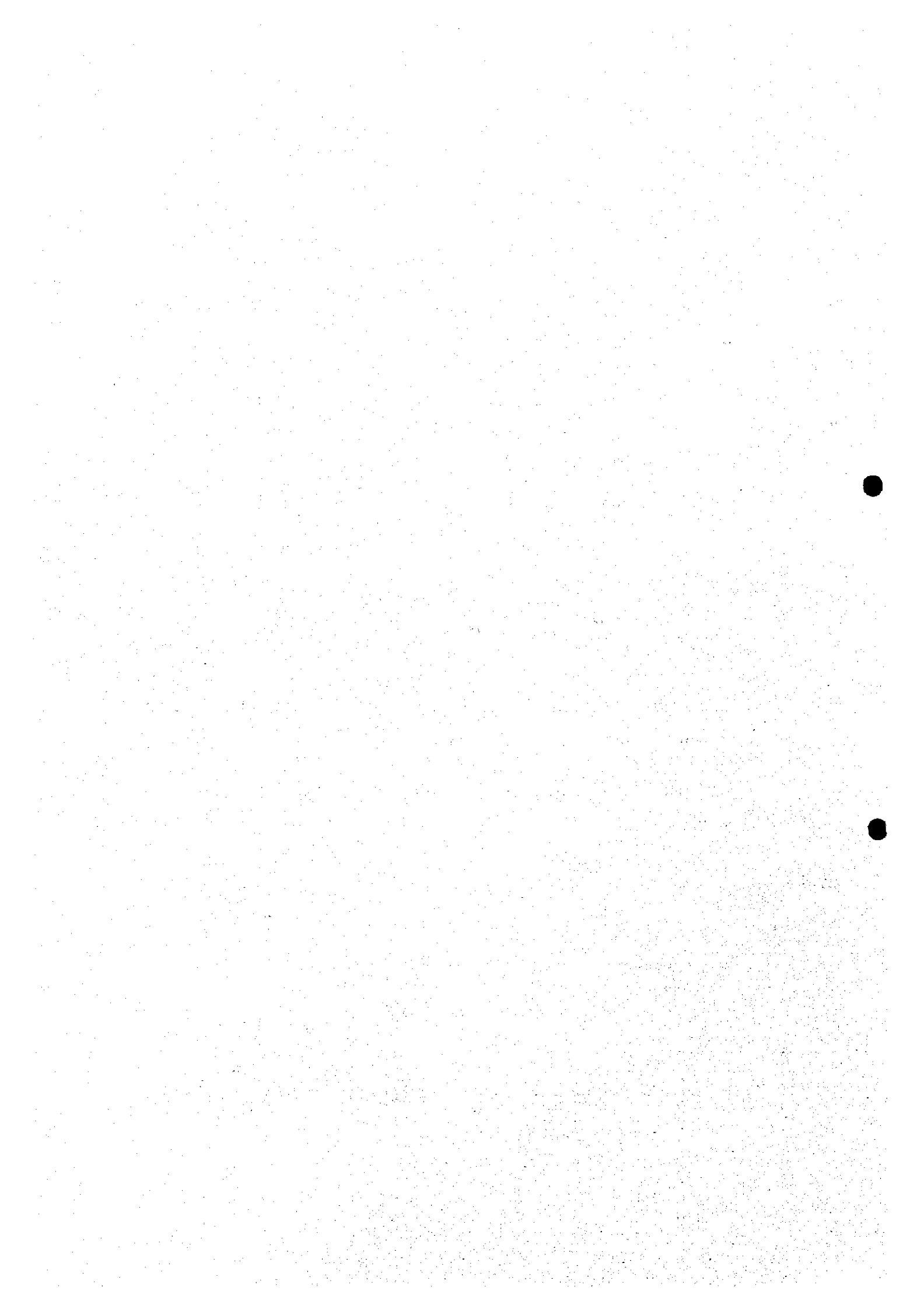


**CHAPTER 14**

**PROJECT EVALUATION**



## Chapter 14 Project Evaluation

### 14.1 Economic Evaluation of Urban Drainage System Improvement Work

#### 14.1.1 Economic Benefit

Following table shows a summary of economic benefit for the Urban Drainage System Improvement Works as a priority Project in HCMC.

Average Annual Benefit of Targeted Zone of Priority Project

(billion VND)					
Direct benefit			Indirect benefit		
Benefit items	Base year	2020	Benefit items	Base year	2020
Buildings/movables	118.06	185.80	Business suspension losses	17.90	17.34
Public facilities	1.14	2.19	Income losses of workers	0.63	1.22
Agricultural crops	0.51	0.26	Saving amount of medical cost	0.64	1.28
			Navigation benefit	10.79	18.16
<b>Total</b>	<b>119.71</b>	<b>188.25</b>	<b>Total</b>	<b>29.96</b>	<b>38.00</b>

(Note) The base year means the year 1998.

#### 14.1.2 Economic Cost

The estimated annual economic costs for construction together with its financial costs are summarized as below:

Economic Cost for Urban Drainage System Improvement Works

(Billion VND)										
Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
<b>Financial cost</b>										
1 <sup>st</sup> phase	169.5	154.7	216.2	216.2	216.2	69.8				1,042.5
2 <sup>nd</sup> phase						43.4	208.2	204.2	109.9	565.7
<b>Total</b>										<b>1,608.2</b>
<b>Economic cost</b>										
1 <sup>st</sup> phase	165.9	131.8	178.4	178.4	178.4	54.3				887.2
2 <sup>nd</sup> phase						40.7	160.9	157.4	85.8	444.8
<b>Total</b>										<b>1,332.0</b>

Economic costs for operation/maintenance (OM cost) at sums of VND5.7 billion for 1<sup>st</sup> phase and VND0.2 billion for 2<sup>nd</sup> phase both per annum, and economic replacement cost at sums of VND57.1 billion for 1<sup>st</sup> phase and VND77.1 billion both consisting of replacement costs of facilities and OM vehicles are estimated by work items. This cost for OM will be a burden to the Project until the end of the project life of 50 years after completion first phase works of the drainage system improvement. It is assumed that replacement works will be made every 20 years interval.

#### 14.1.3 Economic Viability of Urban Drainage System Improvement Works

The evaluation is made using cash flows based on the above benefit and cost, and results are summarized below:

### Results of Economic Evaluation for Urban Drainage System Improvement Works as a Priority Project

Zone	Net present value(VND10 <sup>5</sup> )	EIRR(%)	B/C
Targeted Zone of Priority Project	557.0	18.77	1.66

The EIRR resulted at 18.77 % as shown in the above table has cleared the level of 10 % of discount rate applied in this study with enough allowance, so it may say that the priority Project has a viability to be executed from an economical viewpoint.

#### 14.1.4 Sensitivity Test of Urban Drainage System Improvement Works

The economic internal rate of return (EIRR) changes its value depending on the parameters employed for the calculation. Out of these parameters, the construction cost of the Project and its benefit are the most important determinants of the economic analysis.

Therefore, a sensitivity analysis is made for 16 combined cases including base case under the benefit of -5 %, -10 % and -15 %, and the cost of +5 %, +10 % and +15 % taking into account of fluctuation of the benefit and the cost to be likely to come at present economic situation in Vietnam.

The EIRR under both the benefit and the cost in base case is calculated as 18.77 % as mentioned above. And, under the cases of (1) the benefit of 5 % decrease and the cost of 5 % increase, (2) the benefit of 15 % decrease and the cost of 15 % increase and (3) the benefit of 15 % decrease and the cost of 15 % increase, the EIRRs are calculated as 16.56 %, 14.61 % and 12.89 % respectively.

It means that the drainage system improvement works as a component of the Project has a high viability to be executed from a viewpoint of the result of the sensitivity test.

#### 14.2 Economical and Financial Evaluations for Sewerage System Improvement Works

##### 14.2.1 Economic Evaluation

From the socio-economic point of view, the benefit of this sewerage development project is expected to be tremendous, but it is rather difficult to quantify them while it is surly and visible. Some of them are identified as follows:

- To improve water environments of Tau Hu, Ben Nghe and Doi, Te canals
- To improve water quality of Saigon River
- To contribute reduction of waterborne diseases contraction ratio

#### 14.2.2 Financial Evaluation

##### (1) Recommended Tariff System to be Applied for Financial Evaluation

For the priority project as the Feasibility Study stage level, a tariff system based on "VND12,500/HH.month" basis is assumed to be the reasonable one taking economic activities of targeted zone into account.

In this case, the recommended tariff system will become as indicated below:

- |       |                |   |                          |
|-------|----------------|---|--------------------------|
| (i)   | For residence  | : | VND 12,500/HH.month      |
| (ii)  | For commercial | : | VND 51,100/shop.month    |
| (iii) | For industry   | : | VND 22,800/factory.month |

Based on the above mentioned tariff system, the financial benefit is estimated as shown in the Table hereunder. In this case, a treatment capacity is designed until 2010 according to the design criteria for this Feasibility Study stage. And the works will be executed stage-wise as the works of Phase-1 and that of Phase-2.

Service area in each phase consists of District-1, District-3, a part of District-5, and a part of District-10 for the works of Phase-1, and service area of Phase-2 covers District-4, the other part of District-5, District-6, District-9, the other part of District-10, District-11, and Tan Binh District.

Service population in 1998 (the base year) and 2010 for the works of Phase-1 are 392,988 people and 386,970 people respectively, and those in 2010 for the works of Phase-2 are 1,421,778 people.

The estimated financial benefit is shown in the following Table together with the estimation process:

### Estimation of Revenue of Sewerage Treatment Services

Item	1997	1998	2010
<b>After completion of 1st phase works:</b>			
Revenue Sources:			
Population in the service area	393,927	392,988	386,970
Domestic subscribers for potable water (HHs) <sup>1)</sup>	68,989	68,825	67,771
Actual number of subscribers for services (HHs)	35,053	34,970	34,434
Commercial subscribers for potable water (shops) <sup>2)</sup>	33,936	33,855	33,336
Industrial subscribers for potable water (factories) <sup>3)</sup>	2,249	2,243	2,160
Estimation of Revenue (financial benefit) <sup>4)</sup> :			
Domestic subscribers (HHs) (million VND)		5,245	5,165
Commercial subscribers (shops) (million VND)		20,760	20,442
Industrial subscribers (factories) (million VND)		614	591
<b>Total</b>		<b>26,619</b>	<b>26,198</b>
<b>After completion of 2nd phase works:</b>			
Population in the service area	1,468,703		1,421,778
Domestic subscribers for potable water (HHs) <sup>1)</sup>	257,216		248,998
Actual number of subscribers for services (HHs)	130,691		126,516
Commercial subscribers for potable water (shops) <sup>2)</sup>	126,525		122,482
Industrial subscribers for potable water (factories) <sup>3)</sup>	8,384		7,936
Estimation of Revenue (financial benefit) <sup>4)</sup> :			
Domestic subscribers (HHs) (million VND)			18,977
Commercial subscribers (shops) (million VND)			75,106
Industrial subscribers (factories) (million VND)			2,171
<b>Total</b>			<b>96,255</b>
(Note 1) Average family size:	5.71 (persons/family)		
(Note 2) % of HHs engaging in Trading and Services:	49.19% (see Table K 2.16)		
(Note 3) Refer to the result of Master Plan study in previous clause.			
(Note 4) Unit service charge by subscriber:			
Domestic subscribers:	150,000 (VND/annum HH in case of VND12,500/month HH)		
Commercial subscribers:	613,200 (VND/annum shop in case of VND51,100/month shop)		
Industrial subscribers:	273,600 (VND/annum factory in case of VND22,800/month factory)		

## (2) Financial Cost for Sewerage System Improvement Works

The estimated financial construction costs are summarized as below:

### Financial Cost for Sewerage System Improvement Works

Year	(Billion VND)											
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Financial cost												
1 <sup>st</sup> phase	133.2	193.2	310.2	441.9	441.9	310.2						1,830.7
2 <sup>nd</sup> phase						90.9	403.0	624.6	624.6	624.6	292.1	2,659.8
<b>Total</b>												<b>4,490.5</b>

Financial costs for operation/maintenance (OM cost) at sums of VND19.9 billion for 1<sup>st</sup> phase and VND46.2 billion for 2<sup>nd</sup> phase both per annum, and replacement cost at sums of VND155.4 billion for the proposed treatment plant and VND83.3 billion for pumping station for 1<sup>st</sup> phase, and VND392.5 for the plant and VND12.6 billion for the pumping station are estimated by work items. This cost for OM will be a burden to the Project until the end of the project life of 50 years after completion of the 1<sup>st</sup> phase of the sewerage system improvement. It is assumed that replacement works will be made every 20 years interval, so the replacement cost is annualized as reservations for them.

(3) Financial Evaluation for Sewerage System Improvement Works

(i) Financial Availability to Cover the Construction Cost and OM Cost by Service Charge Only

For the financial evaluation to cover the construction cost, operation and maintenance cost and replacement cost by service charge only, it is assumed that the basic tariff system will be revised with 2.5 % per annum for the future.

Under the assumption mentioned above, the evaluation is made using cash flows as shown in Table 14.1 based on the above benefit and cost aiming at being made clear whether a revenue from the said tariff will be recover the financial cost or not. Resulted FIRR is 1.20 %. It means that the Project is not sound financially in the case of including the initial investment cost.

(ii) Sensitivity Analysis

A sensitivity analysis is made under the condition of 25 combined cases including base case for the resulted FIRR as mentioned-above as: (1) benefit in increase by 5 % and 10 %, and in decrease by 5 % and 10 % too, and also (2) cost in decrease by 5 % and 10 %, and increase by 5 % and 10 %. Following Table shows its result.

Cost	Benefit				
	+10 %	+5 %	Base	-5 %	-10 %
-10 %	2.33	2.07	1.79	1.50	1.20
-5 %	2.03	1.76	1.49	1.20	0.89
Base	1.74	1.47	1.20	0.91	0.60
+5 %	1.46	1.20	0.92	0.63	0.32
+10 %	1.20	0.93	0.65	0.36	0.05

As indicated above, even in the most optimistic case in benefit of 10 % increase and cost of 10 % decrease, the Project is not financially sound.

(iii) Financial Availability to Cover OM Cost and Replacement Cost by Service Charge

In the case mentioned above the financial annual OM cost including a reservation of replacement of some facilities mentioned above is estimated as VNĐ31.8 billion after completion of the 1<sup>st</sup> phase works and as VNĐ98.2 billion per annum after completion of the whole works. Under the same assumption for tariff revision mentioned above, a comparison between the OM cost including the replacement cost and the revenue is made as shown in Table 14.2. The resulted B/C has come 1.81 as indicated in the same Table.

(4) Repayability Analysis for Sewerage Development Project

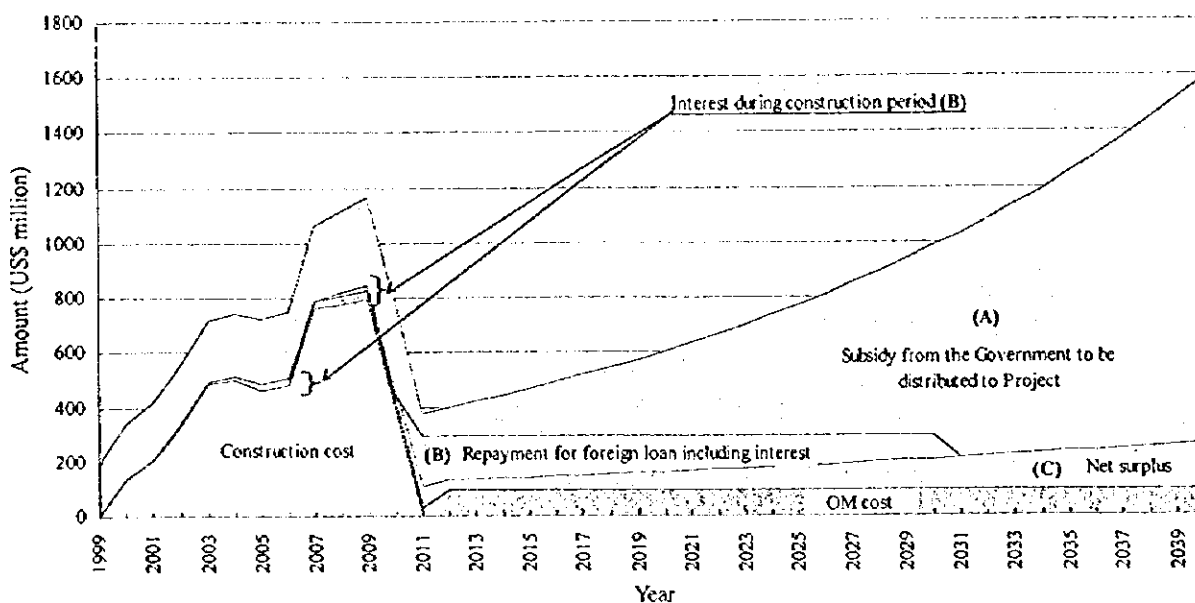
Under the conditions as:

- i) VNĐ12,500/HH.month as a basic charge is applied for commercial operation of waste water treatment plant and other facilities for waste water treatment services,
- ii) an interest rate of 1.3 % is assumed for repayment of loan amount,
- iii) total repayment period of the loan is assumed at 30 years from starting year of the works including 10 years of grace period, and

- iv) the total distributed or subsidized capital expenditure to Ho Chi Minh City from the central Government is assumed at 10 % of the national capital expenditure as same condition as in Ha Noi, and 10% of it is assumed to be able to use for the Project,

a repayability analysis is made as shown in Table 14.3 and illustrated as follows:

**Repayability of Revenue for Loan for the Sewerage System Improvement Works**



In the above illustration, an area (A) shows an amount of annual total subsidy from the Government to be distributed to the Project, but the actual subsidized amount to be used for repayment of loan with its interest is only the amount shown in the other area (B).

The area (C) shows an amount of surplus for the Project executing body dealing with the operation and maintenance services for the said facilities concerned.

As shown in the above illustration, it is cleared that HCMC and the Government can completely repay their whole loan amount consisting for the sewerage system improvement works as priority Project amounting to a sum of VND5,107 billion including a contingency for price escalation until the end of the whole works.

(5) Tariff System to Recover the Whole Works of the Sewerage Development Project

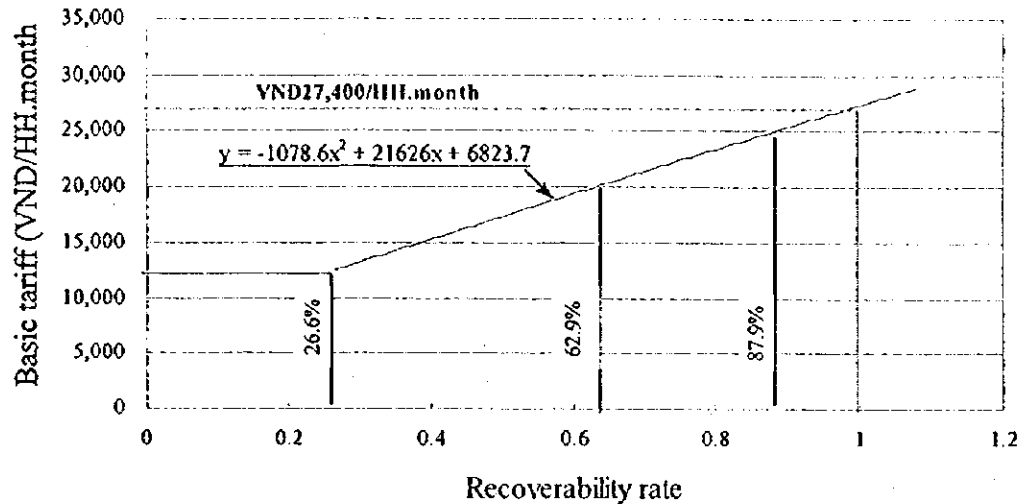
In the case of using VND12,500/HH.month as a basic charge, a recoverability rate of the revenue to the repayment including interest during the repayment period is 26.6 %. If VND20,000/HH.month and VND25,000/HH.month are applied, the recoverability rates are calculated at 62.9 % and 87.9 % respectively to the total repayment amount as a result of trial



calculation of recoverability.

A relationship between the said basic charges and the recoverability rates is illustrated as below:

**Relationship between Basic Tariff and Recoverability Rate**



As indicated in the above figure, the said relationship is expressed as “ $y = -1,078.6x^2 + 21,626x + 6,823.7$ ”. If a recoverability rate of “1.00” (= 100 %) is inserted for  $x$ , resulted basic charge “ $y$ ” is “VND27,400/HH.month”. It means that the justifiable tariff system is VND27,400/HH.month/HH system. Namely, this is a recommendable tariff to recover the whole Project costs.

Accordingly, a recommendable tariff system becomes as:

- (i) For residence : VND 27,400/HH.month
- (ii) For commercial : VND 111,800/shop.month
- (iii) For industry : VND 49,900/factory.month

This recommendable tariff system is within the ATP of VND30,000/HH.month as mentioned above. Therefore, if the Ho Chi Minh City has a plan to set this tariff system, people living in the City have enough affordability to pay as a service charge for the waste water treatment services.

### 14.3 Social Evaluation

The urban drainage improvement and sewerage development project is to be executed to advance the basic infrastructure, to improve the existing environmental conditions and to enhance the development potential of HCMC. Accordingly, the proposed Priority Project will give socially positive impacts, and the direct adverse effects by the Project will be localized and

short term in comparison with the necessity and benefits of the Project.

The social impacts of the Project are likely as follows:

- (a) Built-up area of about 7.4 km<sup>2</sup> having vulnerable population of about 185,000 in the central part of HCMC will be safe from the internal flood of at least 2-year return period, after completion of rehabilitation of existing combined sewers.
- (b) Pump drainage area of 1.32 km<sup>2</sup> having vulnerable population of about 28,000 in the fringe area of HCMC will be safe from the internal flood of 5-year return period and the external flood of 100-year frequency.
- (c) Low-lying area below EL +2.0 m of about 9.2 km<sup>2</sup> in Tau Hu - Ben Nghe catchment area will be protected from the external flood of 100-year frequency after completion of Tau Hu - Ben Nghe canal improvement.
- (d) Navigation condition of Tau Hu - Ben Nghe canal will be highly improved, especially, waiting time during low water level will be reduced from 7 to 2 hours after completion of the canal improvement.

#### 14.4 Environmental Evaluation

- (a) At present about 58,750 kg BOD/day of pollution load is being discharged to Tau Hu - Ben Nghe - Doi - Te canals. Water quality of the canal is same as that of raw wastewater with BOD of 100 - 300 mg/l and fecal coliform 1.5 E+06 MPN/100ml. Water-borne disease cases in District 6 and 8 were 16 and 32 for 100,000 persons respectively in 1997. Water quality of Saigon River at Nha Rong where it receives untreated wastewater from Tau Hu - Ben Nghe - Doi - Te canals is also deteriorated considerably with BOD as high as 30 - 75 mg/l. If the present situation of indiscriminate discharge of wastewater without any treatment continues, daily BOD load of 71,100 kg in 2010 and 83,400 kg in 2020 will be discharged. It is obvious that these phenomena will aggravate river water quality and lead to spread of water-borne diseases.
- (b) Wastewater treatment plant is planned to be built at Phuoc Loc, Nha Be district. Treated wastewater will be discharged to Cay Kho canal with BOD 50 mg/l in 2010 and 20 mg/l in 2020. After completion of Phase I Project in 2005 and Phase II Project in 2010, pollution load reduction efficiencies are expected at 36% and 66% respectively. Furthermore, after completion of the Master Plan Project in 2020, pollution load reduction efficiency will become at 84%. This will improve the water quality of Tau Hu - Ben Nghe and Doi - Te canals.
- (c) Effluent from wastewater treatment plant satisfies Vietnamese effluent standard TCXD 188-1996. Further to assess the impact of effluent discharge on water quality of receiving Cay Kho canal. According to flow measurement of Cay Kho canal, maximum flow of the canal is as high as 90.6 m<sup>3</sup>/sec, which is 55 times the discharge from treatment plant in

2005, and 15 times in 2020. Flow measurement for 24 hrs shows that Cay Kho canal is influenced by tide. After taking into account inward and outward movement of canal it has been found that about 1.5 million cum of water is flowing in one day. Thus no major impact is expected on the water quality of Cay Kho Canal. EIA study conducted during this study shows that no major negative impacts are expected.

- (d) The Project is part of the sustainable solution to worsening water environmental problems due to indiscriminate disposal of wastewater from HCMC. After implementation of this project, the environmental quality of Fau Hu - Ben Nghe - Doi - Te Basin will be improved considerably.

**Table 14.1 Financial Internal Rate of Return (FIRR) in Case of  
VND12,500/Month in THBNDT Zone for  
Sewerage Treatment Services**

		Cost for THBNDT for 1st Phase				Cost for THBNDT for 2nd Phase				Benefit		(Billion VND)
Year in order	Year	Construction cost and O/M cost	Reserves for replacement for treatment plant	Reserves for replacement for pumping stations	Sub-total	Construction cost and O/M cost	Reserves for replacement for treatment plant	Reserves for replacement for pumping stations	Sub-total	Cost in total	(Revenue in total taking escalation of 2.5%/annum into account) (Based on VND12,500 per HH month in base year)	Cash balance
(Base year: 1998)												
1	1999				0.0					0.0	0.0	0.0
2	2000	133.2			133.2					133.2	0.0	-133.2
3	2001	193.2			193.2					193.2	0.0	-193.2
4	2002	310.2			310.2					310.2	0.0	-310.2
5	2003	441.9			441.9					441.9	0.0	-441.9
6	2004	441.9			441.9					441.9	0.0	-441.9
7	2005	310.2			310.2	90.9			90.9	401.1	0.0	-401.1
8	2006	19.9	7.8	4.2	31.8	403.0			403.0	434.8	32.1	-402.7
9	2007	19.9	7.8	4.2	31.8	624.6			624.6	656.4	50.3	-606.1
10	2008	19.9	7.8	4.2	31.8	624.6			624.6	656.4	69.5	-587.0
11	2009	19.9	7.8	4.2	31.8	624.6			624.6	656.4	89.5	-566.9
12	2010	19.9	7.8	4.2	31.8	292.1			292.1	323.9	110.5	-213.4
13	2011	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	132.8	34.6
14	2012	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	136.1	37.9
15	2013	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	139.5	41.3
16	2014	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	143.0	44.8
17	2015	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	146.5	48.3
18	2016	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	150.2	52.0
19	2017	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	154.0	55.8
20	2018	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	157.8	59.6
21	2019	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	161.8	63.5
22	2020	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	162.1	63.9
23	2021	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	169.9	71.7
24	2022	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	174.2	76.0
25	2023	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	178.6	80.3
26	2024	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	183.0	84.8
27	2025	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	187.6	89.4
28	2026	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	192.3	94.1
29	2027	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	197.1	98.9
30	2028	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	202.0	103.8
31	2029	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	207.1	108.9
32	2030	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	212.2	114.0
33	2031	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	217.5	119.3
34	2032	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	223.0	124.8
35	2033	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	228.6	130.3
36	2034	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	234.3	136.1
37	2035	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	240.1	141.9
38	2036	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	246.1	147.9
39	2037	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	252.3	154.1
40	2038	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	258.6	160.4
41	2039	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	265.1	166.8
42	2040	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	271.7	173.5
43	2041	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	278.5	180.3
44	2042	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	285.4	187.2
45	2043	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	292.6	194.4
46	2044	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	299.9	201.7
47	2045	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	307.4	209.2
48	2046	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	315.1	216.9
49	2047	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	322.9	224.7
50	2048	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	331.0	232.8
51	2049	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	339.3	241.1
52	2050	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	347.8	249.6
53	2051	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	356.5	258.3
54	2052	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	365.4	267.2
55	2053	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	374.5	276.3
56	2054	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	383.9	285.7
57	2055	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	393.5	295.3
Total		2,824.2			3,421.1						11,170.5	2,101.5
In the condition of discount rate at 10%:												
Net Present value (NPV):										2,573.0	669.8	-1,903.2
Financial internal rate of return:												1.20%
B/C:												0.26

**Table 14.2 Suitability Analysis of Proposed Services Charge of VND12,500/Month in THDNĐT Zone for Sewerage Treatment Services**

		Cost for THBNDT for 1st Phase				Cost for THBNDT for 2nd Phase				Benefit		
Year in order	Year	O.M cost	Reserves for replacement for treatment plant	Reserves for replacement for pumping stations	Sub-total	O.M cost	Reserves for replacement for treatment plant	Reserves for replacement for pumping stations	Sub-total	Const in total	(Revenue in total taking escalation of 2.5%/annum into account based on (VND12,500/1st month)	Cash balance
(Base year:1998)												
1	1999				0.0					0.0	0.0	0.0
2	2000				0.0					0.0	0.0	0.0
3	2001				0.0					0.0	0.0	0.0
4	2002				0.0					0.0	0.0	0.0
5	2003				0.0					0.0	0.0	0.0
6	2004				0.0					0.0	0.0	0.0
7	2005				0.0					0.0	0.0	0.0
8	2006	19.9	7.8	4.2	31.8					31.8	32.1	0.3
9	2007	19.9	7.8	4.2	31.8					31.8	50.3	18.5
10	2008	19.9	7.8	4.2	31.8					31.8	69.5	37.7
11	2009	19.9	7.8	4.2	31.8					31.8	89.5	57.7
12	2010	19.9	7.8	4.2	31.8					31.8	110.5	78.7
13	2011	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	132.8	34.6
14	2012	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	136.1	37.9
15	2013	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	139.5	41.3
16	2014	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	143.0	44.8
17	2015	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	146.5	48.3
18	2016	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	150.2	52.0
19	2017	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	154.0	55.8
20	2018	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	157.8	59.6
21	2019	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	161.8	63.5
22	2020	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	165.8	67.6
23	2021	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	169.9	71.7
24	2022	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	174.2	76.0
25	2023	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	178.6	80.3
26	2024	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	183.0	84.8
27	2025	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	187.6	89.4
28	2026	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	192.3	94.1
29	2027	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	197.1	98.9
30	2028	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	202.0	103.8
31	2029	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	207.1	108.9
32	2030	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	212.2	114.0
33	2031	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	217.5	119.3
34	2032	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	223.0	124.8
35	2033	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	228.6	130.3
36	2034	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	234.3	136.1
37	2035	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	240.1	141.9
38	2036	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	246.1	147.9
39	2037	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	252.3	154.1
40	2038	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	258.6	160.4
41	2039	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	265.1	166.8
42	2040	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	271.7	173.5
43	2041	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	278.5	180.3
44	2042	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	285.4	187.2
45	2043	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	292.6	194.1
46	2044	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	299.9	201.7
47	2045	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	307.4	209.2
48	2046	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	315.1	216.9
49	2047	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	322.9	224.7
50	2048	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	331.0	232.8
51	2049	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	339.3	241.1
52	2050	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	347.8	249.6
53	2051	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	356.5	258.3
54	2052	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	365.4	267.2
55	2053	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	374.5	276.3
56	2054	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	383.9	285.7
57	2055	19.9	7.8	4.2	31.8	46.2	19.6	0.6	66.4	98.2	393.5	295.3
<b>Total</b>		<b>993.5</b>			<b>1,590.4</b>					<b>4,578.6</b>	<b>11,174.2</b>	<b>6,595.6</b>

In the condition of discount rate at 10 %:  
 Net Present value (NPV): 370.5      670.2      299.7  
 B/C: 1.81

**Table 14.3 Repayability Analysis for Sewerage System Improvement Works in Ho Chi Minh City in Case of JBIC Loan**

Reference:

**Supporting Capital Expenditure of the Government**

Year in order	Year	(billion VND)									(billion VND)			
		Const- ruction cost	Out flow			In flow			Cash balance	Total capital expenditure of the Government (5% growth/yr)	Subsidy to HCMC in total (10%)	Subsidized amount for the works (10%)		
			Interest	Repay- ment of principal	OM cost for sewerage services	Foreign borrow	Local finance	Revenue in case of increasing by 2.5%/yr.					In flow in total	
1	1998	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	18,254.3	1,825.4	182.5
2	1999	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	19,167.0	1,916.7	191.7
3	2000	136.9	0.0	0.0	136.9	0.0	52.4	84.5	0.0	136.9	0.0	20,125.3	2,012.5	201.3
4	2001	202.9	0.7	0.0	203.5	0.0	195.0	7.8	0.0	202.9	-0.7	21,131.6	2,113.2	211.3
5	2002	333.7	3.2	0.0	337.0	0.0	325.7	8.1	0.0	333.7	-3.2	22,188.2	2,218.8	221.9
6	2003	487.1	7.5	0.0	494.5	0.0	478.8	8.3	0.0	487.1	-7.5	23,297.6	2,329.8	233.0
7	2004	499.1	13.7	0.0	512.8	0.0	490.5	8.5	0.0	499.1	-13.7	24,462.4	2,446.2	244.6
8	2005	463.9	20.1	0.0	484.0	0.0	439.3	24.7	0.0	463.9	-20.1	25,685.6	2,568.6	256.9
9	2006	478.1	25.8	0.0	503.8	31.8	465.0	13.1	32.1	510.2	-25.5	26,969.8	2,697.0	269.7
10	2007	759.1	31.8	0.0	790.9	31.8	745.6	13.5	50.3	809.5	-13.3	28,318.3	2,831.8	283.2
11	2008	777.9	41.5	0.0	819.4	31.8	819.4	13.9	69.5	847.4	-3.8	29,734.2	2,973.4	297.3
12	2009	797.2	51.4	0.0	848.7	31.8	782.9	14.3	89.5	886.7	6.3	31,221.0	3,122.1	312.2
13	2010	382.6	61.6	0.0	444.2	31.8	367.8	14.7	110.5	493.1	17.1	32,782.0	3,278.2	327.8
14	2011	0.0	66.4	225.2	291.6	98.2	0.0	0.0	132.8	132.8	-257.1	34,421.1	3,442.1	344.2
15	2012	0.0	63.5	228.2	291.6	98.2	0.0	0.0	136.1	136.1	-253.8	36,142.2	3,614.2	361.4
16	2013	0.0	60.5	231.1	291.6	98.2	0.0	0.0	139.5	139.5	-250.4	37,949.3	3,794.9	379.5
17	2014	0.0	57.5	234.1	291.6	98.2	0.0	0.0	143.0	143.0	-246.9	39,846.7	3,984.7	398.5
18	2015	0.0	54.4	237.2	291.6	98.2	0.0	0.0	146.5	146.5	-243.3	41,839.1	4,183.9	418.4
19	2016	0.0	51.4	240.3	291.6	98.2	0.0	0.0	150.2	150.2	-239.6	43,931.0	4,393.1	439.3
20	2017	0.0	48.2	243.4	291.6	98.2	0.0	0.0	154.0	154.0	-235.9	46,127.6	4,612.8	461.3
21	2018	0.0	45.1	246.6	291.6	98.2	0.0	0.0	157.8	157.8	-232.0	48,434.0	4,843.4	484.3
22	2019	0.0	41.9	249.8	291.6	98.2	0.0	0.0	161.8	161.8	-228.1	50,855.7	5,085.6	508.6
23	2020	0.0	38.6	253.0	291.6	98.2	0.0	0.0	165.8	165.8	-224.0	53,398.4	5,339.8	534.0
24	2021	0.0	35.3	256.3	291.6	98.2			169.9	169.9	-219.9	56,068.4	5,606.8	560.7
25	2022	0.0	32.0	259.6	291.6	98.2			174.2	174.2	-215.6	58,871.8	5,887.2	588.7
26	2023	0.0	28.6	263.0	291.6	98.2			178.6	178.6	-211.3	61,815.4	6,181.5	618.2
27	2024	0.0	25.2	266.4	291.6	98.2			183.0	183.0	-206.8	64,906.1	6,490.6	649.1
28	2025	0.0	21.7	269.9	291.6	98.2			187.6	187.6	-202.2	68,151.4	6,815.1	681.5
29	2026	0.0	18.2	273.4	291.6	98.2			192.3	192.3	-197.6	71,559.0	7,155.9	715.6
30	2027	0.0	14.7	277.0	291.6	98.2			197.1	197.1	-192.7	75,137.0	7,513.7	751.4
31	2028	0.0	11.1	280.6	291.6	98.2			202.0	202.0	-187.8	78,893.8	7,889.4	788.9
32	2029	0.0	7.4	284.2	291.6	98.2			207.1	207.1	-182.8	82,838.5	8,283.9	828.4
33	2030	0.0	3.7	287.9	291.6	98.2			212.2	212.2	-177.6	86,980.4	8,698.0	869.8
34	2031	0.0			291.6	98.2			217.5	217.5	-173.3	91,329.5	9,132.9	913.3
35	2032	0.0			291.6	98.2			223.0	223.0	-168.9	95,895.9	9,589.6	959.0
36	2033	0.0			291.6	98.2			228.6	228.6	-164.4	100,690.7	10,069.1	1,006.9
37	2034	0.0			291.6	98.2			234.3	234.3	-160.0	105,725.3	10,572.5	1,057.3
38	2035	0.0			291.6	98.2			240.1	240.1	-155.6	111,011.5	11,101.2	1,110.1
39	2036	0.0			291.6	98.2			246.1	246.1	-151.2	116,562.1	11,656.2	1,165.6
40	2037	0.0			291.6	98.2			252.3	252.3	-146.8	122,390.2	12,239.0	1,223.9
41	2038	0.0			291.6	98.2			258.6	258.6	-142.4	128,509.7	12,851.0	1,285.1
42	2039	0.0			291.6	98.2			265.1	265.1	-138.0	134,935.2	13,493.5	1,349.4
43	2040	0.0			291.6	98.2			271.7	271.7	-133.6	141,682.0	14,168.2	1,416.8
44	2041				291.6	98.2			278.5	278.5	-129.2	148,766.1	14,876.6	1,487.7
45	2042				291.6	98.2			285.4	285.4	-124.8	156,204.4	15,620.4	1,562.0
46	2043				291.6	98.2			292.6	292.6	-120.4	164,014.6	16,401.5	1,640.1
47	2044				291.6	98.2			299.9	299.9	-116.0	172,215.3	17,221.5	1,722.2
48	2045				291.6	98.2			307.4	307.4	-111.6	180,826.1	18,082.6	1,808.3
Total		5,318.4	982.8	5,107.1	11,408.3		5,107.1	2,111.3						

(Note)

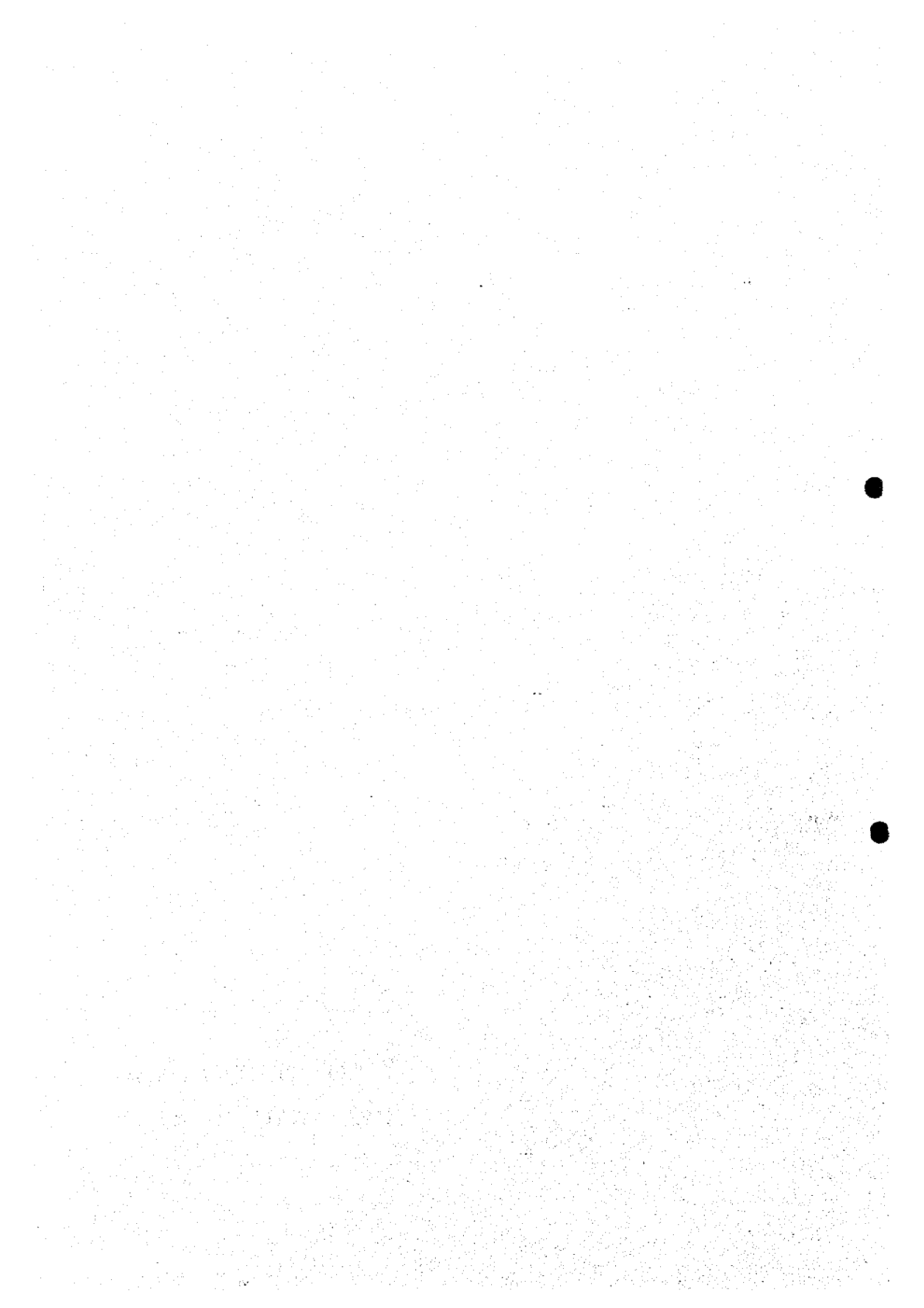
- (1) Interest rate of foreign loan: 1.30%
- (2) Equal annual repayment amount of capital for foreign loan (million VND): 291.6
- (3) The amount of foreign borrow: total cost of construction works minus land acquisition and housing compensation.

(Base)

17,385  
(as of 1997)

**CHAPTER 15**

**CONCLUSION AND  
RECOMMENDATION**





## CHAPTER 15 CONCLUSION AND RECOMMENDATION

Conclusion and recommendation from the Study are summarized below:

### **(1) Immediate Project Implementation**

It is concluded that the Priority Project is technically and economically feasible. Besides, financial viability and positive social and environmental impacts are observed from the integrated project evaluation results. So, it is justified that implementation of the Priority Project, especially Phase I Project shall be commenced as soon as possible to improve the deteriorating environmental conditions in the central part of Ho Chi Minh City. Furthermore, it is recommended to start immediately necessary administrative arrangements by PCHCM, to make a full use of the international funding sources, such as JBIC, ADB, IBRD, etc.

### **(2) Harmonization with Closely Related Project**

Rehabilitation and widening project of Ben Chuong Duong - Ben Ham Tu - Tran Van Kieu Road is on-going by the assistance of JBIC. Engineering Service (Detailed Design) of the project is appraised by JBIC in October 1999. This project is closely related with the canal improvement of Tau Hu - Ben Nghe. So, it is recommended that the detailed design of both projects is to be undertaken in parallel as same timing as possible to harmonize the design of left bank protection of Tau Hu - Ben Nghe canal with the road improvement project.

### **(3) Strengthening of Hydrological Observation System**

The existing hydrological monitoring networks shall be improved to manage effectively the urban drainage system. Six (6) existing manual rain gauge stations shall be replaced with automatic gauges to be able to collect the short term rainfall data. To obtain a more uniform distribution of rain gauge network, five (5) additional automatic type rainfall stations are recommended to install. In line with the strengthening of rain gauge network, nine (9) additional automatic water level stations are also proposed to install along the inner canals to collect short term water level data for hydrodynamic analysis of the complicated canal network.

### **(4) Establishment of Environmental Monitoring System**

A periodical monitoring system of the water quality of rivers, canals and groundwater covering the whole HCMC shall be developed for better environmental management. For this purpose, a laboratory with sufficient experimental equipment and working staff

shall be immediately established.

**(5) Efficient and Sufficient O/M Works**

In order to carry out more efficient O/M works, the introduction of sophisticated O/M equipment along with the strengthening of mutual cooperation among the governmental agencies concerned are recommended to be implemented. For the newly constructed facilities, especially, pumping stations and wastewater treatment plant, their staffs shall be given suitable training to perform smoothly O/M works and Total Quality Control (TQC) activities.

**(6) New Organization**

To operate sufficiently the urban drainage and sewerage service, it is recommended to establish a new organization, which provisional name is Sewerage and Drainage Company (SDC). This new company should have a strong leadership and delegated power to exercise the professional service. SDC will be a natural monopoly. All the expenses should be monitored closely by the public audit and customers, and the tariff setting should also be controlled by the higher authority. However, as much autonomous power as possible should be delegated to SDC to encourage the professional decision making.

**(7) Introduction of Environmental Education Program**

The canal improvement and wastewater treatment programs are indispensable to improve water environment. However environmental education program to prevent pollution activities of rivers and canals is also necessary.

The people living along rivers and canals have been accustomed to discharge their garbage and wastewater to the public water bodies directly. This is one of main pollution sources to deteriorate water environment. The educational program for these people should be initiated. Major aspects to be included in the program are listed below.

- Providing education of solid waste management and wastewater disposal to children in the schools,
- Importance of using appropriate containers for storage of solid waste,
- Emphasizing importance of water environment, and
- Providing health education to mothers and children in the schools

**(8) Establishing Training Center for Sanitary Engineers**

Requirement of well-educated sanitary engineers for designing, and operation and maintenance of wastewater treatment plant will be increased in future. To cope with this

nation wide requirement, the establishment of a training center for sanitary engineers is proposed.

**(9) Test Plant for Wastewater Treatment**

To establish the design criteria for the optimum wastewater and sludge treatment plant in HCMC, the evaluation of wastewater treatment process by a small scale pilot plant should be required in advance. Following factors shall be analyzed:

- Detention time of each facility,
- BOD<sub>5</sub>/MLSS loan in aeration tank,
- Sludge return ratio,
- Return sludge concentration, and etc.

**(10) Strengthening of Project Management Unit (PMU)**

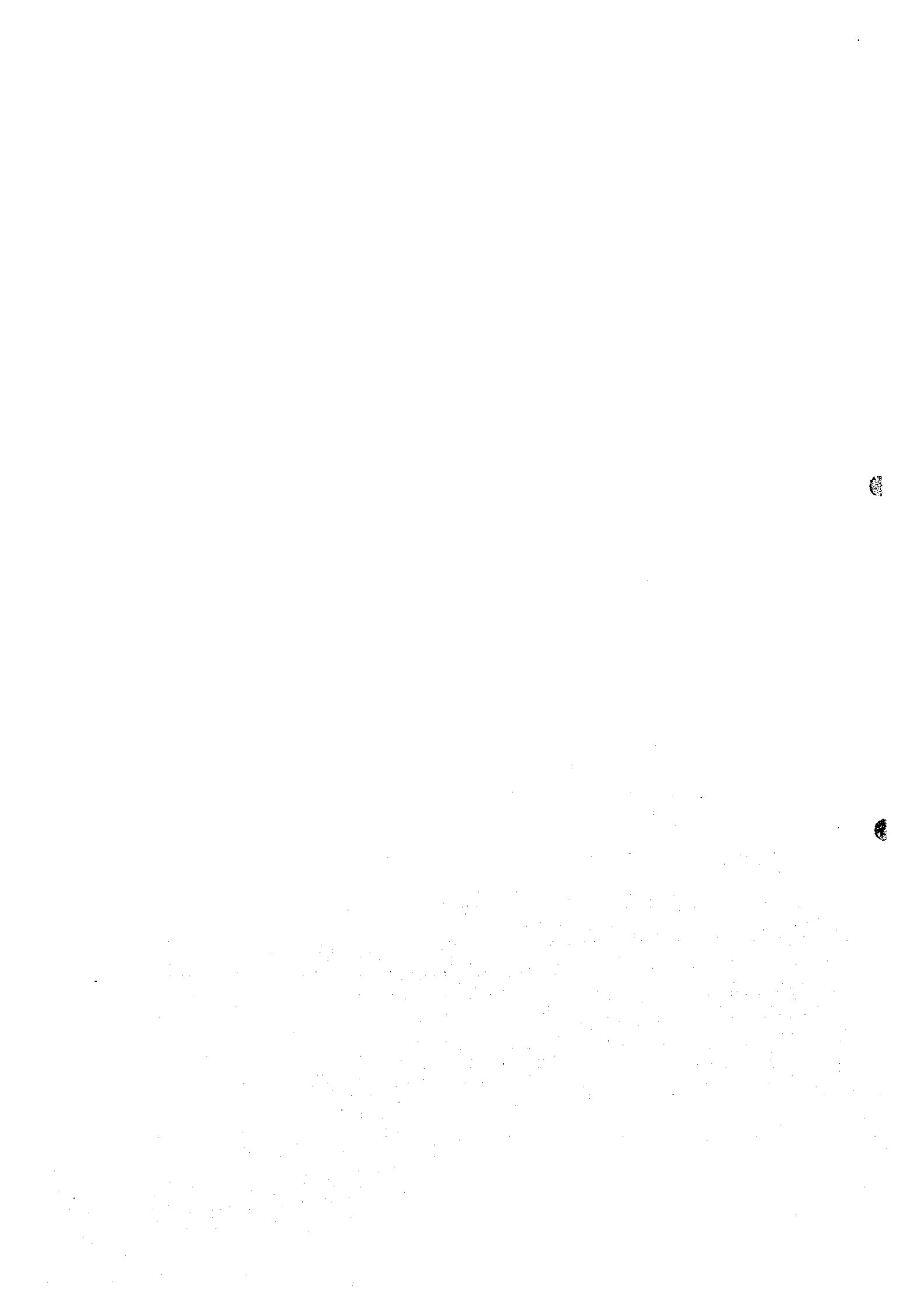
For a smooth implementation of the Project, the existing PMU should be strengthened. The PMU should be made directly under the PCHCMC to avoid any idling time required for consultation with other related authorities in PCHCMC. The PMU should have the right to report directly the vice chairman of PCHCMC.

**(11) Minimization of Relocation**

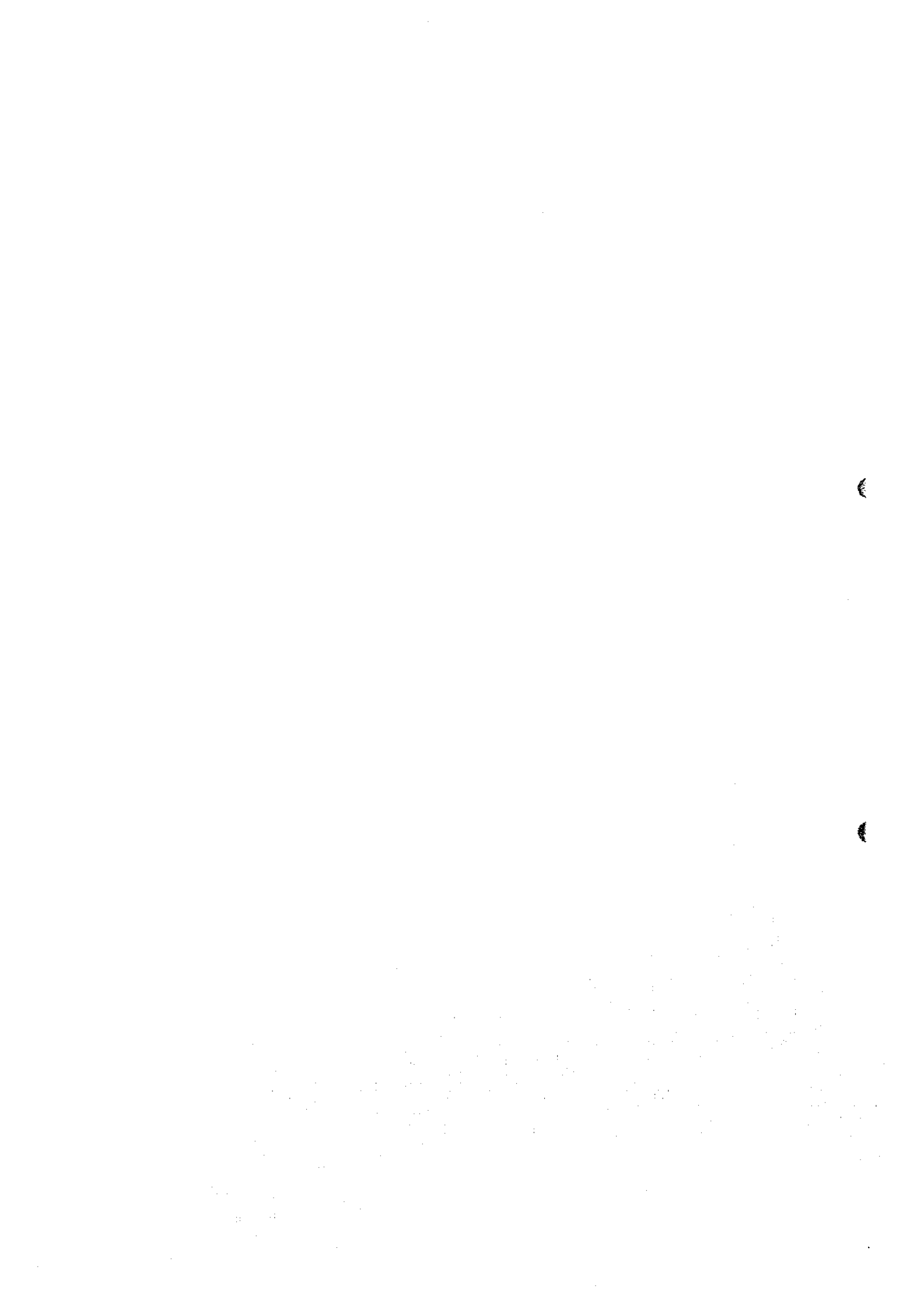
The number of the relocated houses on canal and half canal/half land should be minimized as far as the project implementation is not disturbed. Also, since the moving too many people in a short time to large sites is likely to have serious social consequences, a whole of small community or some divided groups of community are considered to avoid breakup of the existing community.

**(12) Consideration of Socio-Economic Condition for Relocation**

Not only physical development aspects of relocation/resettlement but also invisible condition should be considered such as job, education, health, and other social services. All relocatees should be supported in their re-establishment after resettlement. This support could comprise direct financial support and social assistance. Construction of apartments should be also counted on social investigation such as family structure and economic possibility, etc.









JICA