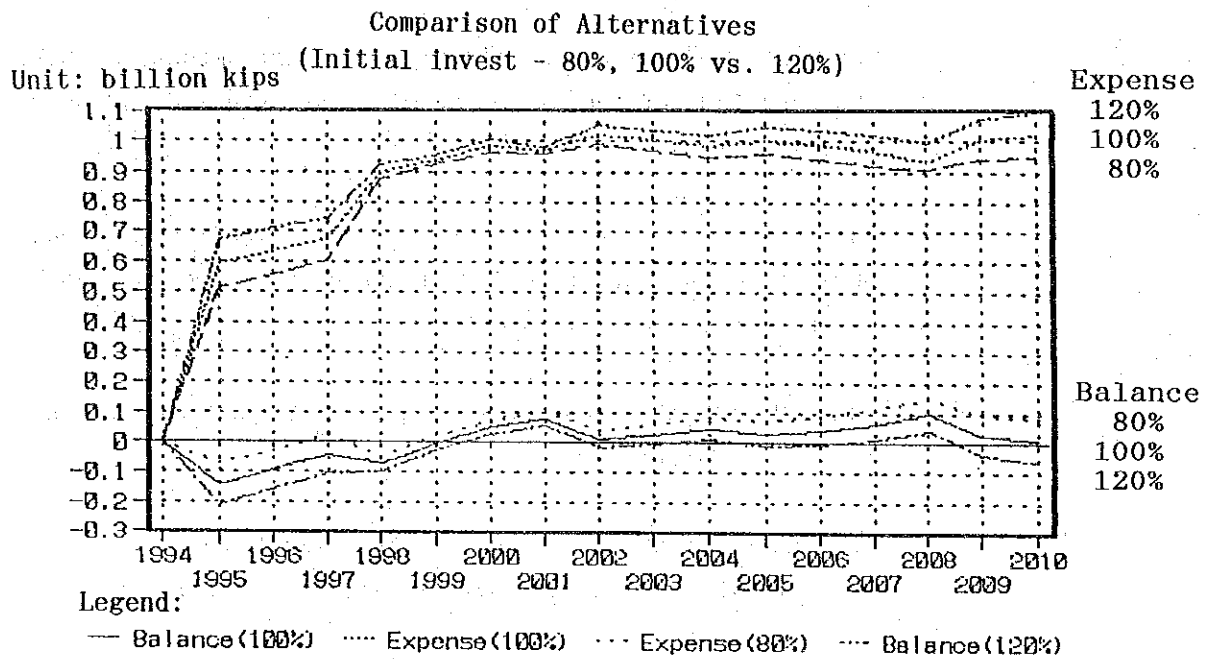


Fig. 11.4-4 Sensitivity Analysis Case 1

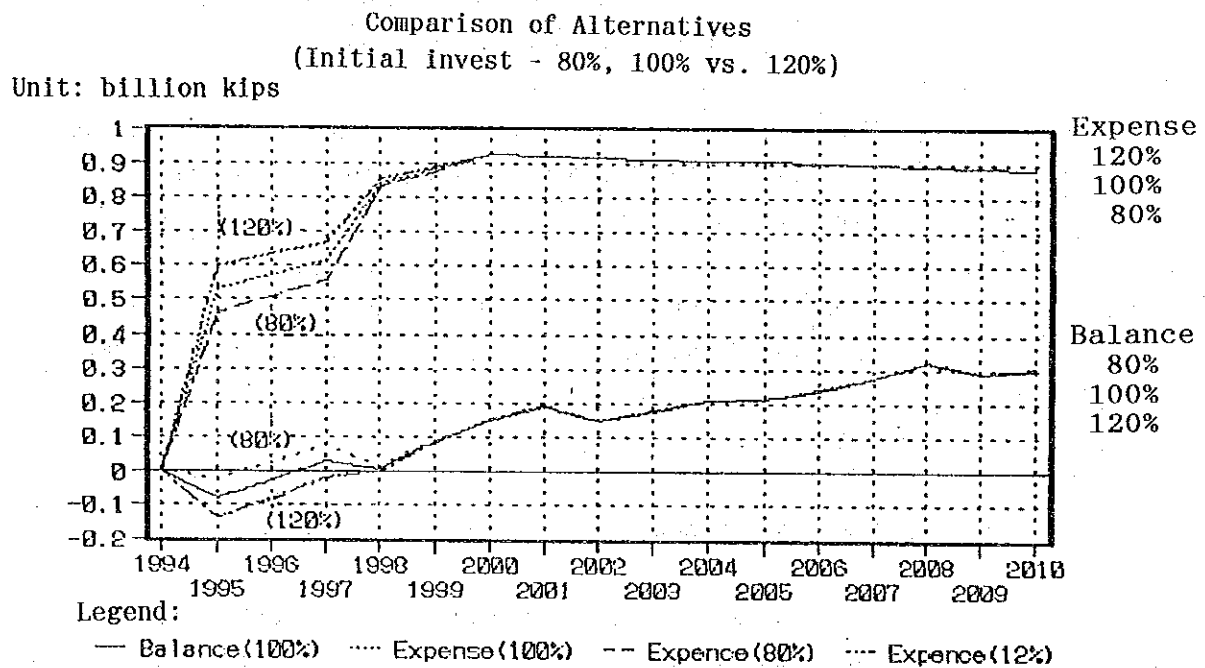


Fig. 11.4-5 Sensitivity Analysis Case 2

Comparison of Alternatives  
(Second invest - Level 3 vs. Level 2)

Unit: billion kips

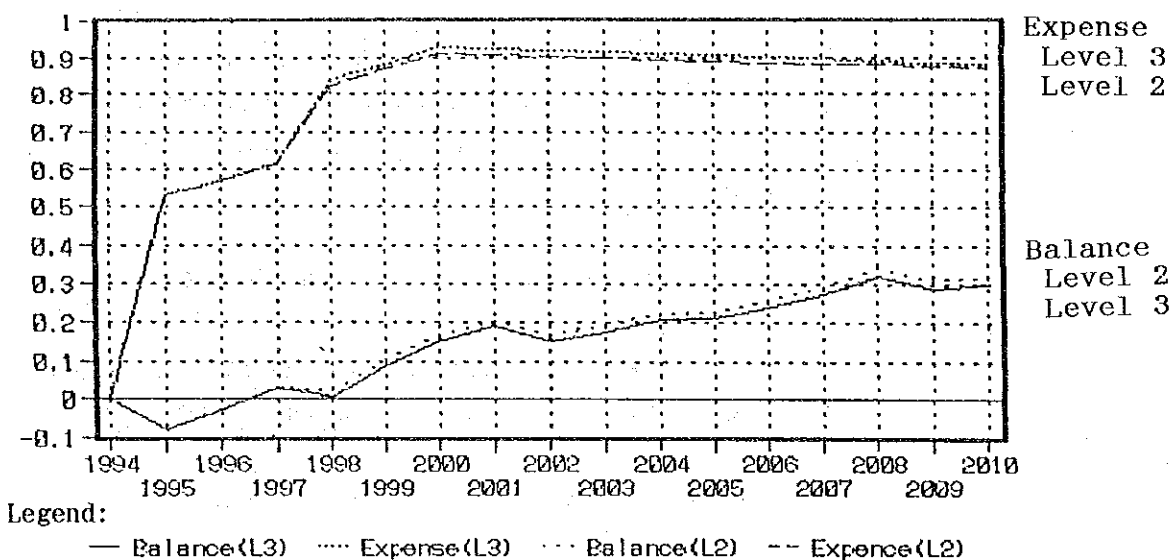


Fig. 11.4-6 Sensitivity Analysis Case 3

Comparison of Alternatives  
(Basic fee - 80%, 90% and 100%)

Unit: billion kips

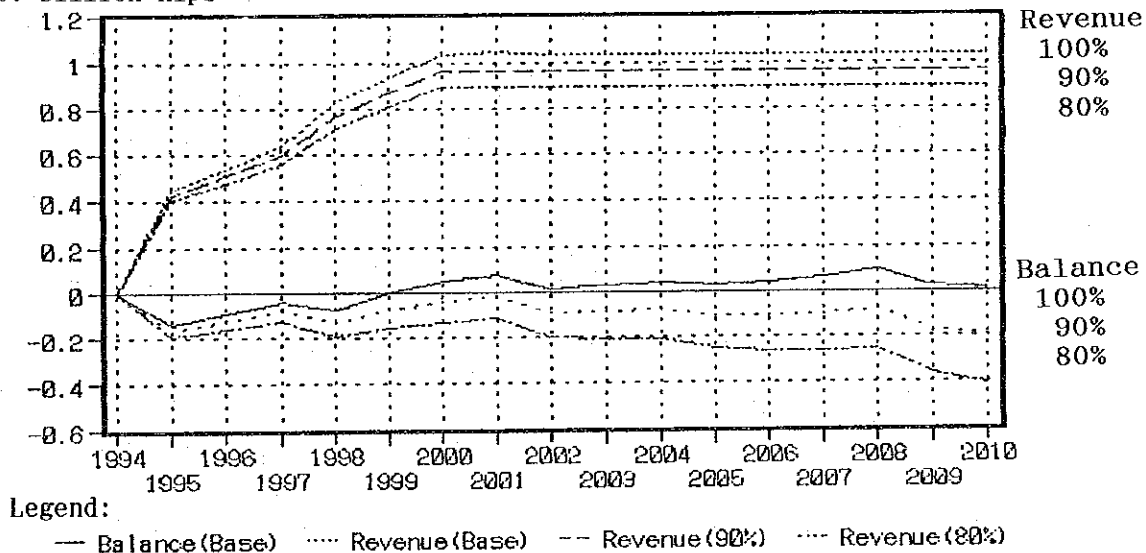


Fig. 11.4-7 Sensitivity Analysis Case 4

- Case 5 : Comparison of Basic Fee (by Grant)

The cases, of which the basic fee for collection is 80%, 90% and 100% of the proposed fee, are studied and shown in Fig. 11.4-8. The other fees are considered as the proposed prices of fees.

- Case 6 : Comparison of Extra Fee (by Grant)

The cases of with the extra fee for collection (100%) and without it (0%) are studied and shown in Fig. 11.4-9.

As the results of analysis, it indicates that

- In case of a loan, 10% price reduction of basic fee will make a deficit of revenue and expenditure.
- In case of a grant, 10% reduction of basic fee will keep the balance in black. However, without extra fee collection the balance will be in red.

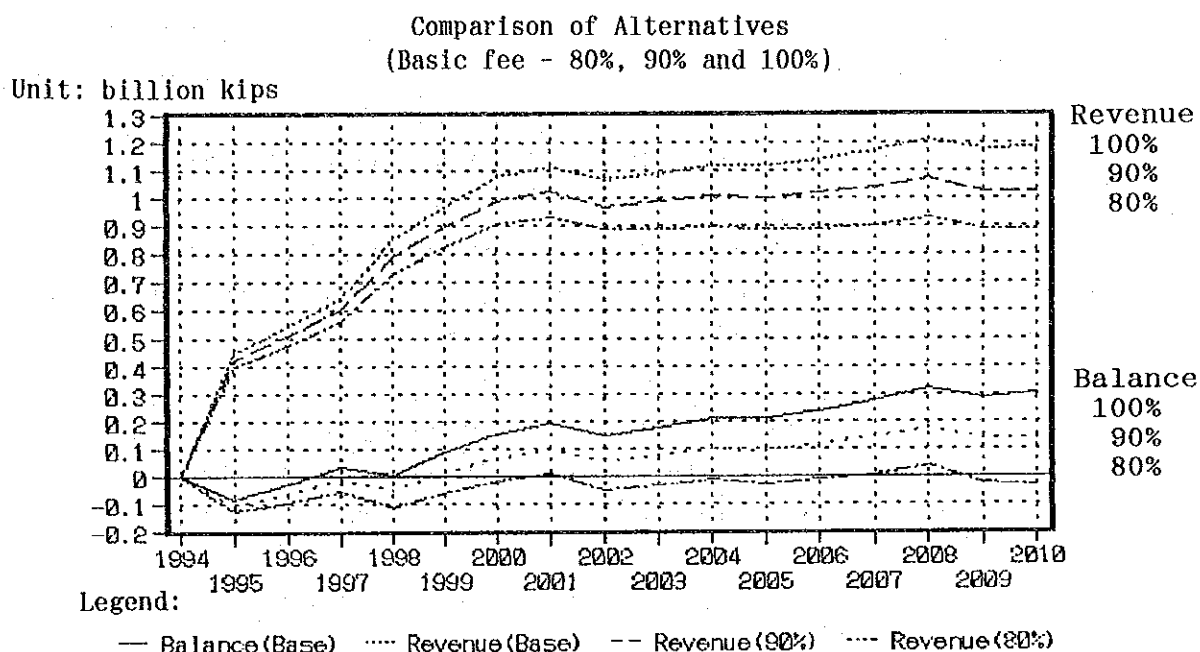


Fig. 11.4.8 Sensitivity Analysis Case 5

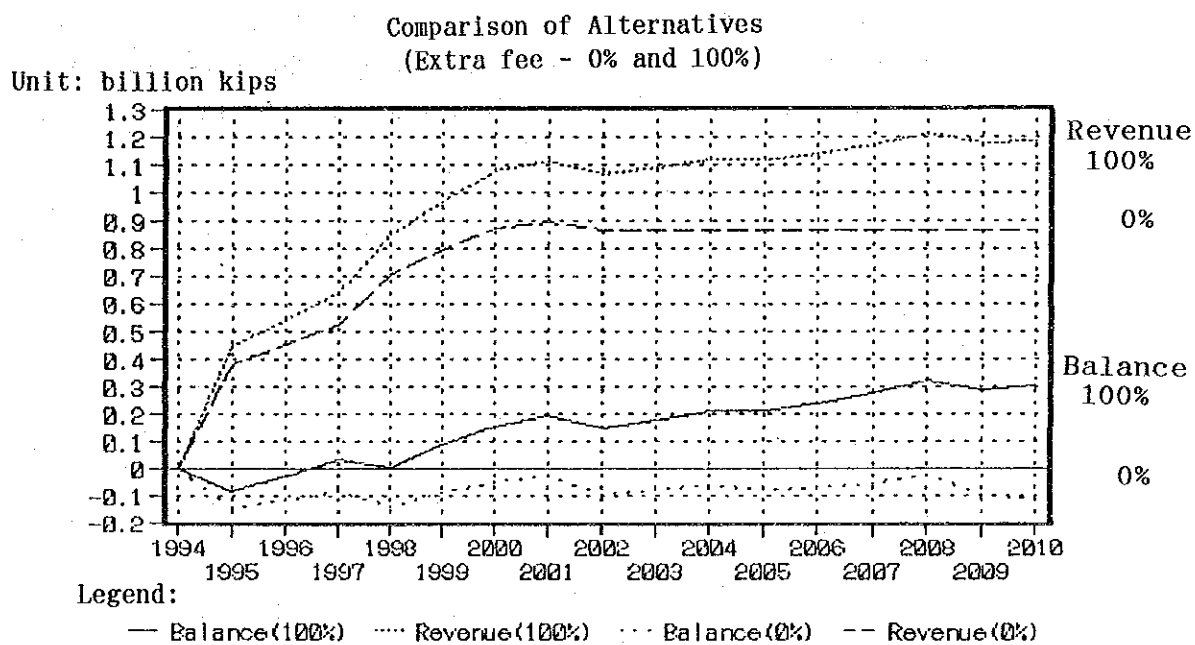


Fig. 11.4-9 Sensitivity Analysis Case 6

#### iv. loan conditions

##### - Case 7 : Comparison of Repayment Period (by Loan)

The following three cases regarding repayment period are studied and shown in Fig. 11.4-10. In each case, the interest rate is set at 3%.

- \* 10 years with 3 years grace period
- \* 20 years with 3 years grace period
- \* 30 years with 10 years grace period

##### - Case 8 : Comparison of Interest Rate (by Loan)

The cases, of which the interest rate is 0.3%, 3% and 6%, are studied and shown in Fig. 11.4-11. In each case, the repayment period is supposed to be 20 years with 3 years grace period.

As results of analysis, it shows that the balance can be in black if the repayment period is more than 20 years and that if the interest rate is 6%, the balance will be in red.



Comparison of Loan Conditions  
(in case of FL, 10, 20 and 30 years)

Unit: billion kips

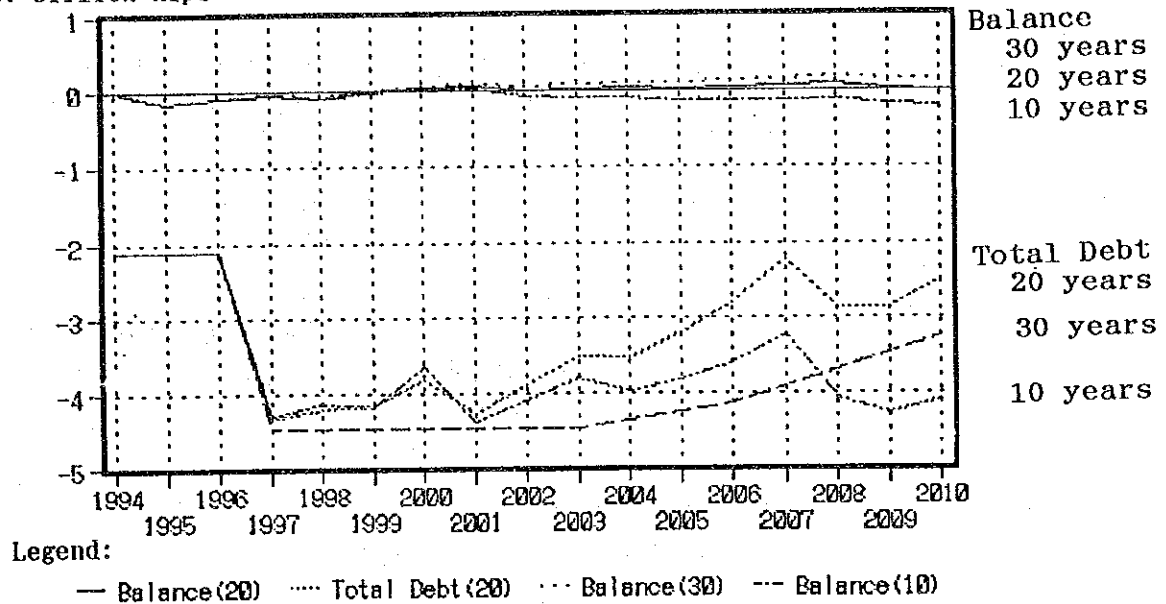


Fig. 11.4-10 Sensitivity Analysis Case 7

Comparison of Loan Conditions  
(in case of FL, 0.3, 3 and 6%)

Unit: billion kips

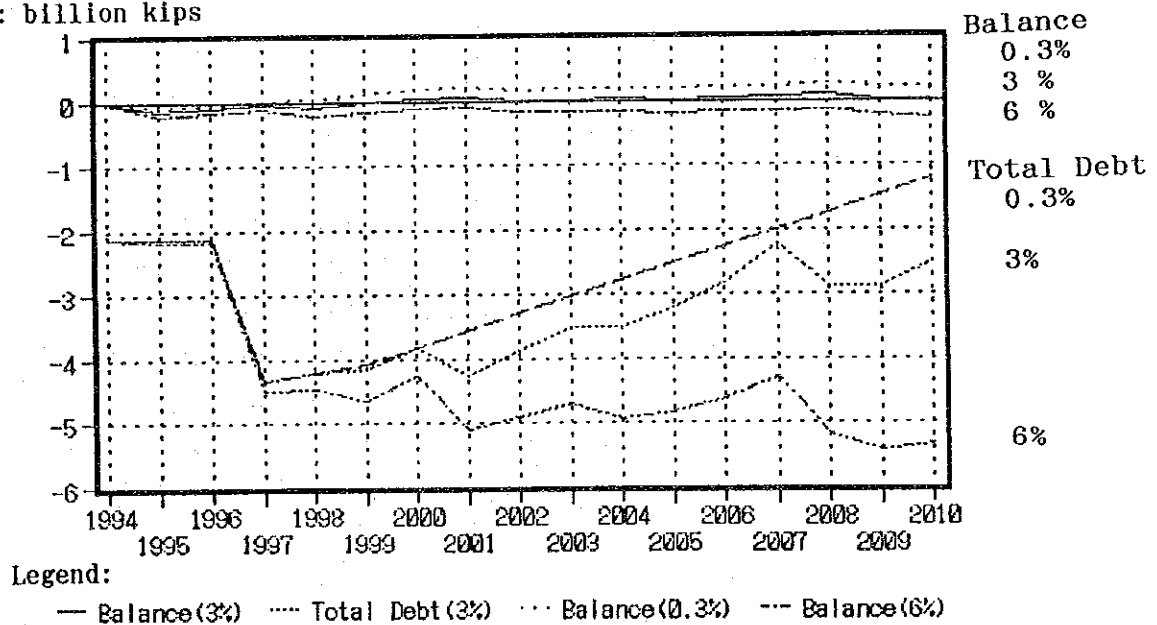


Fig. 11.4-11 Sensitivity Analysis Case 8

v. inflation rates

- Case 9 : Comparison of Inflation Rates (by Grant and Renewal Investment by 100% of Internal Reserve)

The cases, of which the inflation ratio is 3% and 5%, is studied and shown in Fig. 11.4-12.

- Case 10 : Comparison of Inflation Rates (by Grant and Renewal Investment by 50% of Internal Reserve and 50% of VM Budget)

The cases, of which the inflation ratio is 3% and 5%, is studied and shown in Fig. 11.4-13.

The results indicate that without VM budget for renewal investment, the balance will be in red while with VM budget the balance will be in black even if 5% of inflation.

f. Overall evaluation

(1) Economic evaluation

i method of the evaluation

The economic evaluation is done based on the "Cost Minimum Method". Since the execution of waste collection and sanitary landfill is necessary for maintaining the basic functions of the capital city, Vientiane, and there expects many benefits which could not be described in quantity (price), the equalitative analysis is conducted on the economic evaluation.

ii results of the evaluation

- collection and cleansing services improvement project

In view of the present poor hygiene caused by very limited

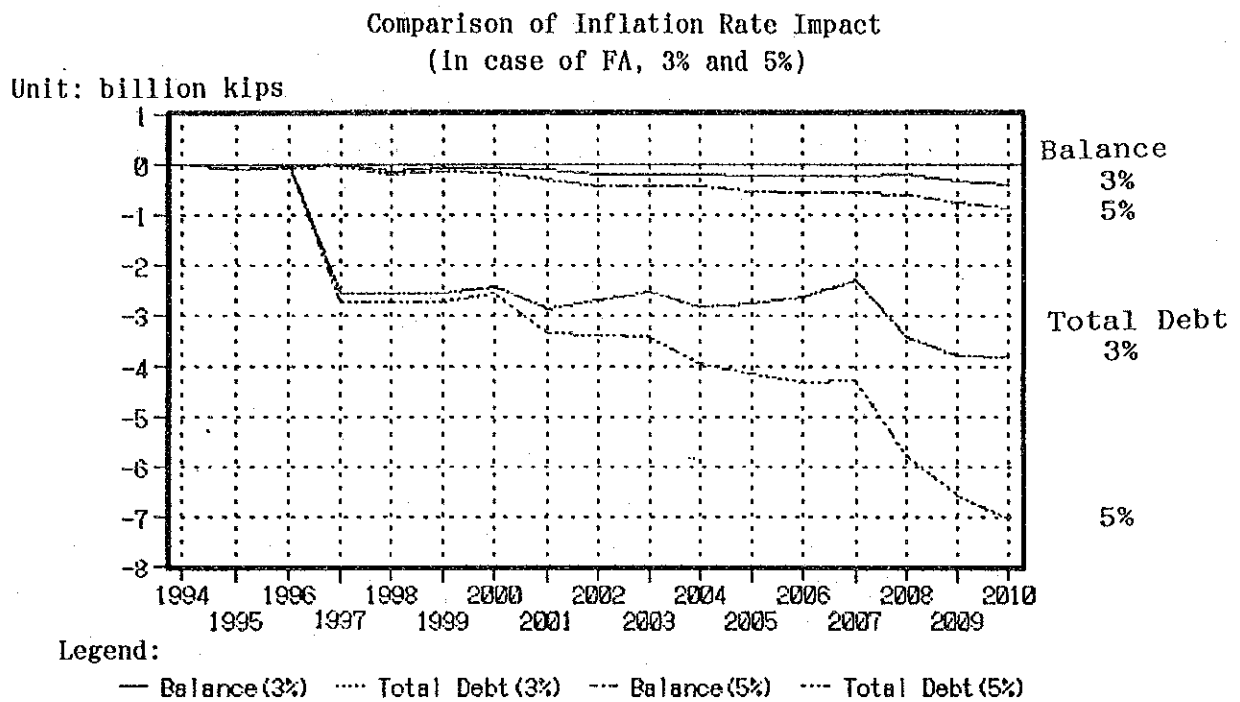


Fig. 11.4-12 Sensitivity Analysis Case 9

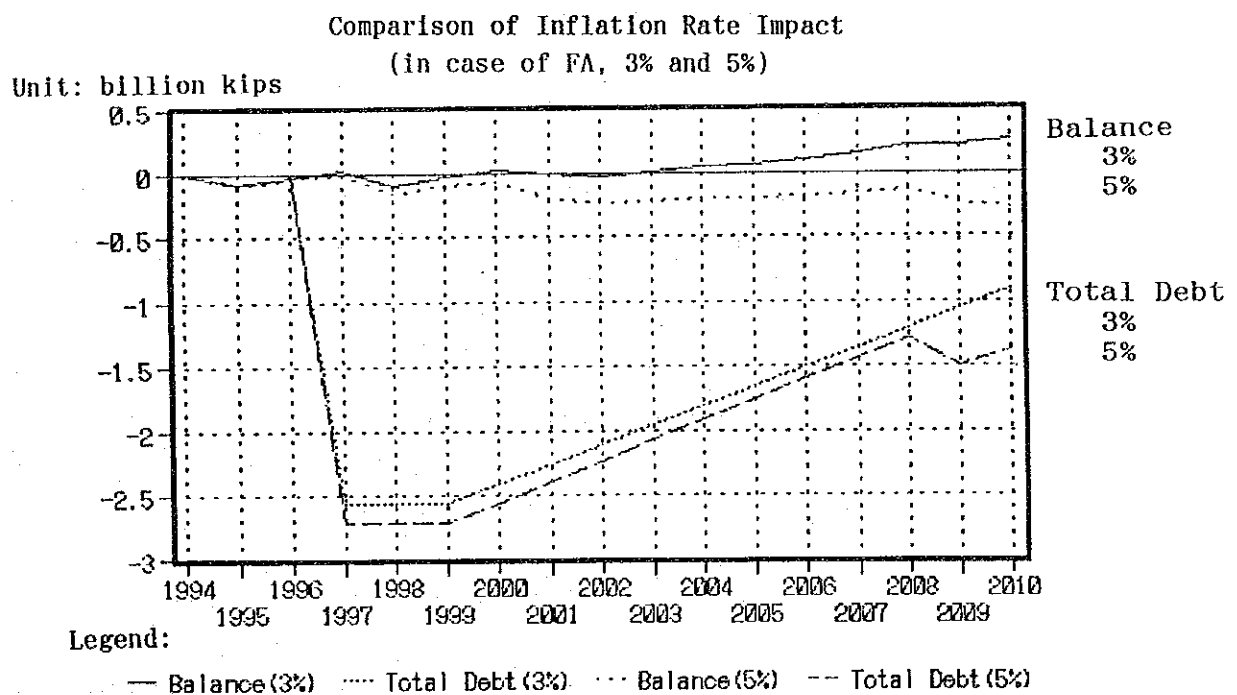


Fig. 11.4-13 Sensitivity Analysis Case 10

waste collection services, expansion of regular collection services is essential to the urban life of Vientiane, and therefore, improvement of collection services is needed urgently.

On the other hand, the establishment of the collection service project would create job opportunities in Vientiane where potential unemployment ratio is high.

In addition, as for the introduction of the container collection system to institutions, better impressions on market and hospitals will be expected as safety and cleanliness are maintained and the spreading of infectious diseases can be prevented. These are some other important indirect effects such as the beautification and sanitation of Vientiane.

The improvement of road sweeping and drain cleansing works will reduce the clogging of drains which may lead to flood and the spread of some diseases.

- final disposal improvement project

The shift from open dumping to sanitary landfill can improve public health and preserve the environment around the final disposal site.

The direct effects of road improvement works and soil covering at the disposal site will lessen the possibilities of vehicular tire punctures by glass or nails, ensuring the working ratio of the collection vehicles.

- maintenance shop improvement project

The major effects of the improvement of the maintenance shop are the prolongation of the life of the vehicles and the augmentation of the working ratio.

Although present maintenance system only provides one trip per day of collection work, the proposed maintenance system will be improved to enable 3 collection trips/day to main streets of town and 2 collection trips/day to the surrounding area. Concurrently, a fixed collection time will be established and the collection services will be improved.

Above everything else, a fixed collection time would heighten the willingness of the residents to pay, as observed from their response in the collection experiment.

## (2) Financial evaluation

### i method of the evaluation

Since the project for the Feasibility Study is the Phase I project of the Basic Plan, the project is financially evaluated in the Basic Plan period.

### ii preconditions

As the establishment of the self-financial system is the goal of the Basic Plan, additional and renewal investments are basically done by the internal fund reserves. The collection fee is set up as 1000 kips/month/household based on the results of the collection experiment. In order to operate the solid waste management project, it is necessary to examine various financial conditions. In this report, especially financial sources of initial investment, collection fees, and financial sources of renewal investment are examined, and contents and results of the examination is shown in the table below. In the table, from case 1 to case 8 the inflation is not considered; i.e., inflation ratio is 0%. Only in case 9 and 10, the inflation is considered. The project period for the financial evaluation is 15 years;

i.e., up to 2010, considering the life span of the equipment and facilities.

iii results of the evaluation

In case the fee is leaving by 2000 as proposed fee for 1995 without inflation, it is difficult to manage the project with the conditions of the initial investment covered by loan and additional and renewal investment covered by the internal fund reserves (Revenue by cost (R/C) ratio until 2000 is 0.54). In case the initial investment is covered by grant, although the R/C ratio until 2000 is improved to 0.83, the FIRR (Financial Internal Rate of Return), is less than 1 and the calculation of FIRR is meaningless. The project is, however, still necessary, because the feasibility of an environmental improvement project like SWM improvement project is determined by the necessity for the Basic Human Needs and not by the profitability of the project.

If the initial investment is covered by grant without inflation and the increase of fees on collection and tipping fees is done in 1998 in order to cover necessary cost for both collection and disposal (Basic fee is 1.2 times more than the proposed fee in 1995 and tipping fee is 1.5 times of that.), the R/C ratio until 2000 is 0.87. However, the R/C ratio until 2010 becomes 1.09 and the FIRR is 9.2%. In case of with inflation, after 2007 the overall debt will increase steadily and shall incapacitate the internal reserves from financing the new investments required due to the increase of the interest for the loan. On the other hand, if the half of the renewal investment is covered by the budget of the Municipality, the balance will be improved (In case of 3% inflation, the R/C ratio until 2010 is 1.03 and the FIRR is 4.5%). Therefore, in order to maintain sound financial condition for solid waste management, the fee tariff shall be reviewed and increased or half of the renewal investment shall be financed by the VM budget.

It can be concluded, therefore, that the profitability of the SWM project will largely depend on the positive cooperation of VM and the financial support by any modes of grants, especially during the time of take off.

# Results of Analysis

(unit: million kips)

Case	Main Contents of Examination	Balance in 2000	Total Debt in 2010	Balance until 2010
Base	Financial Source of the Initial Investment Loan Grant	50 153	2,507 828	Almost Balanced Black in 1998
Case 1	Initial Investment Amount (Initial Investment by Loan) 80% 100% 120%	71 50 28	1,554 2,507 3,475	Black in 2000 ditto Red in 2010
Case 2	Initial Investment Amount (Initial Investment by Grant) 80% 100% 120%	153 153 153	828 828 828	Black in 1996 Black in 1997 Black in 1998
Case 3	Construction of Disposal site(1997) (Initial Investment by Grant) Level 2 Level 3	167 153	776 828	Black in 1998 Black in 1999
Case 4	Basic Fee (Initial Investment by Loan) 80% 90% 100%	-132 -41 50	6,122 4,303 2,507	Always Red ditto Black in 2000
Case 5	Basic Fee (Initial Investment by Grant) 80% 90% 100%	-19 67 153	1,122 828 828	Almost Balanced Black in 1998 ditto
Case 6	Extra Fee (Initial Investment by Grant) 0% 100%	-52 153	1,838 828	Always Red Black in 1998
Case 7	Loan Condition (Repayment Period) 10 years with 3 years grace period 20 years with 3 years grace period 30 years with 10 years grace period	17 50 66	4,095 2,507 3,251	Always Red Almost Balanced ditto
Case 8	Loan Condition (Interest rate) 0.3 % 3 % 6 %	191 50 -117	1,201 2,507 5,318	Black in 1998 Almost Balanced Always Red
Case 9	With Inflation (Grant) (Renewal Investment by 100% of Internal Reserve) 3% 5%	58 -149	3,451 7,096	Always Red ditto
Case10	With Inflation (Grant) (50% of Renewal Investment covered by VM budgets) 3% 5%	154 -52	904 958	Black in 2000 Always Red



# PART IV

## IMPLEMENTATION PLAN AND RECOMMENDATIONS

# CHAPTER 12

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## IMPLEMENTATION PLAN

## PART IV      IMPLEMENTATION PLAN AND RECOMMENDATIONS

### CHAPTER 12   IMPLEMENTATION PLAN

#### 12.1 Operation Manual for SWM

At present, the SWM operational capability of DCTC is very poor due to the lack of an operation manual. The Study Team, therefore, formulated a draft SWM operation manual to enable the implementation of the collection experiment and its continuance by DCTC. Further, DCTC is requested to review and modify the draft manual upon the continuance of the experiment, according to the progress of the works.

Outline of the SWM operation is shown in Fig. 12.1-1.

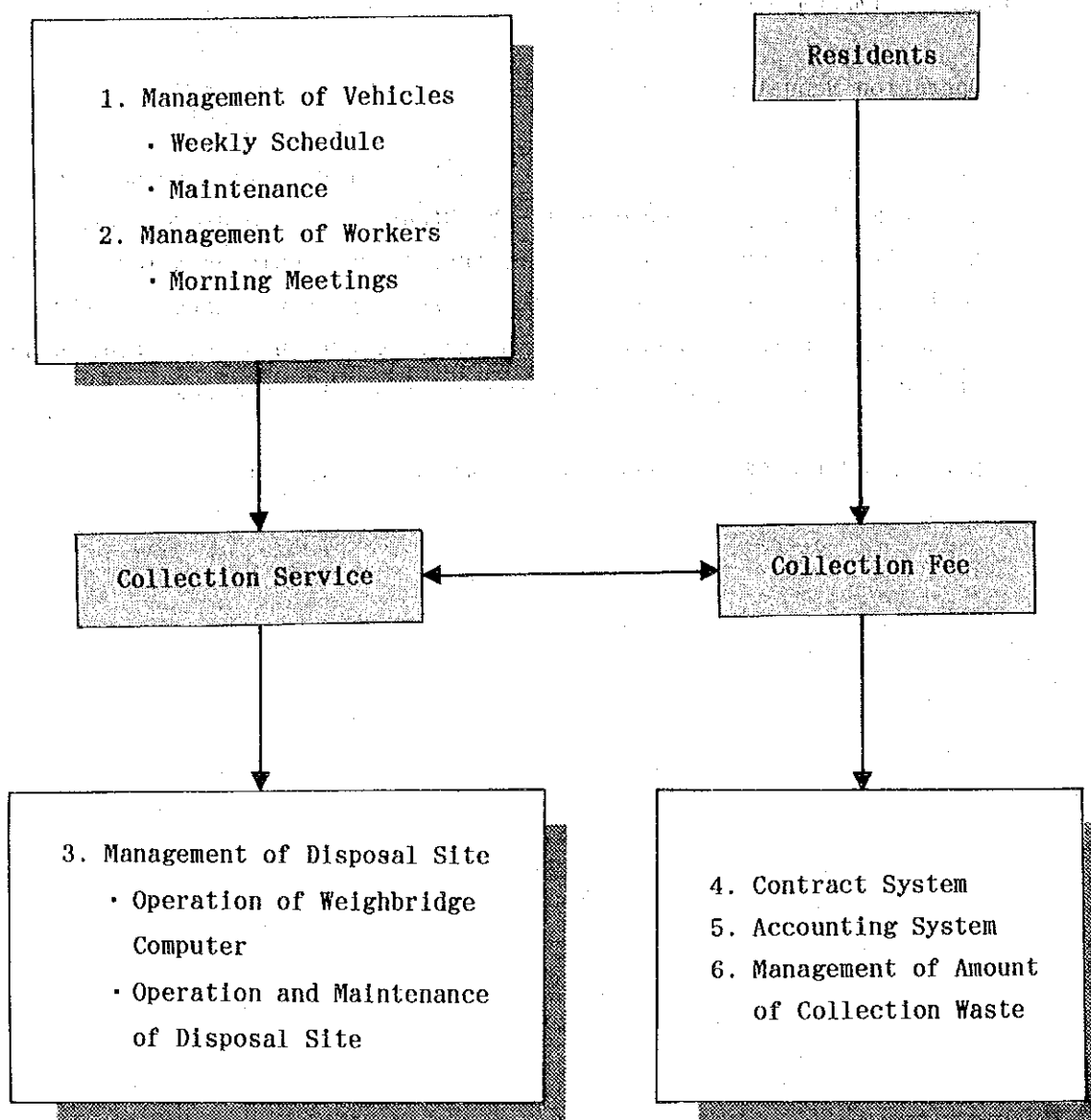


Fig. 12.1-1 Outline of Operation for SWM

## 12.2 Project Implementation Body and Schedule

### 1) Project Implementation Body

Solid waste management is currently conducted by DCTC, Vientiane Municipality, which is responsible for collection/cleansing and disposal. For successful project implementation, however, an Urban Services Department should be established. Since the State Government will not completely support the project implementation financially, Vientiane Municipality should provide the necessary funds and should supervise the implementation of the Project.

### 2) Implementation Schedule

A project implementation plan is proposed as shown in Fig. 12.2-1.

#### a. Implementation conditions

Implementation conditions for the Phase I Improvement Project are as follows:

- Design Target Year : 1995
- Service Commencement Year : 1995
- Subject Area : entire Vientiane urban area

#### b. Preparatory period

The following must be conducted in 1993.

- acquisition of investment funds and preparation of repayment plan;
- confirmation of facility construction site;
- preparation of detailed design and specifications for facilities as well as equipment/material; and
- selection of contractor (tender, evaluation and contract)

c. Construction schedule

The Project is mainly divided into the equipment procurement work and facility construction work and the following work periods are proposed:

- equipment/material procurement : 8 months after completion of contract
- maintenance shop construction : 12 months after commencement of construction work
- disposal site construction : 12 months after commencement of construction work

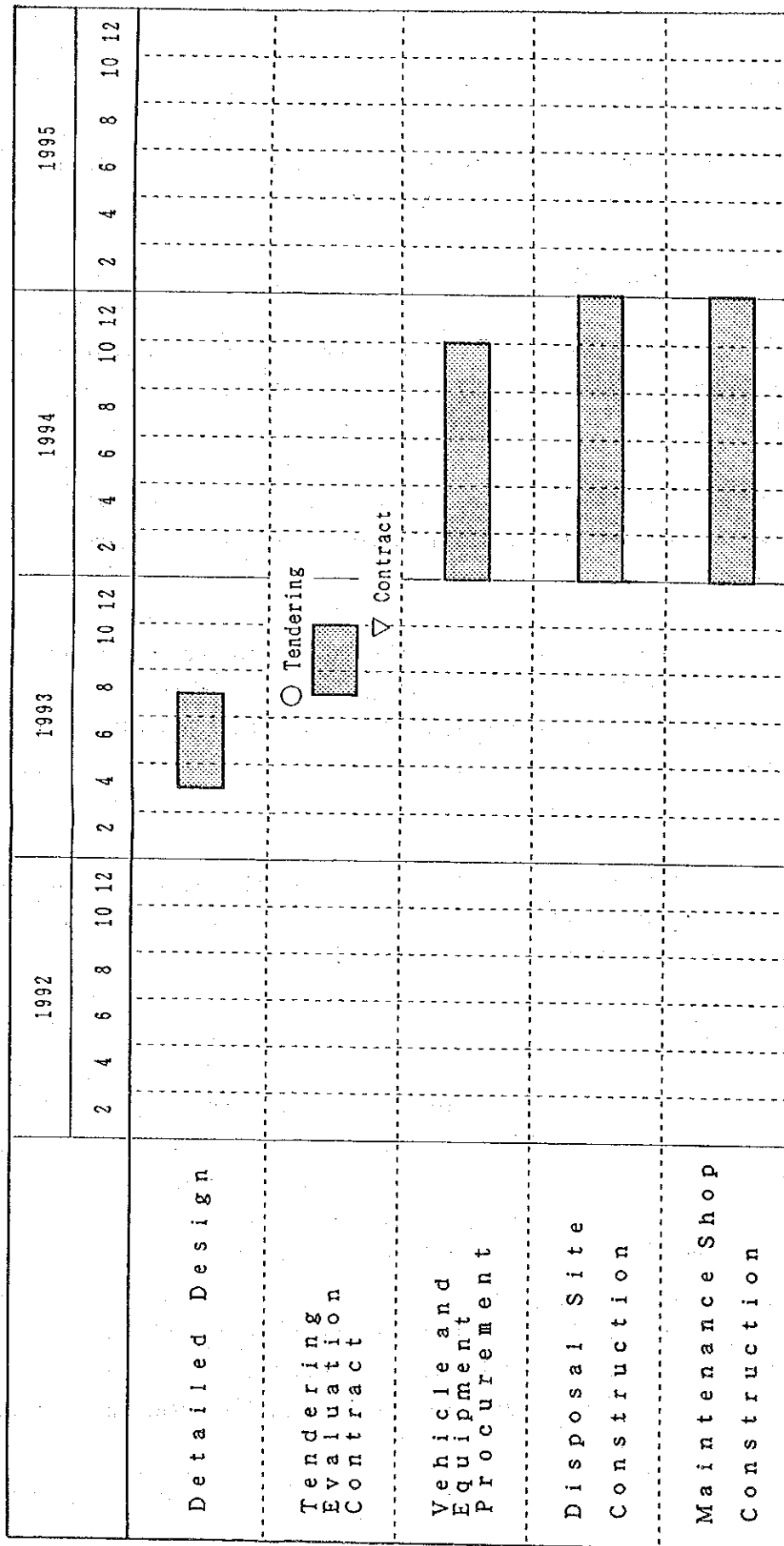


Fig. 12.2-1 Implementation Schedule

### 12.3 Financial Plan

The financial plan for the project implementation is described below based on the financial evaluation results.

#### 1) Required Fund/Capital

The investment cost and annual expenditure have been estimated based upon the project cost described in section 11.3 making the additional assumptions:

- a. The costs for engineering services and contingencies, which were not included in the financial analysis, shall be included in the financial plan.
- b. The investment and operation costs are estimated to increase at the rate of 3.0% per year, while a 5% annual increase in labour cost is assumed. The increase after 2000, however, will not be taken into consideration as the charging system will be revised and improved by then.
- c. Nominal interest rates ranging from 6% for long term loans and 11.5% for short term loans will be adopted. The interest rate for deposits will be 9.5%.

#### 2) Financial Resources

The capital required for the implementation of the project will be appropriated from the VM budget, internal fund reserved by profit and depreciation, and foreign aids. Long term foreign loan is not considered in this Feasibility Study Period due to the insufficient foreign currency holdings and the urgency for the improvement of SWM. Long term foreign loans will be taken into consideration, however, through the formulation of a cash flow after the construction of the final disposal site in 1997. The loan condition is assumed to be 20 years repayment with 3 years grace period. Furthermore, the repayment



of long term loan and its interest is assumed to be subsidized by VM budget.

The appropriation of financial sources is as follows:

Table 12.3-1 Financial Resources for Investment  
(unit : million Kips)

year	1994	1995	1996	Total
Project Budget of VM	-	81	83	164
Internal Fund Reserves	-	81	83	164
Grant	2,451	0	0	2,451
Total	2,451	162	166	2,779

If foreign aids are difficult to acquire, foreign loans shall be considered. However, the repayment terms to be adopted shall be similar to the mean external public borrowing in 1989, that is, a 40 years repayment term with a 20 years grace period, and a 0.6% interest rate.

The source of SWM operation cost will be the collection fees and the ordinary budget of VM.

The appropriation of finances from the 2 sources is shown in Table 12.3-2.

Table 12.3-2 Composition of Revenue

(unit : million Kips)

year	1995	1996	1997	Total
Fee Collection				
Basic Fee	241	311	380	932
Extra Fee	65	85	106	256
Special Fee	14	14	15	43
Tipping Fee	2	2	2	6
Sub-Total	322	412	503	1,237
VM Current Budget	129	133	137	399
Total	451	545	640	1,636

The fee tariff will be reviewed and increased in 1998. At the same time, it is necessary to examine the introduction of a new tax system for the municipality or the increase of the present land tax ratio, because it seems to be very difficult to increase the collection service ratio from 50% by 1995 to 100% by 2000 with the proposed collection fee system due to the existence of poor households.

### 3) Expenditures and Revenues

The cash flow for 2000 is made based on the above-mentioned assumption and shown in Table 12.3-4. The cross-subsidy, however, is not taken into consideration.

The table clearly shows that the balance will be in black figures in 1997 and then in red in 1998 due to the interest rates of foreign loans made for the construction of a full scale final disposal site (level 3) in 1997. By 2000, however, the balance will be in black again.

A total debt of 2,412 million kips will be accumulated in 2000. Since the internal fund reserve in 2000 will be 2,069 million kips, self-finance can be established completely in 2005, if VM covers half of the new investment.

The allocation of VM budget is as follows:

Table 12.3-3 Allocation of VM Budget for SWM (in case of Grant)  
(unit : million Kips)

year	1995	1996	1997	1998	1999	2000	Total
for investment* <sup>1</sup>	81	83	115	126	307	0	712
for public burden	129	133	137	143	158	164	864
for repayment of loan						151	151
for interest of loan				154	154	154	462
Total (A)	210	210	252	423	619	469	2,189
VM budget (B)* <sup>2</sup>	5,550	6,003	6,492	7,021	7,592	8,211	
A/B x 100 (%)	3.8	3.6	3.9	6.0	8.2	5.7	

Note:

\*1 : The investment for the purchase of collection vehicles is assumed to be subsidized by half from VM budget.

\*2 : VM budget is assumed to increase in accordance with the increase ratio of the GRDP plus inflation ratio of 3%.

Table 12.3-4 Balance Sheet and Cash Flow

## Balance Sheet

Unit : million Kips

Year	1994	1995	1996	1997	1998	1999	2000
Revenue							
Fee collection							
Basic fee		241	311	380	539	623	706
Extra fee		65	85	106	126	146	167
Special fee		14	14	15	25	26	27
Tipping fee		2	2	2	3	3	3
Budget from VM		129	133	137	143	158	164
Others		0	13	33	56	94	126
Sub total(A)	0	451	558	672	893	1050	1193
Expense							
Personnel							
Expenditure		43	56	69	96	114	135
Maintenance		37	45	53	61	69	78
Fuel & Others		152	169	187	205	223	241
Depreciation		305	325	347	489	522	557
Interest		0	0	0	154	154	154
Sub total(B)	0	536	596	656	1006	1082	1164
Balance	0	-86	-38	16	-113	-32	29

## Cash Flow

Unit : million Kips

Year	1994	1995	1996	1997	1998	1999	2000
Balance	0	-86	-38	16	-113	-32	29
Depreciation	0	305	325	347	489	522	557
Sub total(C)	0	219	287	363	376	489	586
Money Demand							
Investment	2451	161	166	2792	252	615	0
Loan							
Long Term	0	0	0	0	0	0	151
Short Term	0	0	0	0	0	0	0
Sub total	2451	161	166	2792	252	615	151
Money Supply							
Budget from VM							
for Investment	0	81	83	115	126	307	0
for Debt serv.	0	0	0	0	154	154	304
from Int.Fund	0	81	83	115	126	307	0
Foreign Aids	2451	0	0	0	0	0	0
Long Term Loan	0	0	0	2563	0	0	0
Short Loan	0	0	0	0	0	0	0
Sub total	2451	161	166	2792	406	769	304
Surplus of Money	0	138	204	248	404	336	740
Fund Reserves	0	138	342	590	994	1330	2069
Total of Debt	0	0	0	2563	2563	2563	2412

Note : Debt serv. includes repayment and interest for the long term loan for full scale disposal site(level 3)

## 12.4 Establishment of a Monitoring System

### 1) Necessity for the Establishment of a Monitoring System

Once the Municipality decides to commit itself to achieving the Basic Plan targets, it will be important to establish a system which will monitor closely the progress of improvements within the Municipality. Data obtained from monitoring will be used to evaluate the Municipality's performance, a means to assess its progress.

### 2) Personnel Responsible for Monitoring

In the Research & Development Section of the new department, i.e. USD, the following personnel should be involved in monitoring operations.

Table 12.4-1 Personnel to be Involved in Monitoring Operations

Work Outline	Personnel Responsible
Identification of useful indicators	Technician
Data-collection & compilation	Technician
Data-analysis, Evaluation of performance and formulation of action plans	Manager
Review of Basic Plan Targets based upon performance evaluation	Manager, Deputy Director and Director

### 3) Indicators to be Used

#### a. Selection of indicators

Selection of indicators are related to the Basic Plan targets.

The useful indicators are as follows:

Table 12.4-2 Principal and Supporting Indicators

Basic Plan Target	Principal Indicators	Supporting Indicators
a. Expansion of collection services	<ul style="list-style-type: none"> <li>• Percentage in terms of population</li> <li>• Amount of collection waste</li> <li>• Number of households contracted with DCTC</li> </ul>	<ul style="list-style-type: none"> <li>• Percentage in terms of area</li> <li>• Waste measured by weighbridge</li> <li>• Ledger for management of collection fee</li> </ul>
b. Cleansing activity through public cooperation	<ul style="list-style-type: none"> <li>• Percentage in terms of Bans</li> </ul>	<ul style="list-style-type: none"> <li>• Percentage in terms of area</li> </ul>
c. Upgrading of the Standard	<ul style="list-style-type: none"> <li>• Standard of sanitary landfill</li> </ul>	<ul style="list-style-type: none"> <li>• Amount of Scattering waste</li> <li>• Number of complaint by residents</li> </ul>
d. Strengthening of Organization	<ul style="list-style-type: none"> <li>• Collection service efficiency</li> </ul>	<ul style="list-style-type: none"> <li>• Number of personnel in USD</li> <li>• Unit cost of services per ton</li> </ul>
e. Securing financial resources for SWM	<ul style="list-style-type: none"> <li>• Collection fee</li> <li>• Tipping fee</li> <li>• Revenue and expenditure</li> </ul>	<ul style="list-style-type: none"> <li>• Ledger for management of collection fee</li> <li>• Accounting sheet</li> </ul>

The above table shows some of the useful indicators. It is important to distinguish principal indicators from supporting indicators, as shown in the above table. Whether a particular indicator is identified as a principal or supporting indicator depends on the purpose of the evaluation.

b. Definitions of indicators

One of the most serious problems with respect to performance-indicators arises when ways to measure performance are considered, i.e. the definition of indicators. For example, the unit-collection-cost differs greatly depending on the inclusion or exclusion of certain indirect costs such as administration-costs, assumed office-rent, cost of stand-by vehicles and paid insurance premiums, etc.

In view of the above, it is important for the Municipality to precisely define indicators, and to continually use the same definitions over a long period. This will enable the Municipality to compare past performances with the present.

It will also be very useful for Lao P.D.R. to develop a locally unified definition of indicators. The development of such definitions will enable the comparison of inter-municipal performances based on similar criteria.

# CHAPTER 13

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## RECOMMENDATIONS



## CHAPTER 13 RECOMMENDATION

### 13.1 Conclusion

#### 1) Major Findings and Problems Identified

- Based on the WACS, CCS and actual disposal amount observed by the weighbridge, the present waste stream in Vientiane urban area is identified as shown in Table 13.1-1.

Table 13.1-1 Waste Stream in Vientiane Urban Area in January 1992  
unit : ton/day

	Domestic Wastes	Commercial Wastes	Others* <sup>1</sup>	Directly Hauled	Total
Generation	107.5	21.5	9.4	2.4	140.8
Recycling	14.3	8.0	1.2	-	23.8* <sup>2</sup>
Self-disposal	88.9	10.5	0.4	-	99.8
Collection	4.3	3.0	6.6	3.5* <sup>3</sup>	17.4
Disposal	-	-	-	-	17.1* <sup>4</sup>

Note :

\*1 : Others include market wastes, office wastes, hospital wastes and road sweeping wastes.

\*2 : The figure includes the recycled amount by scavengers at KM 18-DS.

\*3 : Thong Khan Kham market collects and transports their own waste to KM 18-DS (1.1 ton/day).

\*4 : The figure excludes the recycled amount by scavengers at KM 18-DS.

- Discharge system of institutional wastes - markets, hospitals and governmental offices wastes - is not established.
- Present ratio of collection service coverage in the residential area and commercial area is very limited, at only 4.8% and 22.3%, respectively.
- According to the observation done by the weighbridge at KM 18-DS, the present collection capability of each sector is as follows:
  - . DCTC ; 6.1 ton/day ( 35% )
  - . Private Contractors ; 7.8 ton/day ( 45% )
  - . Direct Haul ; 3.5 ton/day ( 20% )
- In addition to the lack of collection capability, the present equipment used is old and dilapidated, and some seems to be out of order.
- There is no processing facility in the Study area. In view of the very limited financial resource, there seems to be less necessity for the introduction of a processing facility including a composting plant.
- Every aspect of the present KM 18-DS should be improved.
- Small scale illegal dumping and littering of waste are commonly seen in many places.
- All aspects of the present operation and maintenance system of equipment should be improved.
- There are various organizations concerned in solid waste management. However, the responsibilities and roles of these agencies are not clearly defined.
- The lack of sufficient and capable staff engaged in the solid waste management is also a serious problem.

- Although the regulation of Vientiane Municipality can be legally enforced on violators, in practice it is very weak because of a poor enforcement system.
- As compared in Table 13.1-2, the budget for solid waste management in Vientiane Municipality is insufficient, especially the budget for maintenance is not secured. Although fee collection is executed, money flow is not clear.

Table 13.1-2 Comparison of SWM Budget Share in Local Government Budget

Country or Municipality	SWM Budget Share
Vientiane	0.3 %
Japan	About 5.0 % in Average
Malaysia	About 30 ~ 40 % in Average
Manila	40 %

- The accounting system for solid waste management is not well established.
- According to the CCS conducted in 120 residences and 60 shops, more than 90% of the residences and shops not receiving collection services wish for services. (As for the breakdown, 50% is willing to pay 100 to 500 kips/month/household and 40% is less than 100 kips/month/household).
- Public cooperation is inadequate in Vientiane urban area and the major reasons behind this are as follows :
  - . Vientiane Municipality has not clearly and strongly specified the role of the public.
  - . The Municipality does not strongly exercise the laws and regulations.

. Inadequate public education for children at home and in schools.

## 2) Major Improvement Measures and Targets Proposed in the Basic Plan

### a. Improvement Measures

- Establishment of a self-sustainable solid waste management system.
- Provision of a collection service in the whole Vientiane urban area and establishment of a reliable collection system under which regular services can be provided.
- Construction of a sanitary landfill (Level 3) which employs sufficient measures for environmental protection.
- Establishment of efficient road sweeping, drain cleansing and grass cutting systems through public cooperation.
- Establishment of Beneficiary-Pay-Principle under which service recipients pay waste collection fees and tipping fees.
- Establishment of a specific organization responsible for SWM, which may be set up as a new Urban Service Department.
- Establishment of a stable financial system.

### b. Stepwise improvement plan

In view of the present defective SWM, especially with regard to its very limited financial resources, in order to achieve the goals and target of the Basic Plan, a stepwise improvement plan until 2000 is proposed in the following manner:

Category of Plan	Target Year
- Basic Plan	1992 ~ 2000
- Immediate Improvement Plan	Present to 1994
- Short Term Improvement Plan for Feasibility Study	1995 ~ 1997
- Medium Term Improvement Plan	1997 ~ 2000

c. Targets

Based on the stepwise approach, the following targets were set up.

i. collection service coverage

	Unit	1991	1995	2000
- Population	(Person)	142,700	163,100	192,800
- Service Population	(Person)	6,800	81,500	192,800
- Non-Service	(%)	95.2	50	0
Population	(Person)	135,900	81,500	0
- Collection Amount	(t/d)	13.9	68.3	148.2
by VM	(t/d)	(6.1)	(58.3)	(138.2)
by Private Co.	(t/d)	(7.8)	(10.0)	( 10.0)

ii. road sweeping, drain cleansing and grass cutting

	Unit	1991	1995	2000
- Cleansing Service by DCTC	(km)	15	15	15
- Cleansing Activity through (No.of Ban) 0			48	96
Public Cooperation			(50%)	(100%)
- Length of Road for	(km)	0	150	230
Sprinkling Water Truck			(65%)	(100%)

iii. final disposal

	Unit	1991	1995	2000
- Disposal Amount	(t/d)	17.1	72.3	152.9
- Sanitary landfill	(t/d)	0	72.3	152.9
- Ratio	(%)	0	100	100
- Level	Open Dumping Level 2 Level 3			

iv. strengthening of organization

	1991	1995	2000
- Responsible Organization	Cleansing Sec.	USD	USD
- Number of Personnel	67	197	366

v. Securing financial resources for SWM

Unit : million kips

	1991	1995	2000
- Fee Collection			
Basic fee	11.5	241	706
Extra fee	-	65	167
Special fee	-	14	27
Tipping fee	0.4	2	3
- Budget from VM	10.5	210	469
<b>Total</b>	<b>22.4</b>	<b>532</b>	<b>1,372</b>

3) Immediate Improvement Projects and Pilot Project

The immediate improvement projects and the pilot projects have been successfully implemented, and the workability of the following major plans proposed in the Basic Plan was proven:

- preparation of weekly and monthly working schedule;
- collection of data regarding amount of waste collected;
- stimulation of community cooperation for cleaning-up its surrounding;
- securing land and authorization of the KM 18-DS as a disposal site;
- improvement of basic knowledge of the DCTC operators and mechanics;
- execution of regular maintenance;
- assignment of the person in charge of planning and management;
- improvement of accounting system;

- improvement of fee collection system;
- collection of data for operational expenditure; and
- preparation of an education program for the primary school.

Immediate improvement projects and pilot project were proposed by the JICA Study Team and implemented by DCTC in cooperation with the Study Team. Through the implementation of those projects, the following were concluded.

i. Curb and bell collection system is cost-effective and workable in Vientiane in view of the results of the collection experiment executed by DCTC and Study Team in three collection experimental area. The system can provide efficient and reliable collection services.

ii. The following aspects were found out through the collection experiment taken over by DCTC:

- The number of contracted households was kept constantly at about 310 to 330. The proposed accounting system, operational system for the weighbridge and organization set up for the experiment have been well maintained for these four months (from March to June 1992).

- During the four months operation of collection experiment, proposed fee collection has been carried out successfully. Then the surplus of the experiment, which was drawn up from total revenue and expenditure including maintenance cost, summed up to 540,520 kips. This proved that DCTC would be able to replace the vehicle after 7 years according to the following calculation

$$540,520 \times 2 \times 3 \times 7 \text{ years} = 22,701,840 \text{ kips}$$



Note

\*2 ; Working days for week can be 5 days instead of 2.5 days

\*\*3 ; 12 months/4 months = 3

- In order to keep the Beneficiary-Pay-Principle, and maintain the number of the participants for the collection experiment and increase the number, the following measures are required:

. deletion of the contract marks on the baskets of the household who canceled waste collection service contract;

. continuous campaign and solicitation to the non-participants; and

. provision of punctual and reliable collection services.

iii. The weighbridge system is essential in analyzing, planning and managing waste collection and haulage.

iv. The experiment on sanitary landfill operation proved that the Municipality was capable of improving disposal standards with the equipment required for sanitary landfill.

v. As for the cleaning-up of roads, drains and public areas through public cooperation, the sanitary environment of the experimental areas could be improved in a step by step basis through further efforts such as the implementation of public campaigns and education, in order to achieve public cooperation in its cleansing services.

vi. Extension of the collection service to the whole population of the Vientiane urban area can be achieved by stepwise approach.

- vii. Establishment of a self-sustainable collection system shall be realized through the Beneficiary-Pay-Principal under which service recipients pay waste collection fee.

### 13.2 Recommendations

#### 1) First Priority Project

The first priority project proposed is feasible and its implementation by the year 1995 is recommended.

#### 2) Financial Source

Although the recurrent cost of the Vientiane SWM improvement project can be recovered, its initial investment cost has to be subsidized by the Central Government or financed by the donation of both bilateral and multilateral aid agencies. As such, Vientiane Municipality has to make every effort to acquire such assistance in order to successfully implement the project. As for the replacement of equipment, the procurement cost will be covered by the internal reserve.

#### 3) Examination of the reduction of the proposed collection fee (1000 kips/household/month)

By the year 1995, the proposed collection fee system shall be maintained and collection service ratio will be increased from 4.8% upto 50%. This target could be achieved by the expansion method proposed by the Study. It seems, however, to be very difficult to increase the ratio from 50% to 100% by 2000 due to the existence of the poor households. It shall be, therefore, necessary to reduce the proposed collection fee making up the deficit by means of the cross-subsidy through the introduction of a new tax system for the Municipality or the increase in the present land tax.

4) Stepwise Approach

In order to mitigate the financial burden, the proposed Basic Plan shall be implemented in a stepwise manner.

5) Setting-up Project Implementation Unit

In view of the large amount of work to be done for the implementation of the first phase projects, the Municipality should set up a project implementation unit which would be responsible for the systematic implementation of the project.

6) Continuance of Collection Experiment

Vientiane Municipality is requested to continue the collection experiment in order to improve their capability and to show the necessity of the project.

7) Urgent Replacement of Existing Dilapidated Vehicles

Vientiane Municipality is requested to take necessary measures for the continuation of the present collection service by the year 1995, such as the replacement of existing dilapidated vehicles.

8) Expansion of Curb and Bell Collection System

Curb and bell collection system being carried out by DCTC as a pilot project in the experimental areas should be expanded to all other residential and commercial areas as early as possible in order to make collection work more efficient.

9) Collection and Utilization of Data

Collection of relevant data is essential for the planning and evaluation of the existing situation and progress of solid waste management. Relevant data include waste amounts and composition which would change daily, seasonally and yearly. In this connection, weighbridge should be actively used.

10) Water Supply to the Surrounding Residences of the KM 18-DS.

The use of groundwater for drinking is not recommended because of the probable effect of leachate. It is, therefore, necessary to provide potable water to the surrounding area by the Municipality or Nampapa Lao.

11) Operation of KM 18-DS

The present KM 18-DS was improved and cleaned-up by the experiment on sanitary landfill operation and in order to maintain this, DCTC should prohibit dumping at the entrance of the site and instruct the incoming vehicle to dump their waste inside as much as possible.

12) Execution of Public and Educational Campaigns

Strong emphasis should be put on public participation in SWM in order to make up the insufficient physical and financial resources of both service supplier (Vientiane Municipality) and service user (residents).

Vientiane Municipality is, therefore, requested to conduct public and educational campaigns in order to achieve public cooperation. For this purpose, tools prepared by the Study Team, i.e. a video tape, drawing boards and educational pamphlet, shall be efficiently used.

### 13) Encouragement of recycling activities

The recycling of domestic and commercial waste at the generation sources is well established. Wastes are segregated into waste for discharge, food waste to be used as domestic animal, mainly livestock feed, reusable materials for recycling, and self-disposable waste. The Vientiane Municipality should encourage these source separation and recycling activities.

### 14) Establishment of a Monitoring System

Once the Municipality decides to commit itself to achieving the Basic Plan targets, it will be important to establish a system which will monitor closely the progress of improvements within the Municipality. Data obtained from monitoring will be used to evaluate the Municipality's performance, a means to assess its progress. The establishment of a monitoring system is, therefore, recommended.

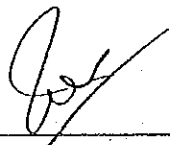
# APPENDICES

Appendix 1 Scope of Work

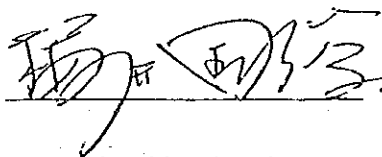
SCOPE OF WORK  
FOR  
THE STUDY ON THE SOLID WASTE MANAGEMENT SYSTEM IMPROVEMENT PROJECT  
IN  
VIENTIANE  
OF  
LAO PEOPLE'S DEMOCRATIC REPUBLIC

BETWEEN  
JAPAN INTERNATIONAL COOPERATION AGENCY  
AND  
THE VIENTIANE MUNICIPALITY

VIENTIANE, OCTOBER 22, 1990



Mr. Phila KHANKHONPHANH  
Acting Director of  
Department of Communication,  
Transport and Construction  
the Vientiane Municipality



Dr. Kunitoshi Sakurai  
Leader of  
Preliminary Survey Team,  
Japan International  
Cooperation Agency

## I. INTRODUCTION

In response to the request of the Government of Lao People's Democratic Republic (hereinafter referred to as "the Government of Lao") the Government of Japan decided to conduct the Study on the Solid Waste Management System Improvement Project in Vientiane (hereinafter referred to as "the Study"), in accordance with the relevant laws and regulations in force in Japan.

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programmes of the Government of Japan, will undertake the Study, in close cooperation with the authorities concerned of the Government of Lao.

The present document sets forth the Scope of Work for the Study.

## II. OBJECTIVES OF THE STUDY

The general objective of the Study is to contribute to the development of solid waste management system in Vientiane with the aim to improve and safeguard public health and protect environmental quality.

The principal objective of the Study is to formulate a basic plan on the solid waste management system improvement project, identify the first priority project, and conduct a feasibility study on the first priority project.

## III. OUTLINE OF THE STUDY

### 1. Study Area

The Study area for the basic plan shall cover the Vientiane urban area in the year 2000. It is approximately 30 Km<sup>2</sup> and is shown in the Attached map (Appendix 1). The Project area for the feasibility study will be selected based on the result of the basic plan study.

### 2. Study Wastes

The Study wastes for the basic plan shall cover domestic wastes, commercial wastes, street sweeping wastes and institutional wastes (schools, hospitals and markets).





### 3. Target Year

The basic plan shall cover the period from the year 1992 to 2000.

### 4. Study Framework

The Study comprises of the following two (2) phases

Phase 1: 1) Collection and review of existing data and information,

2) Preparation of the basic plan of the solid waste management system improvement project, and

3) Identification of the first priority project.

Phase 2: The feasibility study on the first priority project

### 5. Study Items

5-1 Phase 1: Collection and review of existing data and information, preparation of the basic plan of the solid waste management system improvement project, and identification of the first priority project.

#### 5-1-1 Collection of data and existing documents

- a. Meteorology and hydrology
- b. Topography
- c. Geology
- d. Water quality
- e. Land use
- f. Population
- g. City development plan
- h. Road-traffic system
- i. Quantity and quality of solid wastes
- j. Collection, transportation and disposal method of solid wastes
- k. Equipment
- l. Recycle and reuse of solid wastes
- m. Tariff system and financial condition
- n. Organization and manpower
- o. Laws and regulations
- p. Existing plan
- q. Others

5-1-2 Field survey

- a. Solid waste collection, transportation and disposal in sample area
- b. Geology, water quality and land use in existing dumping area and future landfill site
- c. Sampling and analysis of solid wastes

5-1-3 Analysis of existing conditions and identification of problems

5-1-4 Review of existing plans

5-1-5 Confirmation of the planning framework

- a. Future waste quantity and quality
- b. Planning criteria and pre-conditions
- c. Determination of future system components based on the comparative analysis of alternatives
- d. Selection of the best combination based on the comparative study

5-1-6 Preparation of a basic plan

- a. Collection and transportation plan
- b. Disposal plan
- c. Land use plan
- d. Main facility plan
- e. Cost estimation
- f. Organization and financial plan
- g. Evaluation
- h. Implementation plan

5-1-7 Selection of the first priority project

5-2 Phase 2: The feasibility study for the first priority project

5-2-1 Collection of additional data

5-2-2 Field survey

- a. Topographic survey
- b. Geological survey
- c. Water quality survey
- d. Land use survey



5-2-3 Confirmation of planning framework

- a. Target year
- b. Project area
- c. Quantity and quality of waste
- d. Service level
- e. System components

5-2-4 Conduct of solid waste management experiments

5-2-5 Preliminary design of systems and main facilities

5-2-6 Investigation of necessary equipment

5-2-7 Cost estimation

5-2-8 Regulation, organization and manpower

5-2-9 Project evaluation

- a. Economic evaluation
- b. Financial evaluation
- c. Social and environmental evaluation
- d. Total evaluation

5-2-10 Implementation plan

IV. SCHEDULE OF THE STUDY

The Study will be performed in accordance with the tentative study schedule drawn in the Appendix 2.



## V. REPORTS

JICA will prepare and submit the following reports in English to the Government of Lao.

1. Inception Report;

Twenty (20) copies at the commencement of the field survey in Lao

2. Progress Report;

Twenty (20) copies within four (4) months after commencement of the Study.

3. Interim Report;

Twenty (20) copies within six (6) months after commencement of the Study.

4. Draft Final Report;

Twenty (20) copies within eleven (11) months after commencement of the Study.

The Vientiane Municipality shall provide JICA with its comments within one (1) month after the receipt of the Draft Final Report.

5. Final Report;

Fifty (50) copies within two (2) months after JICA's reception of the said comments on the Draft Final Report.

## VI. UNDERTAKINGS OF THE GOVERNMENT OF LAO

1. To facilitate smooth conduct of the Study, the Government of Lao shall take the following necessary measures;

(1) To secure the safety of the Japanese Study Team for the Study (hereinafter referred to as "the Team");

(2) To permit the members of the Team to enter, leave and stay in Lao for the duration of their assignment therein, and exempt them from alien registration requirements and consular fees;

- (3) To exempt the members of the Team from taxes, duties and other charges on equipment, machinery and other materials brought into Lao for the conduct of the Study;
  - (4) To exempt the members of the Team from income tax and other charges of any kind imposed on or in connection with any emoluments or allowances paid to the member of the Team for their services in connection with the implementation of the Study;
  - (5) To provide necessary facilities to the Team for remittance as well as utilization of the funds introduced into Lao from Japan in connection with the implementation of the Study;
  - (6) To secure permission for entry into private properties or restricted areas for the conduct of the Study;
  - (7) To secure permission for the Team to take all data and documents (including photographs and maps) related to the Study out of Lao to Japan; and
  - (8) To provide medical services as needed. Its expenses will be chargeable on members of the Team.
2. The Government of Lao shall bear claims, if any arises against the members of the Team resulting from, occurring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Team.
  3. The Vientiane Municipality shall act as counterpart agency to the Team and also as coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

4. The Vientiane Municipality shall, at its own expense, provide the Team with the following, in cooperation with other relevant organizations concerned, if necessary:

- (1) Available data and information related to the Study;
- (2) Counterpart personnel and support staff necessary for the Study;
- (3) Suitable office space; and
- (4) Credentials or identification cards.

#### VI. UNDERTAKINGS OF JICA

For the implementation of the Study, JICA shall take the following measures:

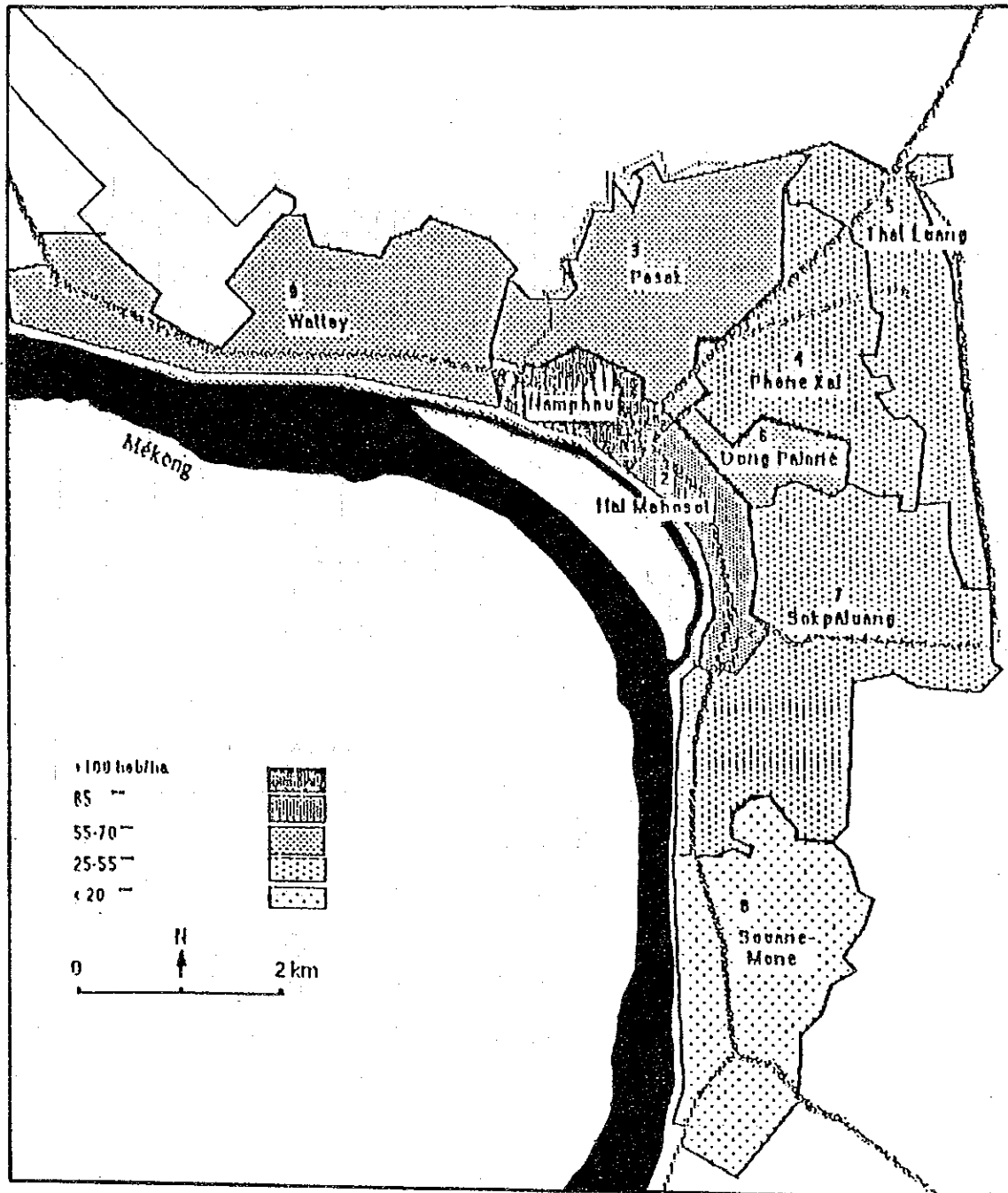
1. To dispatch, at its own expense, the Team to Lao People's Democratic Republic; and
2. To perform technology transfer to the Lao counterpart personnel in the course of the Study.

#### VII. CONSULTATION

JICA and the Vientiane Municipality will consult each other in respect of any matter that may arise from or in connection with the Study.



APPENDIX 1



VIENTIANE: ZONES HOMOGENES

## TENTATIVE WORK SCHEDULE

Phase	← Phase 1 →					← Phase 2 →										
Month in Order	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Works in Laos	▬					▬					▬					
Works in Japan	▬			▬					▬			▬				
Reports	△ Ic/R		△ P/R		△ It/R							△ DF/R	△ F/R			

## (Remarks)

Ic/R : Inception Report

P/R : Progress Report

It/R : Interim Report

DF/R : Draft Final Report

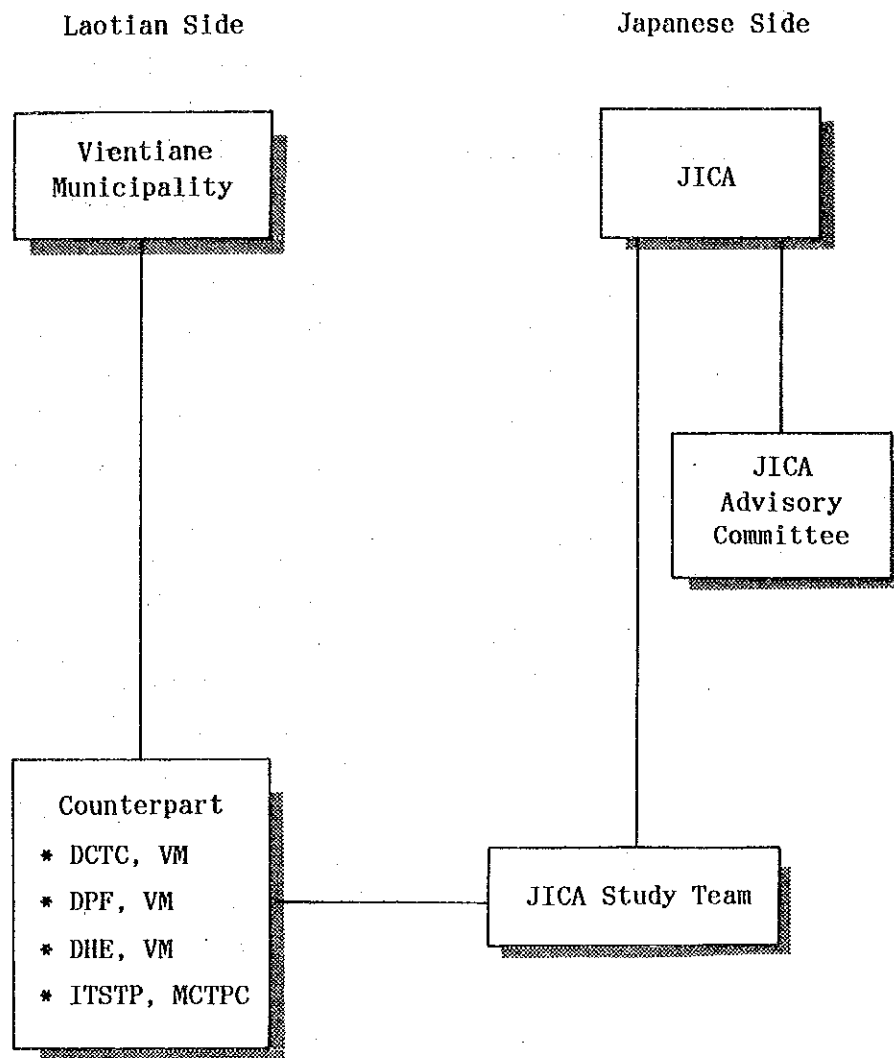
F/R : Final Report



## Appendix 2 Study Organization and Persons Involved

### 2.1 Study Organization

The Study was conducted under the organization as shown in the Figure belows:



## 2.2 Persons Involved

### 1) Members of Laotian Executive Committee

Mr.Say PHAKASOUM	Director of DCTC, VM
Dr.Phouthong SENGAKHOM	Deputy Director of DCTC, VM
Mr.Chanheuung THIPAVONG	Chief of Planning and Statistics Section, DPF, VM
Mr.Dapkeo DOUANGPRACHANH	Chief of External Economic Relation Section, DCTC, VM Project Manager
Mrs.Siphone SOUKHAPHOL	Chief of External Economic Relation Section, Department of Industry, Commerce and External Economic Relation, VM
Mr.Chanthavinh KEOPANYA	Officer of DCTC, VM
Mr.Daokham SENEMUANG	Officer of DCTC, VM
Mr.Oudone VATTANAXAY	Officer of DCTC, VM
Mr.Bounthong KEOHANAM	Head Engineering Section, ITSTP, MCTPC
Dr.Sayamang NANTHANAVONE	Chief of Hygiene and Epidemiology Center, DPH, VM
Mr.Oudom PHONGPASEUT	Head of Cleansing Section, DCTC, VM
Mr.Khambay CHALEUN	Deputy Director of DPF, VM

### 2) Members of JICA Advisory Committee

Dr.Kunitoshi SAKURAI	Chairman Environmental Sanitation Specialist of JICA
Mr.Yoshiki SATO	Member Deputy Director of Facility Division, Environmental Cleaning Project Bureau, Yokohama City
Mr.Yoshihiro NISHIMURA,	Study Coordinator Social Development Cooperation Department, JICA

### 3) Members of the Study Team

Mr.Takao YOSHIDA	Project Manager
Mr.Susumu SHIMURA	Processing and Disposal Planner
Mr.Kouji KUSUNOKI	Collection and Haulage Planner
Dr.Sap DEJVONGSA	Organizational and Institutional Planner
Mr.Kozo BABA	Economic and Financial Analyst
Mr.Susumu USHIDA	Equipment Operation and Maintenance Planner
Mr.Precha CHUNTAKORN	Translator

JICA