9. Conclusion

There are some lessons to be learned from previous relocation/resettlement activities as follows.

(1) Consideration of Socio-economic Consequences

It is necessary that all relocatees are supported in their re-establishment in the new resettlement site. Living condition of the people after relocation should be suitable to the people's demands. This support could comprise direct financial support in offsetting losses of income during the phase of transfer, covering transfer related costs, compensating for increase of living costs. Entitlements to socio-economic re-establishment should be outlined in detail.

The support is not limited to direct financial support to the relocatees, but also includes, facilitation of community development activities particular with the aim to (re-) build community structures, support in training people to enhance their income and employment opportunities and the start of a credit scheme for informal business owners. Department of Land & Housing should collaborate with other related agencies in social aspect of the relocatees before and after relocation.

(2) New Housing at Resettlement Sites

The economic consequences on relocated people are serious enough to undermine the satisfaction with the new housing. Often relocatees cannot afford the new services and buildings and must go into debt either to make the down payment and/or to meet the monthly expenses of the housing and its services.

People on the upper floors in the multi-storied apartment buildings cannot maintain prior business activities. People who have jobs far from their new residence have difficulty paying for transport. The reduction of in income is largely determined by the style of housing being built. Construction of apartments should be counted on social investigation data such as scale, average people/house, economic possibility, etc.

(3) Reasonable Compensation Policy

Since illegal people have not been considered as compensation policy, they should be considered to be subsidized at minimum. Regardless of their residential/housing status, all affected households and businesses before a particular cut-off date, are included in relocation arrangements. Entitlements to relocation arrangements for the different categories of households and businesses are to be well-defined and transparent. Depending on the residence status, legal status of the land and the ownership status of property, different relocation arrangements may be offered. All households are supported in their transfer plus all their belongings from their original site to the

resettlement site.

Since compensation for loss of business is restricted to households with a business license, it cannot cover many existing smaller, informal businesses. Businesses should be compensated at higher rates and those without licenses should also be compensated. A program of small loans to restore income earning capacity should be provided to those who are relocated to multi-story buildings and thereby lose access to their prior markets. A re-training allowance or a place in one of the nearby markets should be considered.

In case of self-finding accommodation, appropriate price of land and social allowance should be considered. Rehabilitation in the new resettlement sites should be covered not by money but by program, such as providing facilitators (NGOs and community groups) to support relocatees new life.

(4) Planning and Management of Relocation/Resettlement

All sectors (government, industries, and affected inhabitants) should be involved in planning and management process. A transparent organizational structure should be presented. Besides, in order to be active and to secure the common progress of the city's program, the organization should be designated to districts. District will itself carry out the program and the city only support on judicial aspect and work out policies including planning and land supply. Capital source of the program should be managed by district itself and the city can support only for the district without enough budget.

Responsibilities should be clearly defined and allocated for each district and more power is given to district to implement the relocation process. Organizations and their staff should have the capacity to perform their responsibilities. The relocation process lacks a follow-up program of monitoring and evaluation. Therefore, a monitoring and evaluation system should be established which allows for the identification of failures and problems in implementation of the relocation policy. Additionally, a grievance mechanism should be established which allows affected inhabitants to bring to the attention any failures in compliance with the relocation policy.

Table I.1.1 Summary of Residents along the Major Canals

Name of Canals	Number of Residents			Households (hh)		Houses (h)	
	Total (persons)	Legal (persons)	Provisional or illegal (persons)	No. (h.holds)	Average Size (persons/hh)	No. (houses)	Ave. Size of Resident (persons/h)
Doi-Te	85,229	56,366	28,863	9,621	8.9	9,434	9.0
	100%	66.1%	33.9%				
Tau Hu-Ben Nghe	65,218	41,722	23,496	7,832	8.3	7,386	8.8
	100%	64.0%	36.0%				
Tan Hoa-Ong Buong -Lo Gom	36,479	22,595	13,884	4,628	7.9	4,477	8.1
	100%	61.9%	38.1%				
Nhieu Loc- Thi Nghe*	31,676	20,084	11,592	3,864	8.2	3,747	8.5
	100%	63.4%	36.6%				
Total	218,602	140,767	77,835	25,945	8.4	25,044	8.7
	100%	64.4%	35.6%				

Source: Department of Land & Housing (Survey of Households on andalong Canals in Inner City of HCM City, 1996)

*Note: Main canal of NL-TG is excluded in this survey.

Table I.1.2 Land Area and House Status

	Doi-Te		Tau Hu		Nhieu Loc		Tan Hoa		Total	
	m2	%	m2	%	m2	%	m2	%	m2	%
Land Area (m2)	588,328	100	248,399	100	204,973	100	279,600	100	1,321,300	100
Legal	246,984	42.0	61,089	24.6	81,007	39.5	73,102	26.1	462,182	35.0
Illegal	341,344	58.0	187,249	75.4	123,966	60.5	206,499	73.9	859,058	65.0
	houses	%	houses	%	houses	%	houses	%	houses	%
Number of Houses	9,434	100	7,386	100	3,747	100	4,477	100	25,044	100
Legal	1,668	17.7	1,419	19.2	698	18.6	767	17.1	4,552	18.2
Illegal	7,766	82.3	5,967	80.8	3,049	81.4	3,710	82.9	20,492	81.8
	houses	%	houses	%	houses	%	houses	%	houses	%
Distance from Bank	9,434	100	7,386	100	3,747	100	4,477	100	25,044	100
<=5m	5,645	59.8	5,921	80.2	2,683	71.6	1,834	41.0	16,083	64.2
(half bank and half river)	(2,191)	(23.2)	(2,124)	(28.8)	(1,343)	(36.0)	(712)	(15.9)	(6,370)	(25.4)
5-15m	1,066	11.3	691	9.4	391	10.4	744	16.6	2,892	11.5
15-20m	551	5.8	138	1.9	132	3.5	285	6.4	1,106	4.4
>20m	2,172	23.0	636	8.6	541	14.4	1,614	36.1	4,963	19.8

Source: Department of Land & Housing (Survey of Households on and along Canals in Inner City of HCM City, 1996)

Table I.1.3 Time of House Construction

(unit : houses)

Name of Major Canals	Time of House Construction					
	Before '75	76-'85	86-'90	91-'95	n.a.	Total
Doi-Te	4,327	1,398	1,254	1,344	1,111	9,434
	45.9%	14.8%	13.3%	14.2%	11.8%	100%
Tau Hu-Ben Nghe	3,679	1,068	748	646	1,245	7,386
	49.8%	14.5%	10.1%	8.7%	16.9%	100%
Tan Hoa-Ong Buong -Lo Gom	1,115	546	696	1,644	476	4,477
	24.9%	12.2%	15.5%	36.7%	10.6%	100%
Nhieu Loc-Thi Nghe	1,569	591	653	669	265	3,747
	41.9%	15.8%	17.4%	17.9%	7.1%	100%
Total	10,690	3,603	3,351	4,303	3,097	25,044
	42.7%	14.4%	13.4%	17.2%	12.4%	100%

Source: Department of Land & Housing (Prefeasibility Study of Households on and along Canals in Inner City of HCM, 1996)

Table I.1.4 House Classification and Ownership

(unit: houses)

Name of Major Canals	House Classification						House Ownership			
							With	Without Certificate		
	Villa	Class 2	Class 3	Class4	Temporary	n.i.*	Certifi-cate	Self-built	Transferred	n.i.*
Doi-Te	4	9	249	4,760	4,320	92	1,708	4,917	1,756	1,053
(%)	(0.04)	(0.09)	(2.6)	(50.5)	(45.8)	(0.9)	(18.1)	(52.1)	(18.6)	(11.1)
Tau Hu-Ben Nghe	0	4	629	2,644	4,069	40	1,073	4,043	1,931	339
(%)	(0)	(0.05)	(8.5)	(35.8)	(55.1)	(0.5)	(14.5)	(54.7)	(26.1)	(4.6)
Tan Hoa-Ong Buong -Lo Gom (%)	3	19	124	2,005	2,315	11	727	2,272	1,072	406
	(0.07)	(0.4)	(2.8)	(44.8)	(51.7)	(0.2)	(16.2)	(50.7)	(23.9)	(9.1)
Nhieu Loc-Thi Nghe	10	3	146	1,062	2,525	1	959	1,480	1,130	178
(%)	(0.3)	(0.08)	(3.9)	(28.3)	(67.4)	(0.03)	(25.6)	(39.5)	(30.2)	(4.8)
Total	17	35	1,148	10,471	13,229	144	4,467	12,712	5,889	1,976
(%)	(0.07)	(0.14)	(4.6)	(41.8)	(52.8)	(0.6)	(17.8)	(50.8)	(23.5)	(7.9)

* No identification of justification

Source:Department of Land & Housing (Survey of Households on and along Canals in Inner City of HCM, 1996)

Table I.2.1 Age of All Members of Sampled Households

Site	Category	Unit	<16 years	16-25 years	26-35 years	36-45 years	46-55 years	56-60 years	60< years	Un-known	Total
On and Along Canal	Already agreed	Persons	65	58	54	55	19	8	20	0	281
		%	23.2	20.6	19.2	19.6	6.8	2.8	7.1	0	100
On and Along Canal/Slum Area	No plan	Persons	1,110	1,011	1,030	785	398	114	391	76	4,915
		%	22.6	20.6	20.9	16.0	8.1	2.3	7.9	1.6	100
Resettlement	Already Resettled	Persons	209	187	220	148	63	34	87	119	1,067
		%	19.5	17.5	20.6	13.9	5.9	3.2	8.2	11.2	100
Total		Persons	1,384	1,256	1,304	988	480	156	498	195	6,263
		%	22.1	20.1	20.8	15.8	7.7	2.5	7.9	3.1	100

Table I.2.2 Sex of All Member of Sampled Respondents

Site	Category	Unit	Male	Female	Total
On and Along canal	Already agreed	persons	137	144	281
		%	48.8	51.2	100
On and Along Canal/Slum Area	No plan	persons	2,388	2,527	4,915
		%	48.6	51.4	100
Resettlement Site	Already resettled	persons	457	610	1,067
		%	42.8	57.2	100
Total		persons	2,982	3,281	6,263
		%	47.6	52.4	100

Table I.2.3 Birth Place of all Members of Sampled Households

Site	Category	Unit	HCMC	North	Middle	West	South	Others	Unknown	Total
On and Along Canal	Already	persons	230	18	14	15	3	1	0	281
	agrred	%	81.9	6.4	4.9	5.3	1.1	0.4	0	100
On and Along Canal/Slum Area	No plan	persons	3,960	89	146	0	592	42	86	4,915
		%	80.6	1.8	2.9	0	12	0.9	1.8	100
Resettlement site	Already	persons	771	69	118	0	91	4	14	1,067
	resettled	%	72.3	6.5	11.1	0	8.4	0.4	1.3	100
Total		persons	4,961	176	278	15	686	47	100	6,263
		%	79.2	2.8	4.4	0.2	10.9	0.8	1.6	100

Table I.2.4 Education of All Members of Sampled Households

Site	Category	Unit	No School	Primary School	Secondary School	High School	Vocational School	College/ University	Others	Un known	Under 6 years old	Total
On and Along Canal	Already agreed	persons	25	40	71	59	3	22	0	42	19	281
		%	8.9	14.2	25.3	21	1.1	7.8	0	14.9	6.8	100
On and Along Canal/Slum Area	No plan	persons	439	1,793	1,473	803	10	135	62	145	55	4,915
		%	8.9	36.5	29.9	16.3	0.2	2.8	1.3	2.9	1.1	100
Resettlement Site	Already resettled	persons	46	163	349	278	3	75	12	55	86	1,067
		%	4.3	15.3	32.7	26.1	0.3	7	1.1	5.2	8	100
Total	Total	persons	510	1,996	1,893	1,140	16	232	74	242	160	6,263
		%	8.1	31.9	30.2	18.2	0.3	3.7	1.2	3.9	2.6	100

Table I.2.5 Legal Status of Land Use and Houses

	Unit	Legal Status of Land Use				Legal Status of House Ownership				
		Own Legal Documen	No Legal Document	Unknown	Total	Own Official Certificate	Certificate Not Approved	No Certificate	Unknown	Total
On and Along	houseuholds	231	634	35	900	261	122	480	37	900
Canal	%	25.7	70.4	3.9	100	29	13.6	53.3	4.1	100
Resettlement Site	houseuholds	134	57	7	198	68	52	68	10	198
	%	67.7	28.8	3.5	100	34.3	26.3	34.3	5.1	100
Total	houseuholds	365	691	42	1,098	329	174	548	47	1,098
	%	33.3	62.9	3.8	100	30	15.8	49.9	4.3	100

Table I.2.6 Residential Status of All Members of Households

Site	Unit	Permanen	Temporary	Illegal	Others	Unknown	Total
On and Along Canal	houseuholds	4,180	840	118	2	56	5,196
	%	80.4	16.1	2.3	0.1	1.1	100
Resettlement Site	houseuholds	806	219	8	0	34	1,057
	%	75.5	20.5	0.8	0	3.2	100
Total	houseuholds	4,986	1,059	126	2	90	6,263
	%	79.6	16.9	2	0.1	1.4	100

Table I.2.7 Legal Status of House

Site	Category	Unit	Own Official Certificate	Certificate Not Approved	No Certificate	Un-Known	Total
On and Along Canal	Already Agreed	households	17	4	19	2	42
		%	40.5	9.5	45.2	4.8	100
On and Along Canal/Slum Area	No plan	households	244	118	461	35	858
		%	28.4	13.8	53.7	4.1	100
Resettlement Site	Before Relocation	households	104	62	25	7	198
		%	52.6	31.3	12.6	3.5	100
	After Relocation	households	68	52	68	10	198
		%	34.3	26.3	34.3	5.1	100

Table I.2.8 Years of Living in the Present Place

Site	Category	Unit	<5 years	6-10	11-20	21-30	31-40	40<	Unknown	Total
On and Along Canal	Already Agreed	Households	2	9	8	12	5	2	4	42
		%	4.8	21.4	19.1	28.6	11.9	4.8	9.5	100
On and Along Canal/Slum Area	No plan	Households	83	147	172	133	150	173	0	858
		%	9.7	17.1	20.1	15.5	17.5	20.2	0	100
Resettlement Site	Before Relocation	Households	15	18	37	59	44	21	4	198
		%	7.6	9.1	18.7	29.8	22.2	10.6	2.0	100
	After Relocation	Households	190 (53)	2	0	1	0	0	5	198
		%	96.0(26.8)	1.0	0	0.5	0	0	2.5	100

Note: Numbers in parentheses show less than 2 years.

Table I.2.9 Purchase Price of Houses in Resettlement Sites

(unit: VND million)

Unit	<40	40-80	81-120	121-160	161-200	201-240	240-280	280<	Unknown	Total
Households	10	90	46	23	4	4	1	4	16	198
%	5.1	45.5	23.2	11.6	2.0	2.0	0.5	2.0	8.1	100

Table I.2.10 Domestic Facilities Owned by Sampled Households

Site	Category	Unit	Electtricity Meter	Water Meter	Well	Telephone	TV	Radio	Bicycle	Motorbike	Washing Machine	Refrigator	Un-known
On and Along Canal	Already agreed	household	17	12	9	11	33	17	31	28	6	11	3
		%	40.5	28.6	21.4	26.2	78.6	40.5	73.8	66.7	14.3	26.2	7.1
On and Along Canal/Slum Area	No plan	household	450	247	90	97	590	445	665	444	1	0	48
		%	52.4	28.8	10.5	11.3	68.8	51.9	77.5	51.7	0.1	0	5.6
Total of (1) and (2)		household	467	259	99	108	623	462	696	472	7	11	51
		%	51.9	28.8	11	12	69.2	51.3	77.3	52.4	0.8	1.2	5.7
Resettlement Site	Already resettled	household	194	172	4	44	181	135	134	129	31	90	4
		%	97.8	86.9	2	22.2	91.4	68.2	67.7	65.2	15.7	45.5	2

Table I.2.11 Reasons for Living in the Present Place

Site	Category	Unit	Close to Work	Close to Friends/ Relatives	Living for Long Time	Assets are Left	Housing is is Cheap	Others	Un-known	Total
On and Along Canal	Already agreed	households	1	4	11	6	7	13	0	42
		%	2.4	9.5	26.2	14.3	16.7	30.9	0	100
On and Along Canal/Slum Area	No plan	households	222	382	85	96	124	201	31	1,141
		%	19.5	33.5	7.4	8.4	10.9	17.6	3.6	100
Total		households	223	386	96	102	131	214	31	1,183
		%	18.9	32.6	8.1	8.6	11.1	18.1	2.6	100

Table I.2.12 Problems with Living in the Present Place

Site	Category	Unit	Flood	Garbage Disposal	Too Many People	Suffer from Diseases	No Legal Title to Land/House	Hard to Get Job	Lack of Schools/ Health Facilities	Others	No problems	Unknown
On and Along Canal	Already agreed	households	37	4	10	3	1	0	0	2	0	0
		%	88.1	9.5	23.8	7.1	2.4	0	0	4.8	0	0
On and Along Canal/Slum Area	No plan	households	486	269	319	78	104	98	14	40	51	56
		%	56.6	31.4	37.2	9.1	12.1	11.4	1.6	4.7	5.9	6.5
Total		households	523	273	329	81	105	98	14	42	51	56
		%	34.5	18	21.7	5.3	6.9	6.5	0.9	2.8	3.4	3.7

Table I.2.13 Way to Get House

Site	Category	Unit	Self-built	Inherited	Purchased	Rented	Alloted	Others	Un-known	Total
On and Along Canal	Already agreed	Households	12	6	21	0	0	1	2	42
		%	28.6	14.3	50	0	0	2.4	4.7	100
On and Along Canal/Slum Area	No plan	Households	387	114	278	2	4	9	25	858
		%	45.1	13.3	32.4	1	2	1.1	2.9	100
Resettlement Site	Before relocation	Households	73	39	74	9	36	3	3	198
		%	36.9	19.7	37.4	1.1	4.2	1.5	1.5	100
Total		Households	472	159	373	11	40	13	30	1,098
		%	43	14.5	34	1	3.6	1.2	2.7	100

Table I.2.14 Monthly Income per Household

(Unit=VND million)

Site	Category	Unit	< 1	1 <= <2	2<= <3	3<= <4	4<= <5	5<= <6	6<=	Un-known	Total	Avwerage (VND 1,000)	Mini./ Max.
On and Along Canal(1)	Already agreed	Households	3	17	10	5	2	1	2	2	42	2,310.75	200,000.00
		%	7.1	40.5	23.8	11.9	4.7	2.3	4.7	2.3	100		8,000,000
On and Along Canal(2)	No plan	Households	230	343	120	51	29	11	25	49	858	1,867.62	24,000.00
		%	26.8	40	14	5.9	3.4	1.3	2.9	5.7	100		100,000,000
Total of (1)and (2)		Households	233	360	130	56	31	12	27	51	900		
		%	25.9	40	14.4	6.2	3.4	1.3	3	5.7	100		
Resettlement Site	Already resettled	Households	35	73	45	14	7	0	7	17	198	1,968.49	140,000.00
		%	17.7	36.9	22.7	7.1	3.5	0	3.5	8.6	100		10,000,000
Total		Households	268	433	175	70	38	12	34	68	1,098	2,048.95	
		%	24.4	39.4	15.9	6.4	3.5	1.1	3.1	6.2	100		

Table I.2.15 Income Change After Relocation

Unit	Increase	Decrease	No Charge	Unknown	Total
houseuholds	7	87	89	15	198
%	3.5	43.9	44.9	7.6	100

Table I .2.16 Annual Expenditure per Household

Site	Category	Unit	<=1	1< <=5	5< <=10	10< <=15	15< <=20	20< <=30	30< <=40	40< <=50	50<	Unknown	Total	Average (1.000 VND)	Min./ Max.
On and Along Canal (1)	Already agreed	households	1	1	8	12	9	7	1	0	1	2	42	16.455.50	960.000
		%	4	4	19	28.6	21.4	16.7	2.4	0	2.4	4.8	100		68.870.000
On and Along Canal/Slum Area (2)	No plan	households	2	80	248	216	112	124	27	8	4	37	858	16.102.20	150.000
		%	0.2	9.3	28.9	25.2	13.1	14.5	3.1	0.9	0.5	4.3	100		200.250.000
Total of (1) and (2)		households	3	81	256	238	121	131	28	8	5	39	900		
		%	0.3	9	28.4	26.4	13.4	14.6	3.1	0.9	0.6	4.3	100		
Resettlement Site	Already resettled	households	0	9	19	54	50	41	11	8	0	6	198	18.684.80	1.100.000
		%	0	4.5	9.6	27.3	25.3	20.7	5.6	4	0	3	100		126.200.000
Total		households	3	90	275	282	171	172	39	16	5	45	1.098	17.080.80	
		%	0.3	8.2	25	25.8	15.6	15.8	3.6	1.5	0.5	4.1	100		

Table I.2.17 Main Water Source

Site	Category	Unit	Tap wate	Well	Rain Water	River	Buying	Use from Neighbor	Others	Un-known
On and Along Canal(1)	Already agreed	households	5	24	1	0	0	2	1	9
		%	11.9	57.1	2.4	0	0	4.8	2.4	21.4
On and Along Canal/Slum Area	No plan	households	625	113	43	1	63	0	22	38
		%	72.8	13.2	5	0.1	7.3	0	2.6	4.4
Total of (1)and(2)		households	630	137	44	1	63	2	23	47
		%	69.6	15.1	4.9	0.1	7	0.2	2.5	5.2
Resettlement	Already resettled	households	153	37	0	3	24	0	0	5
		%	77.3	18.7	0	1.5	12.1	0	0	2.5
Total		households	78.3	174	44	4	87	2	23	52
		%	71.3	15.8	4	0.4	7.9	0.2	2.1	4.7

Table I 2.18 Place for Waste Water Discharge

Site	Unit	Sewer	Pool/ Lake	Canal	River	Empty land	Un-known
On and Along Canal/Slum Area	households	280	58	158	309	4	91
	%	31.1	6.4	17.6	34.3	0.5	10.1
Resettlement	households	172	1	7	17	0	1
	%	86.9	0.5	3.5	8.6	0	0.5
Total	households	452	59	165	326	4	92
	%	4.1	5.4	15	29.7	0.4	8.4

Table I.2.19 Type of Toilets

Site	Category	Unit	Private with Septic Tank	Private withou Septic Tank	Public Toilet	Toilet on Pool/Lake	Toilet on Canal/River	Leaching Pit	Empty land	Unknown
On and Along Canal	Already agreed	households	24	4	0	1	11	0	0	2
		%	57.1	9.5	0	2.4	26.2	0	0	4.8
On and Along Canal/Slum Area	No plan	households	243	123	61	13	377	4	4	37
		%	28.3	14.3	7.1	1.5	43.9	0.5	0.5	4.3
Total		households	267	127	61	14	388	4	4	39
		%	29.7	14.1	6.8	1.6	43.1	0.4	0.4	4.3

Table I.2.20 Environmental Problems Around Houses

Site	Unit	Waste Water	Solid Waste	Bad Smell	Others	No Problems	No Answer	Total
On and Along Canal	houseuholds	498	399	586	17	156	38	1694
	% of total responses	55.3	44.3	65.1	1.9	17.3	4.2	100
Resettlement Site	houseuholds	39	52	103	23	69	8	294
	% of total responses	19.7	26.3	52	11.6	34.8	0.4	100

Table I.2.21 Reasons and Ways to Clean Canals

Unit	Reasons for Cleaning Canals						Ways to Clean Canals					
	Free from obnoxios Odor	No mosquito and germ	Raise walue of housing lot	Safe shipping	Others	Unknown	Pay fee for cleaning to gov.	Stop throwing garbage	Widen Canal	Dredg Canal	Others	Unknown
households	804	791	559	610	29	40	321	592	3	3	40	56
% of total responses	89.3	87.9	62.1	67.8	3.2	4.4	35.7	65.8	7.1	7.1	4.7	6.2

Table I.2.22 Place of Discussion on Environment Improvement

Site	Category	unit	General community meeting	Neighbor-hood unit	Temple/ Church	School	Work Place	Others	Unknown
On and Along Canal(1)	Already agreed	households	0	37	0	1	3	1	2
		%	0	88.1	0	2.4	7.1	2.4	4.8
On and Along Canal/Slum Area(2)	No plan	households	57	744	8	7	1	11	46
		%	6.6	86.7	0.9	0.8	0.1	1.3	5.4
Total of (1) and (2)		households	57	781	8	8	4	12	48
		%	6.6	86.8	0.9	0.9	0.4	1.3	5.3
Resettlement Site	Already resettled	households	11	161	1	1	0	13	15
		%	5.6	81.3	0.5	0.5	0	6.6	7.6

Table I.2.23 Relocation Pakage preferred by Households without plan of Relocation

Unit	Land with Legal title	House to be Bought with low interest loan & Legal land	House to be Bought with low interest loan & Legal land & help To find	House to be Bought with low Interest loan & Legal land & help To find job & to relocated	House for Rent	Cash grant	Others	Unknown
Households	247	153	220	138	8	81	13	70
%	28.8	17.8	25.6	16.1	0.9	9.4	1.5	8.2

Table I.2.24 How to Improve Canal Cleanliness

Site	Category	Unit	Pay fee for cleaning to Government	Stop throwing garbage	Widen Canal	Dredging Canal	Others	Unknown
On and Along Canal	Already agreed	Households	23	12	3	3	0	2
		%	54.8	28.6	7.1	7.1	0	4.8
On and Along Canal/Slum Area	No plan	Households	298	580	0	0	40	54
		%	34.7	67.6	0	0	4.7	6.3
Total		Households	321	592	3	3	40	56
		%	35.7	65.8	7.1	7.1	4.7	6.2

Table I.2.25 Best Way for Environmental Improvement

Site	Category	Unit	Give Incentives	Give gov. help	Competition for cleanliness	Enforcing law/fine	Others	Un-known
On and Along Canal (1)	Already agreed	households	2	29	1	2	4	5
		%	4.8	69.0	2.4	4.8	9.5	11.9
On and Along Canal/Slum Area (2)	No plan	households	361	584	94	189	31	40
		%	42.1	68.1	10.9	22.0	3.6	4.7
Total of (1) and (2)	Already resettled	households	363	613	95	191	35	45
		%	40.3	68.1	10.6	21.2	3.9	5.0
Resettlement Site		households	25	97	43	104	16	9
		%	12.6	48.9	21.7	52.5	8.1	4.5

Table I.2.26 Responses for Living in the Present Place On and Along Canals

Unit	Close to work	Close to Friends/ Relatives	Living for Long Time	Assets are Left	Housing is Cheap	Others	Unknown	Total
houseuholds	223	386	96	102	131	214	31	1,183
%	18.9	32.6	8.1	8.6	11.1	18.1	2.6	100

Table I.2.27 Relocation Package Preferred by Households without Relocation Plan

Unit	Land with legal title	House to be bought with low interest loan & legal land use	House to be bought with low interest loan & legal land use& help to find job	House to be bought with low interest loan & legal land use& help to find job & to relocate	House for rent	Cash grant	Others	Unknown	Total
houseuholds	247	153	220	138	8	81	13	70	930
% of total responses	28.8	17.8	25.6	16.1	0.9	9.4	1.5	8.2	100

Table I.2.28 Concerns After Relocation

Unit	Own land/ build own house	Live in clean area	More chance to get work	Better school/ health facilities	Decrease income	Lose present job	Spend more money	Relocation with neighbors	Others	Unknown	Total
households	486	590	98	379	285	132	19	22	1	53	2,065
% of total responses	54	65.6	10.9	42.1	31.7	14.7	2.1	2.4	0.1	5.9	100

Table I.2.29 Length to Find Jobs After Relocation

(Unit-months)

Unit	<=3	3-6	6-12	12<=	Unknown	Total
households	16	141	28	1	12	198
%	8.1	71.2	14..1	0.5	6.1	100

Table I.2.30 Reasons to Move to Live in the Present Place

Site	Category	Unit	Comply with gov. order	Improve environment in the city	Have a better & clean living condition	Others	Un-known
On and Along Canal	Already agreed	Households	32	1	6	1	3
		%	76.2	2.4	14.3	2.4	7.1
Resettlement Site	Already resettled	Households	175	16	28	3	8
		%	88.4	8.1	14.1	1.5	4.0

Table I.2.31 Reasons for Cleaning Canals

Site	Category	Unit	Free from Obnoxious Odor	No mosquitoes/ germs	Raise value of housing lot	Safe shipping	Others	Un-known
On and Along Canal	Already Agreed	households	39	38	38	1	1	2
		%	92.9	90.5	90.5	2.4	2.4	4.8
On and Along Canal/Slum Area	No plan	households	765	753	521	609	28	38
		%	89.2	87.8	60.7	70.9	3.3	4.4
Total		Households	804	791	559	610	29	40
		%	89.3	87.9	62.1	67.8	3.2	4.4

Table I.2.32 In case of Unsatisfied Compensation for Households Without Plan of Relocation

Unit	Negotiation with Gov.	Receive Compensation	Not relocate	Others	Unknown
Households	602	67	101	25	63
%	70.2	7.8	11.8	2.9	7.3

Table I.2.33 Concerns After Relocation

Site	Category	Unit	Own land/ build own house	Live on clean area	More chance to get work	Better school/health facilities	Decrease of income	Lose present work	Spend more money	Relation with heighbors	Others	Unknown
On and Along Canal	Already agreed	households	9	25	0	4	4	15	6	22	1	2
		%	21.4	59.5	0	9.5	9.5	35.7	14.3	52.4	2.4	4.8
On and Along Canal/Slum Area	No plan	households	477	565	98	375	281	117	13	0	0	51
		%	55.6	65.9	11.4	43.7	32.8	13.6	1.5	0	0	5.9
Total		households	486	590	98	379	285	132	19	22	1	53
		%	54	65.6	10.9	42.1	31.7	14.7	2.1	2.4	0.1	5.9

Table I.2.34 Basic Services Preferred by Households Who Have Not Yet Relocated

Site	Category	Unit	Water meter	Electricity meter	Sewerare system	Garbage dosposal/ collection	Roads/ transportation facilities	Training for income generation	Health nutrition services	Family planning program	Others	Unknown
On and Along Canal	Already agreed	households	36	36	5	2	3	10	6	1	0	2
		%	85.7	85.7	11.9	4.8	7.1	23.8	14.3	2.4	0	4.8
On and Along Canal/Slum Area	No plan	households	781	774	640	567	427	330	383	45	4	58
		%	91	90.2	74.6	66.1	49.8	38.5	44.6	5.2	0.5	6.8
Total		households	817	810	645	569	430	340	389	46	4	60
		%	90.8	90	71.7	63.2	47.8	37.8	43.2	5.0	0.4	6.7

Table I.2.35 Life/Income to be Affected by Env. Facility Construction in the Area without Plan of Relocation

Unit	Relocation	Decrease of Income	Dis-continue of schooling	Difficulties with neighborhood	Unfair compensation	Insufficient compensation for new life	Others	Un-known
households	380	366	121	82	92	128	184	42
%	44.3	42.7	14.1	9.6	10.7	14.9	21.4	4.9

Table I.2.36 Resettlement Options

Site	Category	Unit	Self-finding in the same district	Self-finding outside the district	On-site resettle-ment by gov.	Inside district resettle-ment by gov.	Other District Resettle Ment	Others	Un-known
On and Along	Already	Households	3	1	3	3	23	7	2
Canal	agreed	%	7.1	2.4	7.1	7.1	54.8	16.7	4.8
On and Along	No plan	Households	200	87	389	339	119	35	56
Canal/Slum Area		%	23.3	10.1	45.3	39.5	13.9	4.1	6.5
Total		Households	103	88	392	342	142	42	58
		%	11.9	9.8	43.6	38.0	15.8	4.7	6.4

Table I.2.37 Capacity for Buying New House

Site	Category	Unit	Cash	Installment	Rent	Build	Others	Unknown
On and Along	Already	households	1	27	1	2	2	10
Canal	agreed	%	2.4	64.3	2.4	4.8	4.8	23.8
On and Along	No plan	households	139	563	12	87	0	57
Canal/Slum Area		%	16.3	65.6	1.4	10.1	0	6.6
Total		households	140	590	13	89	2	67
		%	15.6	65.6	1.4	9.9	0.2	7.4

Table I.2.38 Income Change After Relocation

Unit	Increase	Decrease	No change	Unknown	Total
Households	7	87	89	15	198
%	3.5	43.9	44.9	7.6	100

Table I.2.39 Advantages of Relocation

Unit	Close to Friends/ Relatives	Close to work	Close to School	Better house than before	Electricity meter	Good water supply	Can spend more money	Others	Un-known
households	15	30	139	110	68	19	11	2	10
%	7.6	15.2	70.2	55.6	34.3	9.6	5.6	1.0	5.1

Table I.2.40 Disadvantages of Relocation

Unit	Difficult to Transfer School	Poor health facilities	Poor electricity supply	Poor water supply	Difficult to find jobs	Isolated from friends/ relatives	Additional expenditure	Others	Un-known
Households	31	35	8	66	33	27	1	44	43
%	15.7	17.7	4	33.3	16.7	13.6	22.2	21.7	0.5

Table I.2.41 Legal Framework of Relocation/Resettlement at National Level

Category	Law and Regulations	Contents
Rights and obligations of land users	Land Law (issued 15 October 1993)	Land is confiscated by the State for the purposes of national defense, security, national or public interest.
Civil rights and obligations, land use rights	Civil Code (issued 1 July 1996)	Land users shall be entitled to enjoy compensation for the losses.
Compensation policy	Decree No. 22/1998/ND-CP (issued 24 April 1998)	Based on Land Law
Power of Eminent Domain and Compensation		Land set aside for the purpose of national and public beneficiaries decided by PC, as a base of land ownership of the State
	Decree No. 90/CP (issued 17 August 1994) was replaced by Decree No. 22as above.	Establishment of Council for Compensation Compensation when the State confiscates land and property Compensation is limited to those in possession of a land use rights certificate
Legal Entitlement to Compensation	Decree No. 60/CP (issued 5 July 1994)	Requirements necessary to establish full legal title over property, including residential housing and the landuse right in urban area
Frame of prices of house and land	Decree No. 61/CP (issued 5 July 1994)	On buying, selling and trading in residential houses Prices decided by PC Chairman shall be based on the price scale for types of land fixed by the government Term of payment is not longer than 10 years
	Decree No. 87/CP (issued 17 August 1994)	PC carries out the work of grading land Shall not be lower or higher than the frame fixed by the government Organizational structure for compensation is established
	Decree No. 87/CP (issued 19 December 1996)	Payments for compensation are included in the State budget

Table I.2.42 Legal Framework of Relocation/Resettlement at HCMC Level

Unit price of house and other structures in HCMC	Decision No. 4755/QD-UB-QLDT (issued 29 June 1995)	Frame of prices for compensation and subsidizing houses and other structures to be cleared on and along canals and rivers as well as other slum areas in HCMC
	Decision No. 6337/QD-UB-QLDT (issued 28 August 1995)	Modifying of the above Decision No. 4755
	Decision No. 05/QD-UB-QLDT (issued 4 January 1995)	Unit price for various types of land
	Decision No. 692/QD-UB (issued 4 May 1993)	Unit cost of construction
	Decision No. 5184/OD-UB-KT (issued in 1996)	Minimum standard rate for houses
Relocation policy for Nhieu Loc-Thi Nghe Canal Project	Decision No. 4964/QD-UB-VX (issued 24 September 1998)	All houses and structures on and along the two banks of NL-TG canal should be moved. Activities and responsible organizations Establishing Steering Board of Compensation and Relocation of HCMC
	Decision No. 3597/QD-UB-QLDT (issued 5 August 1998)	Decision of the PC on clearance of houses and other structures on and along NL-TG canal
	Decision No. 1915/UB-QLDT (issued 14 July 1995)	Solution for permanent registration and schools for people living on and along NL-TG canal
	Decision No. 5787/QD-UB-QLDT (issued 8 August 1998)	Management and use of apartment for the relocation of residents living on and along NL-TG canal

Table I.2.43 Categories of Compensation/Assistance and Unit Price in HCMC

Categories	Source of Unit Price	Notes
Compensation for Land	Decree No. 60/CP Decree No. 05/QD-UB-QLDT Decision No. 6337/QD-UB-QLDT	Occupied land with a land use right certificate following the Decrees is compensated at the rate of 100% of the applicable to urban land Residential land which is entitled to legalization but not be legalized yet shall be compensated by 80% of unit price People who had been using land without legal documents and not entitled to legalization from 18 Dec. 1980 to 15 Oct. 1993 shall be subsidized by 50% of the unit price for land area of less than 80m2 in inner city (land area of more than 80m2 shall not be subsidized). Illegal land since 15 Oct. 1993 shall not be subsidized
Compensation for House	Decision No. 4755/QD-UB-QLDT Decision No. 6337/QD-UB-QLDT	Those who have granted or rented State-owned houses shall not be compensated for loss of land and house. If they agree to move and not rent another State-owned house shall be subsidized 500.000 VND/m2 floor of the house in use (area of floor shall not exceed 30m2 for each household). Subsidizing each household with permanent residential permit shall be subsidized by 50% of land value. When the household has rehabilitated, upgraded or reconstructed more area of the house with permission, they shall be paid compensation of 100% of the preliminary construction cost. Those who legally own house shall be paid compensation 100% of the entire area of existing house based on construction unit cost regulated in Decision No. 692/QD-UB, multiplying by 1.2 coefficient. Houses which have been demolished under 70% of area of construction shall be compensated for the demolished area at the construction unit price, times 1.2 plus 10% of the compensated area dismantled. Houses which have been demolished more than 70% of the area shall be compensated as houses which have entirely been demolished. House on canals and rivers constructed before 15 Oct. 1993 shall be subsidized 50% of the value of construction materials. Houses after that date shall unconditionally be demolished.
Access to electricity, water and telephone	Decision No. 4755/QD-UB-QLDT	Electricity meter: 1.5 million VND each Water meter: 1.5 million VND each Bored well: 1.5 million VND each Telephone: Pursuant to the cost of installation of HCMC Telephone Company (new installation cost is 2.6 million VND)
Relocation Allowance	Decision No. 4755/QD-UB-QLDT	Depending on the amount of work to be done and to the distance of moving, those who have houses to be moved shall be subsidized. The level of assistance will be decided by District PC for each house. Minimum assistance is 4 million VND per family.
Stabilization Allowance/Life Settlement Allowance	Decision No. 4755/QD-UB-QLDT	Stabilization allowance is payable to each person (1 million VND each) with a permanent residential permit, with KT3 (returnee) registration or temporary registration for more than 2 years. Families with an invalid or dead war hero will be provided a additional 1 million VND.
Compensation for Production/Loss of Business	Decision No. 6337/QD-UB-QLDT	For houses which are scrapped 70% or more of the area of construction and house owner, dealer with effective permission or business. Allowance based on the average turn-over of the latest year, as determined by Tax Dept. of the District; (i)turnover is less than 5 million VND/month, the one-time compensation will be 3 million VND, (ii)turnover exceeds 5 million VND/month one-time compensation will be 4 million VND.
Compensation for Cemetery Structures	Decision No. 4755/QD-UB-QLDT	Simple earth grave: 6 million VND/grave Simple grave with some brick perimeter: 1.2 million VND/grave Cement/brick grave: 2.4 million VND Fancy concrete grave: 4 million VND Unclaimed grave: PC of district will make arrangement and pay for reburial at a different site.

Table I.4.1 Number of Houses to be Relocated

Location	No. of Houses for the Project	No. of Houses Up to Roads
Drainage Pumping Station Site		
1. Thanh Da Area (Binh Thanh District)	96	96
2. Ben Me Coc 1 and 2	21	21
Wastewater Treatment Plant Site		
(Nha Be District)	60	60
Wastewater Pumping Station Site		
(District 8/Dong Dieu)	20	20
Tau Hu-Ben Nghe Canal Improvement Site		
1. District 4	755	850
Ward 1	(358)	(380)
Ward 2	(147)	(160)
Ward 5	(86)	(115)
Ward 6	(86)	(105)
Ward 12	(78)	(90)
2. District 8	802	924
Ward 8	(245)	(281)
Ward 9	(286)	(329)
Ward 11	(53)	(60)
Ward 13	(85)	(100)
Ward 15	(123)	(141)
Ward 16 (Left side bank)	(10)	(13)
Total	1,754	1,971

Table I.4.2 Summary of Impacts of Drainage Pumping Station Site

Impact	Thanh Da Area	Ben Me Coc 1&2	Remarks
Total Land Area (m^2)	3,043	644	Average land area per house is 31.7m^2 in Thanh Da , and 32.2m^2 in Ben Me Coc 1 & 2.
In which Legal Land Area (m^2)	0	42	All land is used illegally in Thanh Da. Average legal land area per house in Ben Me Coc is 2.1m2, 6.5% of the total land area.
Total Housing Area (m2)	3,571	924	Average housing area per house is 37.2m^2 in Thanh Da, 46.2m^2 in Ben Me Coc.
In which Legal Housing Area (m^2)	0	284	All houses are illegal houses in Thanh Da. Average legal housing area per house is 4.2m^2, 30.7% of the total housing area in Ben Me Coc 1 & 2.
No. of Households to be Relocated	96	20	

Table I.4.3 Summary of Impacts of Wastewater Pumping Station Site

Impact	District 8, Dong Dieu	Remarks
Total Land Area (m^2)	792	Average land area per house is 39.6m^2.
In which Legal Land Area (m^2)	26	Average legal land area per house is 1.3m^2. Legal land area shares 3.3% of the total land area.
Total Housing Area (m^2)	1,270	Average housing area per house is 63.5m^2.
In which Legal Housing Area (m^2)	42	Average legal housing area is 2.1m^2 per house. Legal housing area shares 3.3% of the total housing area.
No. of Households to be Relocated	20	

Table I.4.4 Summary of Impacts of Improvements of Tau Hu-Ben Nghe Canals

Impact	District 4, District 8	Remarks
Total Land Area (m^2)	41,908.9	Average land area per house is 38.3m^2 (total is 28,916.5m^2) in District 4, 16.2m^2 (total is 12,992.4m^2) in District 8.
In which Legal Land Area (m^2)	7,799.1	Average area per house is 4.7m^2 (total is 3,548.5m^2) in District 4, 5.3m^2 (total is 4,250.6m^2) in District 8. Legal land area shares 18.6% (12.3% for District 4, 32.7% for District 8) of total land area.
Total Housing Area (m^2)	62,180.4	Average housing area per house is 37.0m^2 (total is 27,935m^2) in District 4, 42.7m^2 (total is 34,245.4m^2) in District 8.
In which Legal Housing Area (m^2)	19,598.2	Average area per house is 6.2m^2 (total is 4,681m^2) in District 4, 18.6m^2 (total is 14,917.2m^2) in District 8. Legal land area shares 31.5% (16.8% for District 4, 43.6% for District 8)
No. of Households to be Relocated	1,557	755 households in District 4, 802 households in District 8.

Table I.4.5 Summary of Impacts of Wastewater Treatment Plant Site

Impact	Nha Be District	Remarks
Total Land Area (m^2)	15,000	Average land area per house is 250m^2.
In which Legal Land Area (m^2)	15,000	All area is legal land.
Total Housing Area (m^2)	2,592	Average housing area per house is 43.2m^2.
In which Legal Housing Area (m^2)	1,830	Average legal housing area per house is 30.5m^2. Legal housing area shares 70.6% of the total housing area.
No. of Households to be Relocated	60	

Table I.4.6 Options of Relocation/Resettlement

Option	Possibility
70% (1,228 households): Support by the Government	80% (982 households) : To buy or rent units of apartment or town houses in resettlement sites
	20% (246 households) : To get land and build houses by themselves in resettlement sites
30% (526 households): Self Arrangement of Dwelling	63% (331 households) : Not able to find, so go back hometown or move to other area or industrial zone
	37% (195 households) : Able to find and buy land and house with enough resources

Table I.5.1 Estimated Compensation Amount for the Relocation

Quantity	Location						Total
	Canal Improvement		Drainage Pumping Station Sites		Wastewater Treatment Plant Site	Wastewater Pumping Station Site	
	District 4	District 8	Thanh Da Area	Ben Me Coc 1 & 2	Nha Be District	Dong Dieu of District 8	
No. of Houses to be Moved	755	802	96	21	60	20	1,754
Average Unit Cost for House (1,000 VND /house)	56,008	21,676	64,396	13,873	36,550	25,819	42,499
Average Unit Cost for Land (1,000 VND /house)	8,944	14,939	6,524	6,925	7,636	12,753	4,995
Total Cost (1,000 VND)	49,038,760	29,365,230	6,808,320	436,758	2,651,160	771,440	79,767,315.75

Table I.7.1 Total Capital Needed for Relocation/Resettlement

(Unit: 1,000 VND)

Capital Sources	Total	Compensation Cost	Construction Cost in Resettlement Site	
			Infrastructure	Housing
State Budget	127,362,515.75	79,767,315.75	47,595,200	-
Loan from State Budget	130,785,600	-	-	130,785,600
Self-investment by Inhabitants	107,190,400	-	-	107,190,400
Total	365,338,515.75	79,767,315.75	47,595,200	237,976,000
%	100	21.8	13.0	65.2

Table I.8.1(1) Implementaion Schedule of Relocation and Resettlement

Year and Month / Activites	Time (months)	Start	Finish	1999		2000												2001											
				11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Project Schedule																													
D/D for Stage 1 and Approved	13	3/2000	3/2001																										
B/I for Stage 1 Construction	6	4/2001	9/2001																										
Construction for Stage 1	51	9/2001	12/2005																										
Relocation and Resettlement																													
1) Detailed Survey	2	1/2000	2/2000																										
2) Approval of the Survey Report	1	3/2000																											
3) Reconfirmation of Clearance Area	2	2/2000	3/2000																										
4) Formulation of Regulation on Compensation Price for PC HCM for Approval	2	3/2000	4/2000																										
5) Announcement on Land Acquisition	1	4/2000																											
6) Measurement of Houses and Land and Reaffirmation of Cost of Compensation	3	1/2000	3/2000																										
7) Negotiation and Agreement with Households	21	4/2000	12/2001																										
8) Payment of Housing Cost	37	4/2000	4/2003																										
9) Removal to Resettlement Sites (952 households)	21	4/2000	12/2001																										

Table I.8.1(2) Implementaion Schedule of Relocation and Resettlement

Activites \ Year and Month	Time (months)	Start	Finish
Project Schedule			
D/D for Stage 1 and Approved	13	3/2000	3/2001
B/I for Stage 1 Construction	6	4/2001	9/2001
Construction for Stage 1	51	9/2001	12/2005
Resettlement Site Development			
1) Submission of the Housing Projects for Approval of PCHCMC	6	11/1999	4/2000
2) Bidding for Stage 1	3	1/2000	3/2000
3) Clearance of Resettlement Area	7	11/1999	6/2000
4) Construction in Resettlement Sites	36	11/1999	10/2002

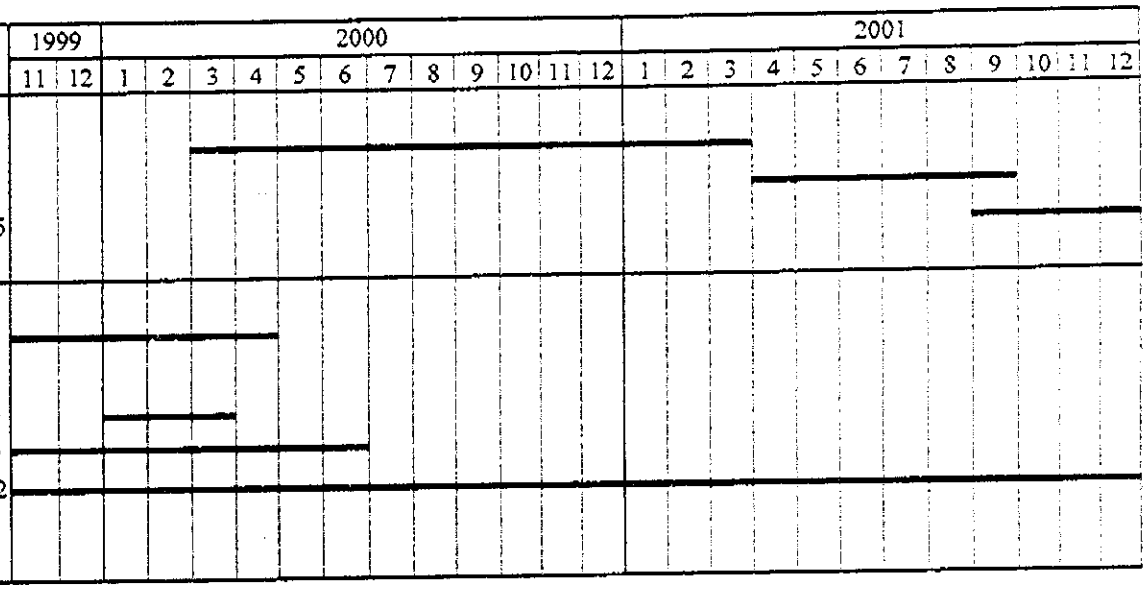


Table I.8.1(3) Implementaion Schedule of Relocation and Resettlement

Activites \ Year and Month	Time (months)	Start	Finish	2004												2005											
				1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Project Schedule																											
D/D for Stage 2 and Approved	9	1/2005	9/2005																								
B/I for Stage 2 Construction	6	9/2005	3/2006																								
Construction for Stage 2	54	4/2006	9/2010																								
Relocation and Resettlement																											
1) Detailed Survey	2	11/2004	12/2004																								
2) Approval of the Survey Report	1	2/2005																									
3) Reconfirmation of Clearance Area	2	1/2005	2/2005																								
4) Formulation of Regulation on Compensation Price for PC HCM for Approval	2	2/2005	3/2005																								
5) Announcement on Land Acquisition	1	5/2005																									
6) Measurement of Houses and Land and Reaffirmation of Cost of Compensation	3	11/2004	1/2005																								
7) Negotiation and Agreement with Households	20	5/2005	12/2005																								
8) Payment of Housing Cost	37	5/2005	5/2008																								
9) Removal to Resettlement Sites (802 households)	12	1/2005	12/2005																								

Table I.8.2 Housing Construction Project and Proposed Allocation for Relocatees

Location	Investor	Space (m2)	Housing Type			Total Capital (billion VND)	Allocation for Relocatees
			Town House	Apartment Building	Separate House		
District 4		851,062	1,307	3,492	0	551.4	544
1. Residential Area in Ward 6	Construction & Housing Development Company of District 4	45,600	335	304		71.8	114
2. Residential Area in Ward 12, 13	ditto	510,000	500	1,500		200	100
3. Residential Area in Ward 5	ditto	210,000	400	600		130	130
4. Phu My Residential Area in District 7	Construction & House Trading Company Saigon	85,462	72	1,088		149.6	200
District 8		1,045,000	3,405	3,584	3,340	1,031	594
5. Residential Area in Ward 4	Housing Service Company of District 8	400,000	2,000	2,000	2,000	380	224
6. Rach Lao Residential Area in Ward 15	Tan Binh Dong Construction Company	400,000	500	600	1,000	300	100
7. Bui Minh Truc 3 Residential Area in Ward 5	Housing Service Company of District 8	70,000	156	544	28	110	100
8. Bui Minh Truc Residential Area (A, B C) in Ward 6	Tan Binh Dong Construction Company	30,000	250	200	50	85	55
9. Bong Sao Residential Area in Ward 5	ditto	60,000	314	100	213	50	50
10.Binh Dang Commerc residential Area	Housing Service Company of District 8	85,000	185	140	49	106	65
BinhThanh District							
11. North Dinh Bo Linh Residential Area	PC of Binh Thanh District	84,600	0	106	0	11.6	90
Total		1,980,662	4,712	7,182	3,340	1,594	1,228

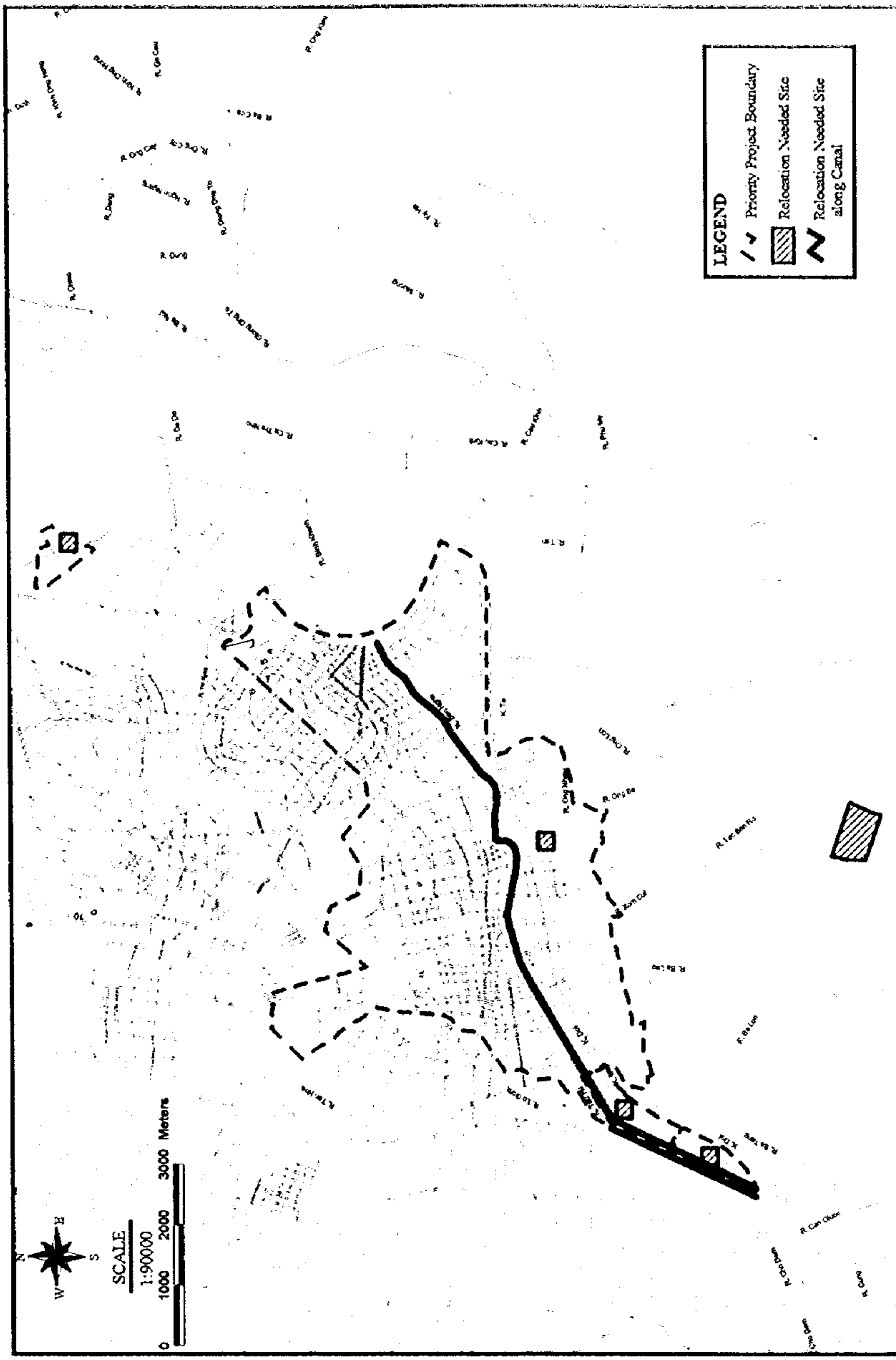
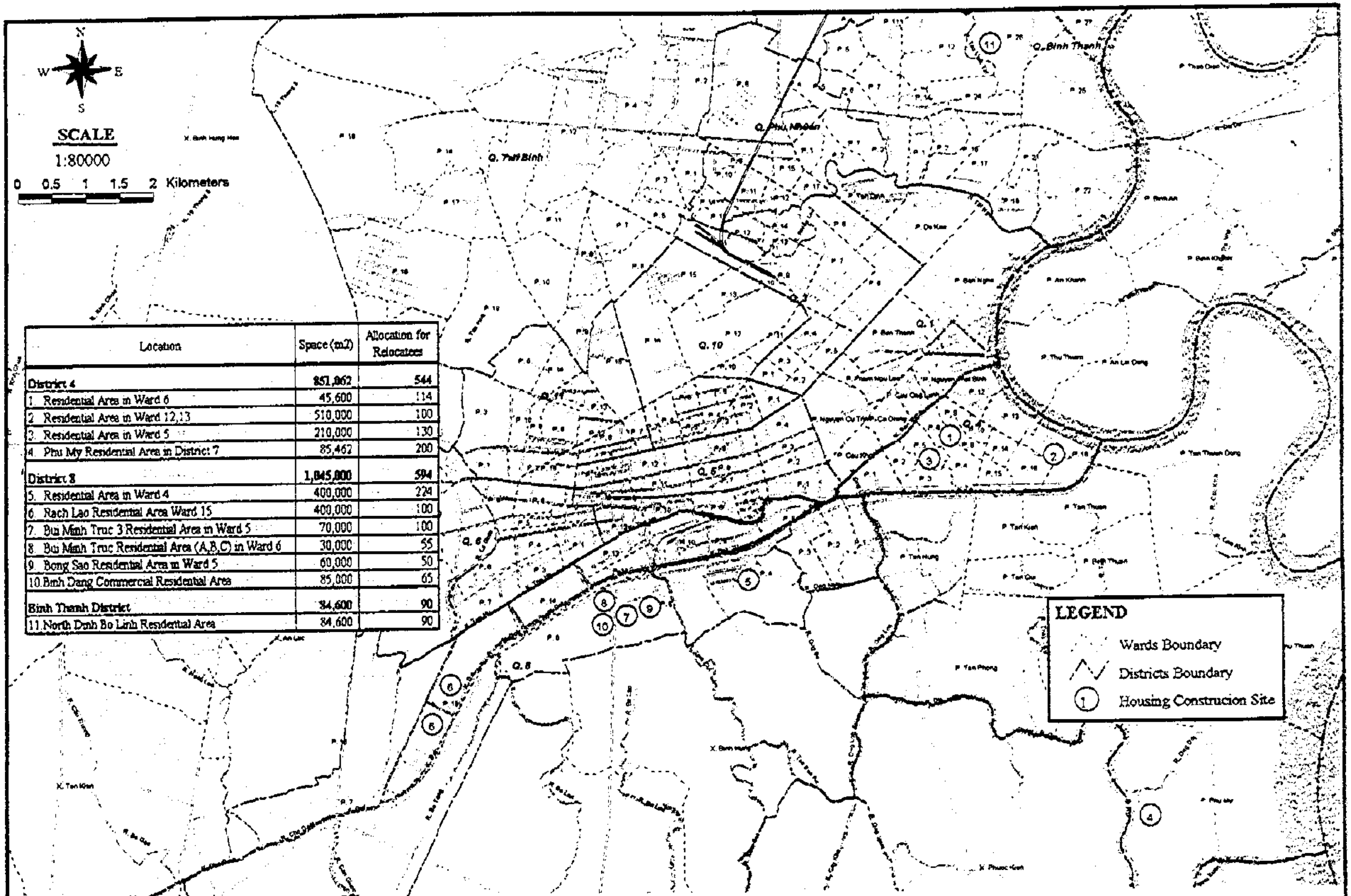


FIG. I.1.1 LOCATION OF RELOCATION NEEDED



Location	Space (m2)	Allocation for Relocatees
District 4	851,062	544
1. Residential Area in Ward 6	45,600	114
2. Residential Area in Ward 12,13	510,000	100
3. Residential Area in Ward 5	210,000	130
4. Phu My Residential Area in District 7	85,462	200
District 8	1,045,000	594
5. Residential Area in Ward 4	400,000	224
6. Rach Lao Residential Area Ward 15	400,000	100
7. Bui Minh Truc 3 Residential Area in Ward 5	70,000	100
8. Bui Minh Truc Residential Area (A,B,C) in Ward 6	30,000	55
9. Bong Sao Residential Area in Ward 5	60,000	50
10. Binh Dang Commercial Residential Area	85,000	65
Binh Thanh District	84,600	90
11. North Dinh Bo Linh Residential Area	84,600	90

FIG. I.3.1 LOCATION OF RESETTLEMENT SITE

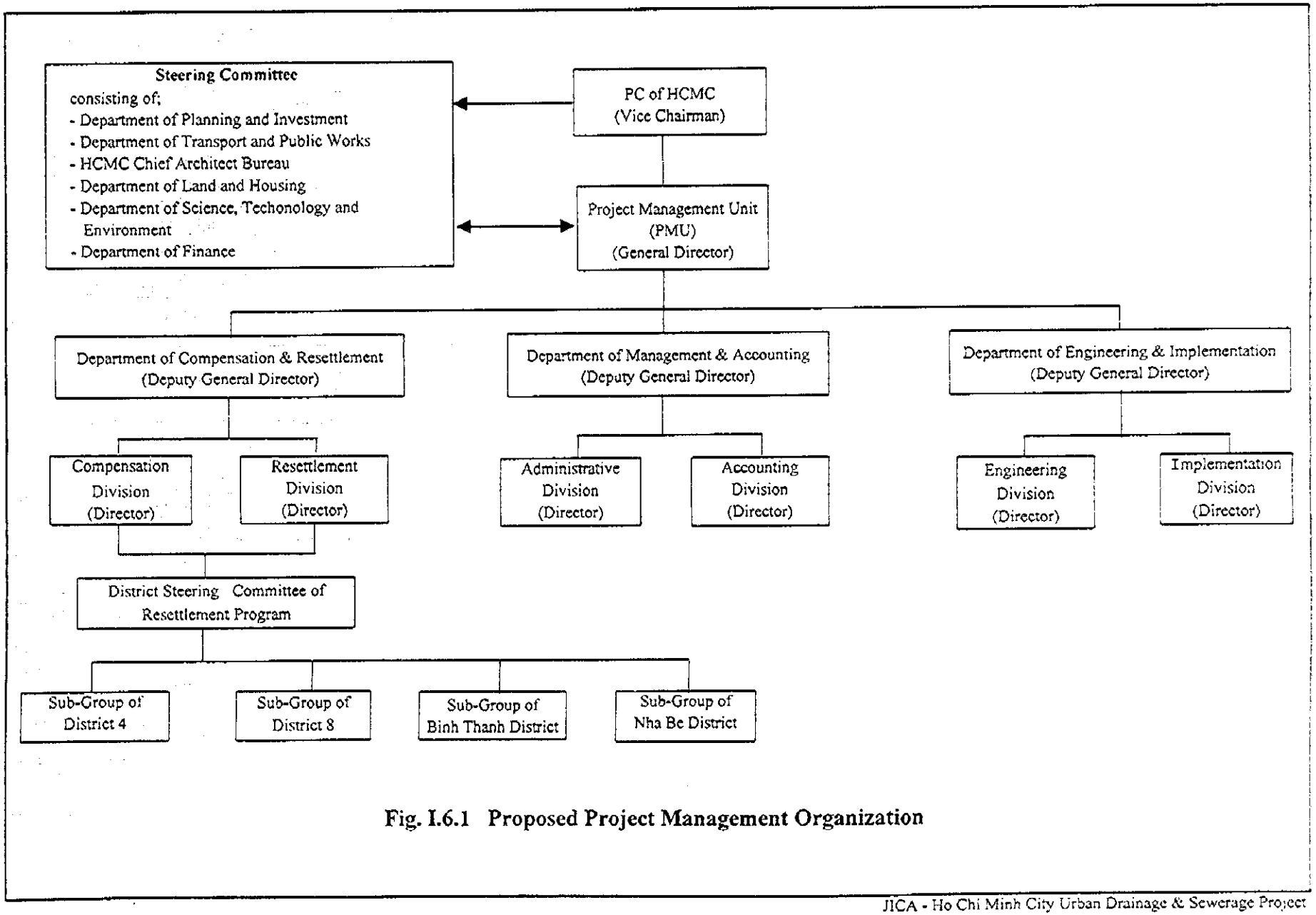


Fig. I.6.1 Proposed Project Management Organization

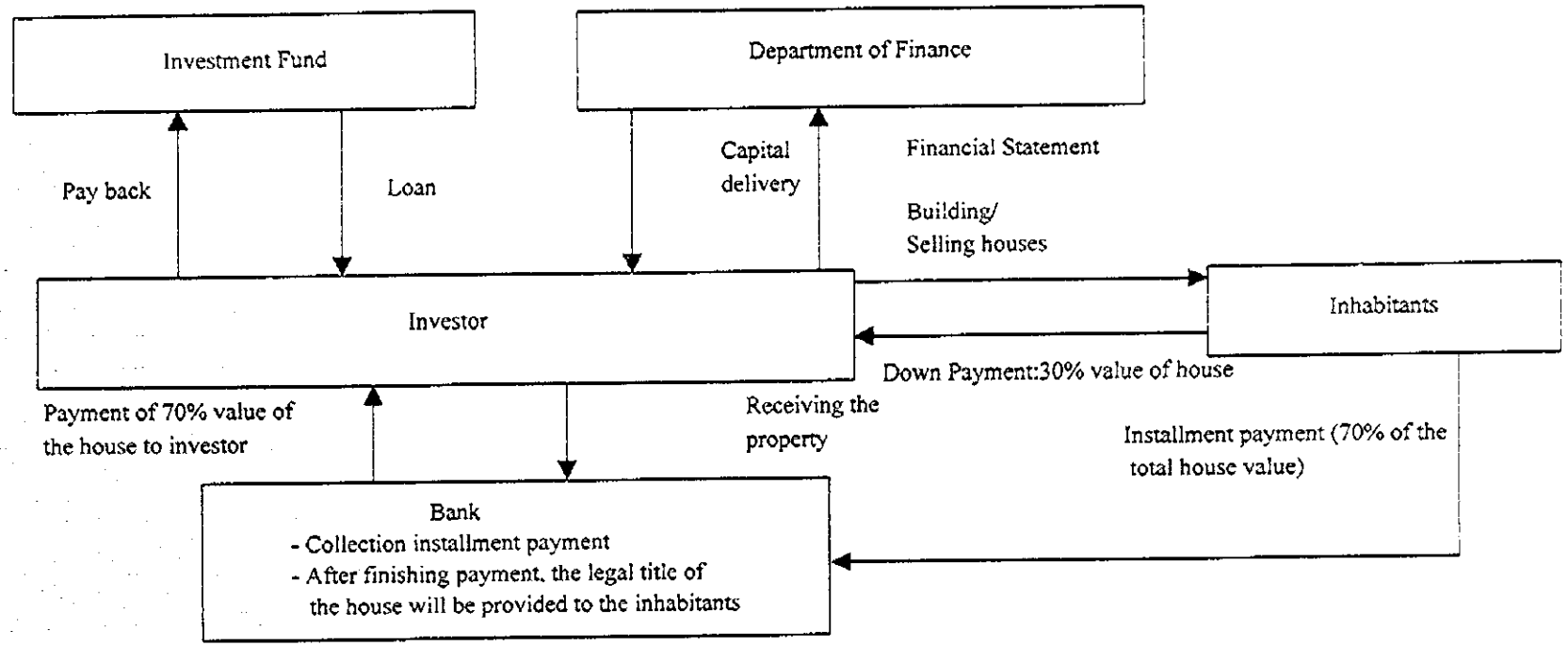


Fig. I.7.1 Capital Flow

APPENDIX J CONSTRUCTION PLAN AND COST ESTIMATE

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APPENDIX J CONSTRUCTION PLAN AND COST ESTIMATE

I. Master Plan

1. Project Cost of Urban Drainage Improvement

1.1 Basic Condition for Cost Estimation

The estimation of the project cost consisting of (1) construction cost of drainage improvement works, (2) land acquisition and house compensation, (3) engineering cost, (4) administration cost, and (5) physical contingency was conducted under the following basic conditions:

(a) The cost estimates are made on the assumption that all construction works will be contracted to the general contractors by international tender.

(b) All base cost are expressed under the economic conditions prevailing in February 1999.

(b) The exchange rates of foreign currencies are assumes as follows: US$ 1.00 = Yen 120, Yen 1.0 = VND 111.1, US$ 1.0 = VND 13,332

(d) The cost is classified into foreign currency (F/C) and local currency (L/C) portion, base on the following conditions:

- The foreign currency portions includes the cost of (i) imported equipment, materials and supplies, (ii) domestic materials of which the country is a net importer, (iii) wages of expatriate personnel, and (iv) overhead and profit of foreign firms,

- The local currency portions include the cost of (i) domestic materials and supplies, (ii) wages of local personnel, (iii) overhead and profit of local firms, and (iv) taxes

A percentage of F/C and L/C portion for each cost is employed at the following value generally used in similar project.

Item	F/C (%)	L/C (%)
Construction Cost	30	70
Land Acquisition & House Compensation	0	100
Engineering Cost	70	30
Administration Cost	0	100
Physical Contingency	30	70

(e) The construction cost consists of the direct construction cost and the indirect cost including contractor's overhead and profit, which corresponds to 80% of the direct construction cost.

(f) Administration cost is assumed at 3 % of a total cost of construction and land acquisition & house compensation.

(g) Engineering cost consisting of detailed design and construction supervision, and physical contingency allowance are assumed at 7 and 10 % of the construction cost.

1.2 Estimation of Unit Cost

The unit direct construction cost by work items are calculated form the material cost, labor cost, and equipment cost by analyzing the data on the similar works implemented in recent years as well as taking into consideration the local conditions in Ho Chi Minh.

The unit construction cost is estimated at 1.8 times of the unit direct construction cost considering the indirect cost and contractor's overhead and profit. These unit costs estimated by work items are listed in Table J.1.1.

1.3 Construction Cost of Each Drainage Improvement Work

Construction costs are estimated by the following drainage improvement work:

(a) Canal improvement
(b) Pump drainage improvement
(c) Onsite detention pond
(d) Drainage pipe and channel development

Tables J.1.2, J.1.3, J.1.4 and J.1.5 show the construction cost by the above works.

1.4 Land Acquisition and House Compensation

The price of land varies depending on its location, land use category, and geographical condition. The unit land costs in table below are given in this study for three typical land usages in the drainage zones.

UNIT LAND ACQUISITION COST

Drainage zone	Unit Land Acquisition Cost (1,000 VND/m^2)
C	1,500
N	600
W, S, NE, SE	310

House compensation cost is estimated for the improvement of only for (4) canals, Doi-Te, Tau Hu, Nhieu Loc-Thi Nghe, and Tan Hoa-Lo Gom because of available relocation data. Unit cost of house compensation is assumed as follows:

- For legal house : 80 % of the land acquisition cost
- For illegal house : 50 % of the land acquisition cost

1.5 Estimated Project Cost

The total project cost including construction, land acquisition/house compensation engineering, and physical contingency, amounts to 16,212.0 billion VND at February 1999 price as shown in the table below: Combined Sewer

PROJECT COST

(Unit: Billion VND)

Cost Zone	C	N	W	S	NE	SE	Total
1. Construction	3,856.4	2,649.1	1,243.7	883.4	1,559.6	1,031.2	11,223.4
(1) Canal Imp.	(894.0)	(786.1)	(540.1)	(272.4)	(648.8)	(179.8)	(3,321.2)
(2) Pump Drainage	(262.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(262.1)
(3) Onsite Re-Pond	(0.0)	(0.0)	(0.0)	(0.0)	(272.4)	(0.0)	(272.4)
(4) Existing Sewer Imp	(118.4)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(118.4)
(5) Combined Sewer	(2,369.0)	(785.0)	(350.8)	(0.0)	(0.0)	(0.0)	(3,504.8)
(6) Storm Sewer	(212.9)	(1,078.1)	(352.8)	(611.0)	(638.4)	(851.4)	(3,744.5)
2. Land Acquisition and Compensation	1,386.2	631.3	250.5	183.6	235.6	181.7	2,868.9
3. Administration	157.3	98.4	44.8	32.0	53.9	36.4	422.8
4. Engineering Service	269.9	185.4	87.2	61.8	109.2	72.2	785.9
5. Contingency	385.7	264.9	124.3	88.3	156.0	103.1	1,122.3
Total	6,055.5	3,829.3	1,750.5	1,249.1	2,114.3	1,424.6	16,423.3

Note : 1. Engineering cost and physical contingency is assumed at 7 and 10 % of the construction cost.
2. Administration cost is assumed at 3 % of a total cost of construction and land acquisition and house compensation.
3. Breakdown of the construction costs is shown in Tables J.1.2 to J.1.5.
4. Breakdown of the land acquisition costs is shown in Table J.1.2.

1.6 Operation and Maintenance (O/M) Cost

Operation and maintenance (O/M) costs for the drainage facilities include personnel expense, electricity expense for running the pump and gate, and cleaning and repair of the canal, onsite detention pond and drainage pipe. Annual O.M cost for the proposed project is assumed at 0.3 % of the construction cost for canal, onsite detention pond and drainage pipe and 0.5 % of the construction cost for pumping station with gate, based on the data and information of the similar urban drainage project.

1.7 Annual Disbursement of Project Cost

Annual disbursement schedules by drainage zone shown in Table J.1.7 are prepared based on the proposed tentative implementation schedule of urban drainage improvement shown in Table J.1.8. This disbursement schedule is utilized for the economic evaluation study of urban drainage improvement work by zone.

2. Project Cost of Sewerage Development

2.1 Basic Condition for Cost Estimation

2.1.1 Service Area / Population / Wastewater Rate

The service area, service population and design wastewater of each sewerage development zone are shown below.

Sewerage Zone No	Sewerage Zone Name	Area (ha)	Population in 2020	Population density (Person/ha)	Design Wastewater (m^3/day)	Max Hourly Flow (m^3/day)
1	TLBC	1,495	354,857	237	130,765	183,071
2	NLTN	3,935	1,359,569	346	501,001	701,402
3	THLG	2,447	655,540	268	241,566	338,193
4	THBN	3,065	1,390,282	454	512,319	717,246
5	SS	1,555	320,000	206	89,056	124,678
6	SE	1,690	600,000	355	166,980	233,772
7	SN-I	2,324	500,000	215	139,150	194,810
8	SN-II	1,152	196,500	171	54,686	76,560
9	SW	1,315	398,000	303	110,763	155,068
	Total	13,422	4,354,713	324	1,410,134	1,974,188

2.2 Estimation of Construction Cost

2.2.1 Wastewater Treatment Plant

The estimation of construction cost for wastewater treatment plants is based on the cost function formula adopted by Japan Sewage Works Association with some modifications to meet the local conditions. The formula used for the estimation of construction cost of conventional activated sludge system without the incineration facility of sludge is as follows;

$$C = a \cdot Q^b$$

[Where]

C : construction costs in 1,000,000 Yen

Q : wastewater rate in 1,000 m^3/day

a, b : depending on the capacity of treatment plant as follows;

Q (1,000 m^3/day)	10 < Q < 50	50 < Q < 100	100 < Q <500	500 < Q
a	211	209	200	185
b	0.730	0.730	0.730	0.730

In addition to the estimated cost by the formula mentioned above, following soil improvement costs are considered, because of the bad soil condition of the proposed treatment plant sites.

Pre-loading with 3 m height and dewatering by vertical drain method are proposed to strengthen soil bearing capacity. The unit costs of soil improvement are estimated as mentioned below.

① Filling : H = 3 m
Unit Cost of Soil Filling Work = 69.5 x 1,000 VND/m^3
3 x 69.5 x 10,000
= 2,085 million VND/ha

② Soil Improvement : Plastic Drain Method (Vertical Drain Method)
1.5 m (pitch) x 30 m (improvement depth)
30 m x 4,444 pile/ha x 43.96 x 1,000VND/m
= 5,861 million VND/ha

Total 7,946 million VND/ha

Construction cost of wastewater treatment plant in each sewerage zone is estimated as follows;

Sewerage Zone	Construction Cost (Billion VND)
TLBC	866.8
NLTN	2,184.9
THLG	1,378.9
THBNDT	2,247.7
SS	679.0
SE	1,027.0
SN-I	895.0
SN-II	486.7
SW	777.9

Break-down of treatment plant construction cost in each sewerage zone is shown in Table J.2.1.

2.2.2 Pumping Stations

Construction cost of pumping station is estimated by the cost function formula adopted by Japan Sewage Works Association.

$C = a \cdot Q^b$

[Where]

C : construction cost in million VND

Q : design wastewater volume in m^3/min.

a, b : a = 51.3, b = 0.598

Construction cost of pumping station in each sewerage zone is estimated as shown below.

Sewerage Zone	No. of Pumping Station	Construction Cost (Billion VND)
TLBC	1	68.5
NLTN	5	607.7
THLG	3	301.2
THBNDT	1	233.8
SS	2	94.0
SE	3	167.2
SN-I	3	151.2
SN-II	2	70.8
SW	2	107.2

Design capacity and break-down of construction cost of each pumping station is shown in Table J.2.2.

2.2.3 Sewer Pipeline

1) Sewerage Zone with Combined Sewer System

In this sewerage zone, sewer system consists of collection sewer (tertiary, secondary and main sewers), interceptor sewer and conveyance sewer. The estimation of construction cost of collection sewer is dealt with the urban drainage section. The construction costs of interceptor and conveyance sewers are estimated in this section.

Pipe jacking method and shield tunneling method are considered to construct interceptor and conveyance sewers along with open cut method.

The unit construction cost of pipe installation by open cut method with respective diameter and earth covering depth is shown in Table J.2.3. These unit costs include the materials and laying works such as excavation, backfiring, retaining walls and restoration of the pavement if necessary.

The unit construction costs of pipe installation by pipe jacking method and shield tunneling method are shown in Table J.2.4. The construction cost of interceptor and conveyance sewer of each sewerage zone is estimated as shown below.

Sewerage Zone	Construction Cost (Billion VND)
TLBC	51.5
NLTN	269.8
THLG	116.0
THBNDT	585.4

The break-downs of the construction cost of the interceptor and conveyance sewers are shown in Table J.2.5.

The unit construction costs of large size and small size storm overflow chamber are estimated at 233 million VND and 58 million VND, respectively.

Large Size Storm Overflow Chamber:

- ϕ 1500mm – 7.0m x 10.0m x 5.0mH

Small Size Storm Overflow Chamber:

- ϕ 600mm – 3.0m x 4.0m x 2.0mH

The numbers of storm overflow chambers in each sewerage zone are shown in Table J.2.6.

Sewerage Zone	Construction Cost (Billion VND)
TLBC	4.9
NLTN	17.6
THLG	12.3
THBNDT	18.8

2) Sewerage Zone with Separate Sewer System

Separate sewer consists of tertiary, secondary, main and conveyance sewers. Required sewer length of each sewerage zone is estimated based on the existing sewer condition of District 1. In District 1, main sewer of 111 m/ha and secondary and tertiary sewers in each sewerage development zone are shown in Table J.2.7.

The construction cost of sewer pipeline in each sewerage zone is estimated as shown below.

Sewerage Zone	Construction Cost (Billion VND)
SS	1,087.6
SE	1,235.3
SN-I	1,545.2
SN-II	842.0
SW	961.2

The breakdown is shown in Table J.2.7.

2.2.4 House Connection Cost

Unit construction cost of house connection is assumed at 1.17 million VND/house. The required number of house connection in each sewerage zone is estimated by dividing the population in outside of the existing sewerage area by number of family member of 5. Number of house connection in each sewerage zone is shown in Table J.2.8. Construction cost of house connection in each sewerage zone in shown below.

Sewerage Zone	Construction Cost (Billion VND)
TLBC	59.6
NLTN	146.0
THLG	78.8
THBNDT	70.3
SS	71.7
SE	140.4
SN-I	117.0
SN-II	46.0
SW	93.1

2.3 Land Acquisition

Sewer will be installed under the road, in principle. While, the land acquisition is required for construction of treatment plant and pumping station. The required land acquisition area along with unit land price in each sewerage zone is shown in Table J.2.9. Required land acquisition cost in each sewerage zone in summarized as below.

Sewerage Zone	Land Acquisition Cost (Billion VND)
TLBC	2.2
NLTN	13.7
THLG	8.1
THBNDT	14.6
SS	2.2
SE	2.4
SN-I	2.0
SN-II	1.4
SW	10.8

2.4 Project Cost

Project cost consists of construction cost, land acquisition cost, engineering cost, administration cost and physical contingency. Engineering cost and physical contingency allowance are assumed at 7 % and 10 % of construction cost. And administration cost is assumed at 3 % of construction cost and land acquisition cost. Total project cost of nine (9) sewerage development projects is estimated at VND 25,146.9 billion at February 1999 prices. Break-down of the project cost in each sewerage zone is shown below.

Project Costs of Each Sewerage Zone

(Million VND)

No	Zone	Construction Cost (DC)	Land Acquisition Cost (LC)	Engineering Cost DC x 0.07	Administration Cost (DC+LC) x 0.03	Physical Contingency DC x 0.1	Total
1	TLBC	1,051,337	2,181	73,594	31,606	105,134	1,263,852
2	NLTN	3,225,994	13,703	225,820	97,190	322,599	3,885,306
3	THLG	1,887,145	8,106	132,100	56,858	188,715	2,272,924
4	THBNDT	3,155,965	14,552	220,918	95,116	315,597	3,802,148
5	SS	1,932,343	2,158	135,264	58,036	193,234	2,321,035
6	SE	2,569,965	2,413	179,898	77,172	256,997	3,086,445
7	SN-I	2,708,458	2,027	189,592	81,314	270,846	3,252,237
8	SN-II	1,445,538	1,390	101,188	43,408	144,554	1,736,078
9	SW	1,939,410	10,848	135,759	58,508	193,941	2,338,466
	Total	19,916,155	57,378	1,394,133	599,208	1,991,617	23,958,491

[Note] 1. Cost: Cost as of February 1999

2. Exchange Rate : 10,000VND = 90J-Yen, 120J-Yen/US$

2.5 Foreign Currency and Local Currency Portion

Project cost consists of the foreign currency portion (F.C.) and the local currency portion (L.C.). The components of each item are assumed as follows:

Item	F.C. (%)	L.C. (%)
Construction Cost	30	70
Land Acquisition	0	100
Engineering Cost	70	30
Administration Cost	0	100
Physical Contingency	30	70

2.6 Annual Disbursement Schedule

Based on the implementation program as shown in Fig S-25, disbursement schedule is formulated as shown in Table J.2.9. Total project cost for nine (9) sewerage development projects is VND 25,146.8 billion at 1999 prices and required annual investment cost ranges from VND 134.5 billion to VND 1,828.5 billion with an average of VND 1,197.5 billion. Detail annual disbursement schedule of each sewerage development plan is shown in Table J.2.10.

2.7 Replacement Schedule

15 years after completion of the construction of each sewerage zone, all mechanical equipment will be replaced within 5 years. Annual replacement cost ranges from 189 million VND to 572 million VND with an average of 303 million VND. Required replacement cost of each sewerage zone is shown in Table J.2.11.

II. Feasibility Study

3. Construction Plan

3.1 Urban Drainage Improvement

3.1.1 General

This report deals with the construction plan and construction schedule of the urban drainage of the identified priority areas of the feasibility study.

The construction works consist mainly of dike, embankment, pump station, flap gate, storm sewer, and rehabilitation of existing combined sewer.

3.1.2 Basic Conditions

For the construction planning and scheduling, the following considerations have been taken as basic concept of construction works.

(1) Content of Construction Project

The three areas subjected to this construction project are Thanh Da district for 15.4 ha, Ben Me Coc (1) district for 70.9 ha, and Ben Me Coc (2) district for 46.0 ha. Moreover, the improvement works of Tau Hu – Ben Nghe canal and, the new construction and rehabilitation of sewers will be done accordingly.

The construction project is divide into two terms. The Phase I is from 2000 to 2005, and the Phase II is such as safety and cleaningfrom 2006to 2010.

The contents of construction project of each place are shown as follows.

[Phase I : 2000 ~2005]

Item	Location			
	Thanh Da	Ben Me Coc (1)	Ben Me Coc (2)	Tau Hu-Ben Nghe Canal
Embankment	7.6 km			7.360 km
Dredging	-	-	-	7.360 km
Retarding Pond	Pond	Pond	-	-
Flap Gate	6 places	12 places	8 places	-
Pump Station*	Q=21m³/min	Q=21m³/min	-	-
Storm Sewer	0.691km	4.607km	4.206km	-
Rehabilitation	Rehabilitation of Combined Sewer : ϕ 1,200~ ϕ 2,500 ; 12.518 km			

* : The construction of pumping station include sluice gates and other related equipment.

[Phase II : 2006 ~ 2010]

Item	Location			
	Thanh Da	Ben Me Coc (1)	Ben Me Coc (2)	Tau Hu-Ben Nghe Canal
Embankment	-	-	-	6.015 km
Dredging	-			6.015 km
Retarding Pond	-	Pond	Pond	-
Pump Station	-	Q=24m³/min.	Q=63m³/min.	-
Storm Sewer				
New Sewer	New Storm Sewer : ϕ 600 ~ ϕ 3,000 ; 46.053 km			

(2) Mode of Construction

The construction shall be carried out by contractors selected through international competitive bidding.

(3) Availability of Construction Plant and Equipment

The major construction work shall be carried out by applying heavy equipment due to limited construction period and keeping good quality of construction.

(4) Construction Materials

Most of basic construction materials are found available in this country. While, the particular processed steel and other particular materials are to be procured from outside.

(5) Pattern of Construction Method

Main work comprises of earth work and concrete work. The Earth work is planned to be carried out mainly by construction machinery in combination with manpower. While, the concrete work is to be mixing plant and or conventional way.

3.1.3 Major Work of Construction

The construction consists of the following three major item of works.

1) Pump Drainage Improvement
   a. Embankment
   b. Dike
   c. Flap Gate
   d. Pump Station
   e. Retarding Pond
   f. Storm Sewer
   g. Related Structures

2) Canal Improvement Works

a. Embankment
b. Dredging
c. Revetment

3) New and Rehabilitation Sewer
a. New Storm Sewer
b. Rehabilitation of Existing Combined Sewer

The work is covered both new construction and rehabilitation for existing facilities include temporary works, surveying, coffering, scaffolding etc. The construction methods for major works are planned as follows:

(1) Embankment / Dike

The embankment and dike of Thanh Da district, Ben Me Coc (1) district, and Ben Me Coc (2) district is total 7.6 km. All these embankment and dike of three districts are scheduled to be completed at the Phase I.

Both soil condition of these districts are very soft grounds such as N-value = 0~3 continues over 17m~20m according to the soil investigation. Therefore, when constructing the embankment, it is necessary to note to the adoption of appropriate method of earth works, method of dewatering, and selection of construction machine, etc.

The banking for the embankment is to be principally carried out with the suitable materials from borrow pit nearby the embankment site, except in the special case where the materials is not suitable for the embankment.

The banking is principally carried out by bulldozer, compactor for spreading and compaction. While, transportation and hauling of the earth materials is carried out by dump track and manpower.

The excavation from borrow pit is to be carried out by using bulldozer, swampdozer, backhoe and manpower.

In case of excavation for low-lying portion width wetted condition, swampdozer is mainly used. The excavation by dredging is also considered for underwater excavation.

In the dry season, water tanker may be required to adjust the water content of the earth materials for quality control.

Furthermore for the smooth and effective operation of the work, supporting equipment and temporary coffering, etc, are required.

(2) Storm Sewer Pipe Laying Work

The diameters of the storm sewer pipes are ϕ 800~ ϕ 2,000, and the construction depth is 2m ~4m. The length of the pipe laying works of each district is shown follow.

Thanh Da	:	0.691 km
Ben Me Coc (1)	:	4.607 km
Ben Me Coc (2)	:	4.206 km

The constructions are done on the road in the city, but the construction depths are comparatively shallow. The important notice of the construction and the use construction machine are similar to the sewerage system described after this.

(3) Flap Gate

Construction of flap gate requires earth work, concrete work, foundation work, metal work and installation of flap gates.

In most of the site, design level is below ground water. Civil work is needed coffering with earth banking and or steel sheet piling. Foundation is principally to be treated by concrete paling. Regarding to mechanical facilities, Fabrication shall be done in authorized factory.

(4) Pump Station

The construction of pump station comprises the civil work, building work, mechanical and electrical works.

The major work items of the civil work are excavation, banking, backfill, foundation work and concrete works. The civil work is planned to be carried out with same manner described in the "sewerage system; pumping station" after this.

The pumping equipment is composed of pump, main motor, pipe and valve, sluice gate, and other facilities. When the equipment with good quality cannot be obtained, they are imported.

(5) Canal Improvement Works

The canal improvement works is done at Thu Hu – Ben Nghe Canal, 13.375 km. The Phase I construction is 7.360 km, and the Phase II is 6.015 km.

The construction of the canal improvement works is composed of the embankment, revetment and dredging. The construction is carried out according to the progress situation of the relocation program of illegal houses along the canal.
The embankment work is planned to be carried out with same manner described in the

"3.1. Embankment". However, along this canal area is a place crowded most in the city. Therefore, the conscientious plan is demanded as for the construction.

The revetment is designed on the river side slope of the embankment. The structure of the revetment is decided depending on the topography, and the land use, etc for the place. The revetment is constructed by combination of man power and construction machine. Coffering is also required for the construction under water portion.

4) Main Construction Machine

Kind of Work	Machine Name	Work Content
Earthwork	Backhoe	Excavation work
	Bulldozer	Grading of earth and sand
	Dump Truck	Transport of earth and sand
	Tractor Shvel	Leveling of earth and sand
	Swampdozer	Grading of earth and sand
Foundation Driving Work	Pile Driver	Piling Work
	Diesel Hammer	Piling Work
	Crawler Crane	Transport of Pile
Foundation Work	Backhoe	Excavation work
	Bulldozer	Leveling of gravel & cobble
	Handdozer	Leveling of gravel & cobble
	Dump Truck	Boulder, Transport of earth and sand
	Tractor Shvel	Leveling of gravel & cobble
	Concrete Pump Car	Concrete placement
	Submersible Pump	Dewatering work
Concrete Work	Crawler Crane	Landing, Transport of Material
	Truck	Landing, Transport of Material
	Concrete Pump Car	Concrete placement
	Transit Mixer	Transport of Concrete
	Vibrator	Concrete placement
	Air Compressor	Cleaning of Form, and others
	Electric Welding Machine	Welding of Reinforcing bar, etc.

3.1.4 Construction Schedule

The construction schedule is based on the following assumptions :

[Phase I]

A) Financial and required arrangements shall be complete by the middle of 2000.
B) Detailed design shall be commenced in the middle of 2000, and completed within a period of 9 months.
C) The construction works of the pump drainage improvement shall be commenced in the end of 2001 and completed within a construction period of two years.
D) The construction works of Tau Hu – Ben Nghe canal improvement shall be commenced in 2003 and completed within the beginning of 2005.
E) After completion of the Phase I construction, the drainage system shall be monitored and checked whether there are any gaps between the actual conditions

and the assumed conditions.

[Phase II]

A) Financial and required arrangements shall be complete by 2004.
B) Detailed design shall be commenced in the beginning of 2005, and completed within a period of 9 months
C) All construction works shall be commenced in 2006 and completed within 2008.

The proposed implementation schedule is shown in Fig. J.3.1.

3.2 Sewerage Development

3.2.1 General

This report deals with the construction plan and construction schedule of the sewerage system in the identified priority areas of the feasibility study.
The construction works consist mainly of sewer pipe laying works, and the construction of pumping station and wastewater treatment plant for the sewerage system.

3.2.2 Basic Condition

For the construction planning and scheduling, the following considerations have been taken as basic concepts of construction works.

1) Content of Construction Project

This construction is carried out in at two stages. The contents of construction of each stage are shown as follows.

Item		Phase I 2000~2005	Phase II 2006~2010	Total
Design Flow		141,000m³/day	328,000m³/day	469,000m³/day
Water Quality		50 mg/l	50mg/l	-
Sewer pipe laying works	Interceptor Sewer	ϕ 700~2500, 6.053km	ϕ 400~2500, 29.052km	ϕ 400~2500, 35.105km
	Conveyance Sewer	ϕ 1500~2500, 6.400 km	0	ϕ 1500~2500, 6.400km
Pumping station	Civil & Building	100%	0	100%
	M & E Works	40%	60%	100%
Wastewater treatment plant	Civil & Building	25%	50%	75%*
	M & E Works	20%	55%	75%*

* : In a final specification of this sewerage system facilities, the design flow is 512,000 m³/day, the target water quality is 20 mg/l and the design period is 2020. However, this project is up to 2010, they are constructed by the specification shown in the above-mentioned table.

2) Mode of Construction

The construction shall be carried out by contractors selected through international competitive bidding.

3) Availability of Construction Plant and Equipment

The major construction work shall be carried out by applying heavy equipment due to limited construction period and keeping good quality of construction.

4) Construction Materials

Most of basic construction material are available in this country. While, the particular processed steel and other particular materials are to be procured from outside.

3.2.3 Major Work of Construction

(1) Sewer Pipe Laying Works

Outline of Construction Works and Construction Position

Sewer pipe laying works are to be done for the sewerage system of the old town of THBNDT district in Ho Chi Minh City because the combined sewers are mainly existing in this district. The new sewer pipes consist of interceptor sewers and conveyance sewers. The interceptor sewers intercept and gather the sewage from the existing combined sewers. The conveyance sewers discharge the collected sewage to the pumping station and the wastewater treatment plant constructed in the low marsh belt of the city suburbs.

Besides, the new construction (51.4 km)and the rehabilitation (12.5km)of sewers are done in the areas of insufficient sewers. The construction method of these sewers is similar to the interceptor sewers and the conveyance sewers. Therefore, only the construction plan of the interceptor sewers and the conveyance sewers is described in the report.

Sewer pipe laying works are constructed by Open cut method, Pipe jacking method, and Shield tunneling method depending on the condition of the depth of laying underground of piping and the situation in the surrounding.

The construction position and the construction section of each construction method are shown in Fig. J.3.2.

Preparation Beforehand

1) Investigation Beforehand

Investigations are carried out to obtain materials necessary for securing the examination of the construction method, the temporary housing plan, the term of works, the construction expense, safeties and environmental maintenance beforehand. The investigations beforehand consist of preliminary surveys such as collecting existing materials and main surveys such as the measurements, borings, and exploratory excavations.

1 Existing Material Investigation

It is necessary to examine the following materials beforehand to know the content of construction and the site of construction that will be done hereafter from an overall viewpoint.

- Design Document
- Road Register
- Land Register

2 Local Survey

To investigate, and to confirm the current state around the construction site, the following local surveys are done.

- Current states of valleys of geographical features and drain situation, etc.
- Environment in region and situation of traffic.
- Investigation at current state of existing structure : Road shape, Positions and structures such as building, retaining wall, utility poles, and fire-plugs, Aerial wires of electric power and telephones.

3 Investigation of underground burial pipes and other things.

4 Land survey : When an existing plan is incomplete, the planimetry is done in the locale.

5 Soil survey : The material of the examination of the pipe foundation and the selection of the earth-retaining method, etc. is obtained.

6 Exploratory excavation : The exploratory excavation is done when the position of the underground burial things is indefinite.

2) Selection of Construction Method

The construction methods are decided by the economy of the method and the technological sides of auxiliary construction methods, the nature of soil condition, and the temporary facility plans, etc. Moreover, it is necessary to be considered of the construction conditions such as the problem of the noise and the vibration, the subsidence, and traffic condition, etc.

The main element which should be considered when the construction method is selected is described as follows.

(a) Comparison of construction methods of pipe laying works and examination of application section

(b) Linear shape of piping route, depth, shape, and examination of the structure

(c) Examinations of temporary work method

(d) Examinations of auxiliary work method

(e) Examinations of environmental maintenance measures and especially examination such as traffic circumstance, working hours, and noises and vibrations.

(f) Examinations of safety measures of construction

(g) Examinations of construction process and construction expense.

3) Construction Organization and Safety Measures, etc.

(a) Construction Site Organization
The person in charge according to the field on the construction site such as a person in charge of the entire site, a technological person in charge, the safety manager, the person in charge of security of underground laying things, the person in charge of public relations, and the person in charge of a special construction method is decided, and the site organization is fixed.

(b) Labor, Materials and Machines Plan
Labor plans such as the number of schedules according to the occupational category are planned based on the execution construction schedule. About the materials, these are divided for the temporary facilities and for this construction, and the use schedule time and the carrying time are planned. Main construction machines also plan similarly.

(c) Safety Control Measures
Noise, vibration, fine particles, and subsidence :

The construction site is investigated enough before we start constructing, and necessary measures are considered. Moreover, we have to explain to the local resident beforehand, and necessary notifications to public offices are done.
Safety control organization :

The safety control organization on the construction site is organized, and the persons in charge of the safety control are set in each kind of works.
Safety education :

The safety teaching to the worker is regularly executed.

Open Cut Method

1) Outline of Construction Method

The open cut method is most generally used, and the feature is as follows.

(a) It is suitable to the case that the excavation depth is comparatively shallow, and the construction is technically easy because of the adoption of the various slop cut methods and the earth- retaining methods corresponding to the soil condition.
(b) The construction expense is cheap, the term of works is also short, and the execution is certain.
(c) It is possible to correspond to various section shape.
(d) It becomes the obstacle of the road traffic because of work on the road.
(e) The temporary works such as earth-retaining work, road deck, and defenses of the underground burial things are necessary.

2) Protection of Pipe and Pipe Foundation

(a) Protection of Pipe

When the earth-pressure and the working load exceed the allowable load of the pipe, the pipe has to be protected by lining concrete or reinforced concrete placement. When the inside in the pipe might be damaged due to the wear and corrosion, the inside in the pipe is coated by a suitable method.

(b) Pipe Foundation

The shape of the pipe foundation is decided according to the kind of shape of the pipe and soil condition, etc. Especially, the conveyance sewer will be constructed with an undeveloped low marsh belt. Therefore, the basis of the pipe foundation is to use Torii (Portal) foundation. Moreover, the elaborate construction is demanded as a

foundation ground is paved and hardened with gravel sand, etc. Main pipe foundations are shown as follows, and these shapes are shown Fig. J.3.3.

- Sand foundation
- Gravel foundation
- Concrete foundation
- RC foundation
- Ladder-Tie foundation
- Torii (Portal) foundation

3) Main Construction

(a) Earth-Retaining Works

In digging the ground, as a rule, when the depth of digging exceeds 1.5 m, the earth-retaining works is needed. The best construction method is selected from the kind of the following earth-retaining methods according to each site condition.

- Wooden Sheet Pile method
- Berlinoise method
- Light Steel Sheet Pile method
- Steel Sheet Pile method

The outlines of these methods are shown Fig. J.3.3.

The steel sheet pile method is excellent in durability, watertight, and strength. In this construction area, the steel sheet pile method is recommended because it is forecast that the ground is very soft, and there is a lot of spring water. Moreover, when a lot of spring water is forecast, it is necessary to prevent Heaving and Boiling by enlarging the penetration of the steel sheet pile. Vibro hammer is used in general for driving a steel sheet pile and it is necessary to note the noise and the vibration. Moreover, the subsidence of the ground in the circumference is caused easily at the time of pulling out the steel sheet pile, and enough attention is necessary, because, to disarrange soil in the back of the steel sheet pile, for soil to adhere to steel sheet pile, to pull up.

(b) Earthwork

When the excavation work begins, the position of the underground burial things are investigated and confirmed beforehand, and 1.5 m in depth is carefully dug because there are a lot of underground burial things. When underground water goes out, we dig while promptly dewatering with a submersible pump.

The backfill is executed after dewatering without fail, and the specified sand is used. Moreover, we carry out enough compaction at intervals of 15 cm, so as not to cause

the subsidence. Especially, the surrounding of the underground burial things is compacted deliberately.

The removal of surplus soil is carried out by using an appropriate transportation means such as dump trucks for the specified disposal area. The load volume work to the dump truck notes that the road does not became dirty by the soil's dropping, and it is necessary to note the road clean and safely.

(c) Dewatering Work

This construction area is forecasted that the groundwater level is in general high, and a large amount of spring water will occur. The dewatering work by the following groundwater level lowering methods is done by the occurrence situation of spring water.

- Sump Drainage Method
  The sump drainage method is a construction method which collects the water which flows in the digging ditch to the sump installed in the bottom, and drains it with the submersible pump outside. This construction method is most generally used. Dirty spring water settles earth and sand by the grit chamber, and drains it.

- Deep Well Method
  The grinding hole of about 40～60cm in the diameter is done, the casing is build in, and the submersible pump which is settled in the casing pumps an underground water up. This construction method is used for a large amount of drain, for the pumping depth is large, and for the coefficient of permeability of the soil is bigger than the well point method.

- Well Point Method
  It is adopted for the purpose to make the digging part dry. This construction method is to drive the catchment pipe named well point to an underground side, and to decrease by this well point in the underground water level. Usually, the underground water sucks and drains with the vacuum pump by setting up two or more well point, and bringing these together. The pump head is 6～8 m.

4) Main Construction Machines

Kind of Work	Machine Name	Work Content
Excavation work	Conveyor Belt	Surplus soil sending off
	Backhoe	Excavation work
	Dump Truck	Removal of Surplus soil
Pipe Laying Work	Wrecker	Pipe Hanging
Earth-Retaining Work	Wrecker	Steel Sheet Pile Hanging
	Vibro Hammer	Steel Sheet Pile Driving
Back Filling	Rammer	Sand･Bottoming roll
	Roller	Subgrade, Subbase rolling
Pavement Exclusion	Cutter Machine	Pavement cutting
	Compressor	Asphalt concrete destruction
	Breaker	
Dewatering Work and Subsidiary work	Submersible Pump	Dewatering
	Well Point Machine	Dewatering
	Machines for pavement work	Pavement restoration
	Truck and others	Transportation, and others

Pipe Jacking Method

1) Outline of Construction Method

The pipe jacking method is pipe laying method by press-in the propulsion pipe to earth by the driving force of the jack. The propulsion pipe is produced at the factory, and preceding equipment is taken in the point. As a rule, it is the construction of the straight line, and it is possible to correspond also to the construction of some curve.

The concept drawing is shown in Fig. J.3.4.

The pipe jacking method is used in the following places.

(a) The place on the road where a lot of traffic exists and the road that the underground burial things are crowded and where digging from the ground is difficult.

(b) To cross the track or the river, the place where digging from the ground is impossible.

(c) Because the position where the sewer pipe is laid underground is very deep, the place where digging from the ground is difficult, or becomes uneconomical. There are a lot of kinds of the pipe jacking methods depending on the stability of the facing, the digging method, the transmission method of the driving force, and the method of carrying out the earth and sand. In this construction, we select it from the following two methods by the soil conditions and the situation of spring water.

(d) Cutting Edge Pipe Jacking Method

The cutting edge pipe jacking method is used in the ground where the facing is steady. The cutting edge is installed in point of the propulsion pipe, and capitalized on as the preceding equipment. The construction equipment is simple, because the digging and the carrying out the muck are done by human strengths. Usually, the cutting edge pipe jacking method is applied to the pipe more than 800mm diameter. The possible maximum construction length is about 70m. However, if the middle pushing method is adopted, it is possible up to about 200m.

(c) Semi-Shield Tunneling Method

The semi-shield tunneling method installs "Shield" in the point of the propulsion pipe, and capitalized on as the preceding equipment. It is possible to correspond to a soft soil by selecting this Shield. The possible maximum construction length is about 100m. However, if the middle pushing method is adopted, it is possible up to about 500m.

2) Note in Design and Construction

(a) The allocation of the construction section of the pipe jacking method is decided in consideration of the manhole and the diversion chamber, or a refraction point of the pipeline and the straight-line distance. Each departure shaft and arrival shaft is used as manhole and diversion chamber.

(b) A forecast is made that the soil of this construction area is soft and the underground water level is height. When the pipe jacking works is done, it is necessary to do measures of the prevention of the collapse of the facing, and the prevention of springing up the underground water.

(c) When departure shaft and arrival shaft are constructed, the confirmation of the underground burial things is noted, and an appropriate earth-retaining method and dewatering work are selected. Moreover, it is necessary to make the arrangement plan of the site in consideration of carrying materials and carrying out the surplus soil.

3) Main Construction Machine

Machine Name	Use Purpose
Portal Crane	Pipe and Materials hanging
Dump Truck	Surplus soil sending off, Materials transportation
Oil Jack & Control Unit	Jacking, and Control
Handcar	Transportation of Surplus soil in pipe
Grouting Pump	Injection of Lubricants and backfill materials
Grout Mixer	Injection of Lubricants and backfill materials
Winch	Handcar and Surplus soil sending off

Gas Cutter	Cutting such as Steel sheet pile

Shield Tunneling Work

1) Outline of Construction Method

The shield tunneling method is a construction method by which the tunnel constructed in soft ground. The tunneling arm digger that is called "Shield" propels in the earth. The shield has the function to do the digging work safely in it while preventing earth and sand from collapsing. The shield consists of outside frame part of the steel-made and the internal device group. The outside frame part of the steel-made protects the inside for the lord which acts on the outside. An internal device group has the function to do digging in the front side, lining in the backside, and propelling in the earth.

The shield tunneling method has the following features.

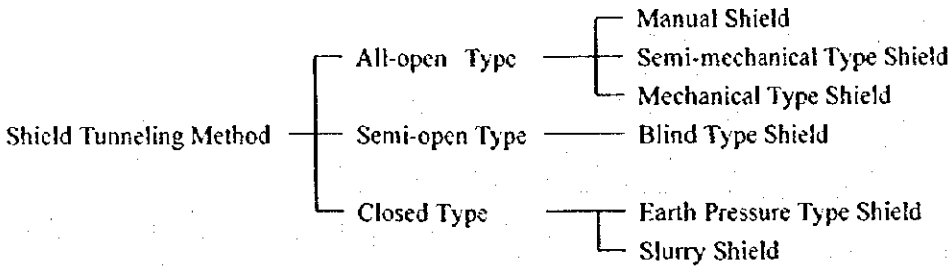
(a) The worker can work safely and surely because the ground is supported by the shield.

(b) The shield tunneling method does lining work by using the segment manufactured at the factory. Therefore, the construction is easy and early, and it is excellent also in the quality control.

(c) It is easy to be saved labor from the repetition of the same work it, and becomes certain the progress of work control.

(d) This method does not obstruct the road traffic, and is an excellent construction method in environmental preservation such as the noise and vibrate.

This construction method is divided roughly into the type of all-open and the closed types by a front structure, and, in addition, classified as follows.



In this construction, the slurry shield method is used based on the result of soil investigation beforehand.

2) Slurry Shield Method

The slurry shield method is a construction method by which it opposes water pressure and earth pressure by filling and pressurizing the slurry in the chamber, and the facing is stabilized. The occurred muck is made to the slurry, and transported with fluid. Because somewhat larger slurry pressure is put than the earth pressure on the digging surface, the stability of the facing is kept, and there is no dread of blow. The facing is stabilized by not only the slurry pressure but also the use of slurry that a specific gravity is large, and the viscosity is high. Therefore, the place where water pressure in the riverbed and bottom of the sea is high can be constructed.
The concept drawing is shown in Fig. J.3.4.

3) Note in Design and Construction

(a) This construction method uses the underground in the canal and the river. And, the machine and the material of this construction method used are abundant. Especially, around the departure shaft, there are the slurry treatment plant and other lot of the machines and the materials that are carried, and carried out. Therefore, the wide construction site is necessary, and it is necessary to take notice to select the construction position.

(b) The note of the construction of the shaft is similar to the case of the pipe jacking method. However, it is necessary to note of the construction procedure and safety because the construction scale is large and the slurry treatment plant is set up, etc.

4) Main Use Machine

Use Place	Machine Name	Work Content
Surrounding of Facing	Shield Machines	Driving work
	Shield Jack	Driving work
	Slurry Pump	Removal of Slurry and Muck
	Screw Conveyor	Removal of Slurry and Muck
Tunnel interior	Slurry Pump	Removal of Slurry and Muck
	Belt Conveyor	Removal of Slurry and Muck
	Battery Locomotive	Removal of Slurry and Muck
	Muck Car	Removal of Slurry and Muck
Surrounding of Shaft	Portal Crane	Transport of Machine and material
	Mortar Mixer & Pump	Secondary Lining
	Submersible Pump	Dewatering
	Crawler Pile Driver	Shaft construction
	Vibro Hammer	Shaft construction
Other equipment	Slurry Treatment Plant	Slurry treatment
	Machines for Secondary Lining	Secondary Lining
	Electric Insulation	
	Dump Truck and others	

Construction Process Plan

As for the sewer pipe laying works, 41.5 km (The Phase I; 12.5 km) in the total length and the construction distance are long, and a long series of construction period is needed. Moreover, the construction places are varied with conditions of a road in the city such as a lot of traffic, undeveloped low marsh areas, etc. Therefore, it is necessary to use the best construction method for a specific construction place, and to schedule a deliberate construction process.

1) Interceptor Sewer

It is the construction by the open cut method in the city road where a lot of traffic exists. The construction needs to be delimited to the span of 200m～500m according to the land use form and the traffic etc. After piping is constructed, it is noted to restore promptly, and not to hinder traffic. It is similar to the construction of new sewer and the rehabilitation of sewer.

2) Conveyance Sewer

When the conveyance sewer is constructed in the place where river is crossed and the depth of laying underground of the pipe is large, the pipe jacking method and the shield tunneling method are used. In construction by the open cut method, the construction place is an undeveloped low marsh area and a narrow farm road. Especially, in construction with the low marsh area, the roads for construction have to be executed by the fill beforehand because it is a super-soft ground. The section on this road is shown in Fig. J.3.5. The road fill works precede the pipe laying works for 6～12 months. Meanwhile, the ground is tightened and hardened enough by running about the bulldozer and the construction machine. As a result, the ground is steady, and the strength increases.

(2) Wastewater Treatment Plant

Outline of Construction

The construction sites are in the delta zone of about 6.4 km to Ho Chi Minh City south, and are about 52.2 ha in the area. The construction site region is low marsh area, and a super-soft ground that the state of N-value = 0 continues up to about –20m according to the result of the soil investigation. Moreover, there is no existing road in the circumference of the site, therefore we should examine carrying construction machine and material by the ship which uses the river.

The construction is done for a long term according to the provided order of priority. Therefore, because, as the case, the construction will be done concurrently driving the facilities as a wastewater treatment plant, a deliberate examination is necessary for the

planning construction. Moreover, it is necessary to pay enough attention for the method of making site preparation and the plan of the temporary road.

Temporary Access Construction

The temporary access is set by two places. These positions are shown in Fig. J.3.5.

1) Unloading Pier for Construction Machine and Materials

One place of the temporary access is set up the unloading pier for construction machine and materials at the position where it face the Go Noi River on the construction site southwest edge. The earth and sand for the fill and the large-scale construction machine are chiefly carried here, and the surplus soil is carried out. The pier is set up at the position of depth where the ship can moor even because of the low water. The pier superstructure is constructed to be able to operate the large-scale dump truck, and RC pile or H bearing pile is used for the construction. The width of the pier is assumed to be about 50 m.

2) Temporary Road

Another place is a road that links the expressway of existing with the construction site northwest edge. The conveyance sewer is constructed under this road. Moreover, in the future, it will become a trunk line road to go to the wastewater treatment plant.

The road is constructed low cost road pavement for the construction period. And we use it while one by one repairing because a large subsidence is expected. In construction in an undeveloped low marsh area, the road is filled before six months of the use beginning. And, this pre-loading stabilizes the ground.

Site Preparation

1) The First Fill

This construction site is a super-soft ground and a low marsh area where the majority of the site goes under water at the high tide. Therefore, the first fill is done filling of 1m to whole of the site, and the trafficability of vehicle for construction is secured. At this time, the geotextile seat laid on the whole of the site so that the fill material should not slip into a soft ground. According to the soil condition, the reinforced-earth method is used together such as the grid base made of bamboo. The fill material should use good permeability sand for the soil-improvement work continuously done.

2) Soil-improvement Work (Treatment of Poor Subsoil)

The soil-improvement work is done by vertical-drain method. The aims are the early stabilization of the consolidation settlement and the strength improvement of the ground. In the vertical-drain method, there are the sand drain method and the plastic board drain method. The method is selected by the easiness of obtaining the material of drain and the presence of the driving machine. Especially, it is preferable that the important structure that wants to avoid subsiding does pre-loading by the extra banking about 1.25 times the load. The amount of the consolidation settlement is continuously measured setting the position of about ten points. Moreover, the sump trench is constructed to100 m in length and breadth pitch, and the consolidation water is removed and the consolidation accelerates.

3) The Second Fill

The second fill is done filling of 4m to whole of the site. It is necessary to do leveling and rolling compaction to the ground surface by a bulldozer, etc. After the fill is completed, the road for construction in the site is executed by using gravel sand. Moreover, after the 80%- consolidation settlement ends, we start the construction of the landscaping work such as the drainage work and the revetment work, etc.

Construction of Facilities of Wastewater Treatment Plant

1) Earthwork

(a) Excavation Works

The construction of the facilities of wastewater treatment plant will be implemented only after the completion of soil-improvement work because the soil condition in the construction site is very soft. The excavation for each facility is the open cut method, and the maximum digging depth is –17m of the pumping pit. The underground water level is presumed about –1.5m～-2.0m from the surface of the site ground, and so it is necessary to examine the groundwater level lowering method such as the well point method. In the deep excavation, the two-stage construction of the well point is necessary.

When the digging section is designed, setting the slope gradient and the use of steel sheet pile are planned because of the relation to the ground situation and the neighboring structures. Because the site is soft ground and the underground water level is high, the selection of excavator is noted. And it is necessary to take measures to dewatering such as the trench and the sump.

The removal of surplus soil is carried out by using the hopper barge to transport to a disposal area. Because the surplus soil is silty clay with high water content, it is necessary to properly examine the dewatering measures, the transportation and the

filling soil method.

(b) Well Point Method

When the well point method is planned, the necessary volume of pumping water is calculated from the coefficient of permeability and the thickness of aquifer by the soil investigation. And, the arrangement plan of the pumps, the well points and header pipe is made. Usually, one pump is applied with a capable pumping volume of 2 m^3/min, and the length of header pipe of 100m ~200m.

2) Foundation Pile Driving work

The foundation pile uses high strength RC piles usually, and is selected from the specification and the situation of the quality control, etc. The pile driving work should be considered the noise and other construction pollution. But in this construction, it is possible to use the diesel-pile hammer because the site is wide and places near private houses are few. When rain falls and the velocity of the wind exceeds 15m, the work will be discontinued. We take notice of safety of the work such as getting a foothold of pile driver.

3) Concrete Work

The concrete work of the structures of treatment facilities has the kind of the following construction. There are a lot of kinds of construction, and each work related. Therefore, because the worker and the construction machine are complicated, it is necessary to schedule the work of close attention.

- Foundation Work
  - Boulder Foundation Work
  - Blinding Concrete
  - Reinforcement Work
  - Formwork
  - Concrete Placement
- Reinforcement Work
- Formwork
- Concrete Placement
- Waterproofing
- Subsidiary Work
- Falsework
  - Outside Falsework
  - Inside Falsework

The construction materials used for each work note the specification and the quality enough. Especially, the main structures of treatment facilities are mass water tanks where watertight efficiency is strictly demanded, careful construction is necessary for concrete placement and waterproofing. Moreover, when the falsework is done,

the drawing of falsework plan is made beforehand. And the various facilities to achieve the safety of work in the height are examined.

Main Construction Machine

Kind of Work	Machine Name	Work Content
Earthwork	Backhoe	Excavation work
	Bulldozer	Grading of earth and sand
	Dump Truck	Transport of earth and sand
	Tractor Shvel	Leveling of earth and sand
Well Point	Well Point Machine	Groundwater level lowering
Foundation Driving Machine	Pile Driver	Piling work
	Diesel Hammer	Piling work
	Crawler Crane	Transport of Pile
Foundation work	Backhoe	Excavation work
	Bulldozer	Leveling of Boulder
	Handdozer	Leveling of Boulder
	Dump Truck	Boulder、Transport of earth and sand
	Tractor Shvel	Leveling of Boulder
	Concrete Pump Car	Concrete placement
	Submersible Pump	Dewatering work
Concrete work	Crawler Crane	Landing, Transport of Material
	Truck	Landing, Transport of Material
	Concrete Pump Car	Concrete placement
	Transit Mixer	Transport of Concrete
	Vibrator	Concrete placement
	Air Compressor	Cleaning of Form, and others
	Electric Welding Machine	Welding of Reinforcing bar,etc.
Temporary road	Backhoe	Excavation work
	Bulldozer	Grading of earth and sand
	Dump Truck	Transport of earth and sand
Temporary pier	Crawler Crane	Erection of Pier
	Truck	Transport of Material
	Vibro Hammer	Piling work of Pier
	Electric Welding Machine	Welding

(3) Pumping Station

Outline of Construction

The pumping station is in district 8 of Ho Chi Minh City, and the site area is about 1 ha. The site is a low marsh and a soft ground according to the result of the soil investigation where the soil condition of N-value = 0 continues up to about –5m. After that, about N-value = 15, medium dense clayey sand continues up to about –42m, and the bearing stratum exists in about –45m. The construction is the final relay pumping station at THBNDT district in Ho Chi Minh City. When all facilities operate, the design wastewater flow amount of 512,319 m^3/day of the average sewage is supplied to the wastewater treatment plant. However, only the amount of sewage of 141,000 m^3/day is subjected to

treatment in Phase I of this whole sewerage system plan. In the construction of the Phase I, all civil and building works are done. The machinery and electrical works will be done for about the 1/4.

Temporary Road for Construction

The temporary road for construction is made by 10m in width by widening the existing farm road. And, two temporary roads of 8m in width are constructed in order to link this road with the construction site. The road is constructed with a low cost road pavement for a short construction period. And we use it with latter repairing works because a large subsidence is expected. The plan section on the road is similar to the case of the wastewater treatment plant. After the normal operation of the pumping station, these roads will be constructed with a firm pavement to be used as the O/M road.

Site Preparation

The site preparation works are done first to lay geo-textile sheets, afterwards, the first fill is done by 1m in thickness, as a result, the trafficability is secured. The second fill is executed by examining the situation of the subsidence by the first fill, the excavation plan, and the temporary road plan in the job site.

Construction of Facilities of Pumping Station

1) Earthwork

All excavation works are done with the open cut method. The maximum digging depth is –17m of the pumping pit, and this part is vertically dug by the steel sheet pile method. The underground water level is high as well as the wastewater treatment plant, we should adopt the groundwater level lowering method such as the well point method. The removal of surplus soil and other execution plan are similar to the wastewater treatment plant. However, it takes notice to take measures such as safety and cleaning for the near residents because the construction is in the city.

2) Foundation Pile Work

Because the job site is near the city, and the site area is narrow, and the construction depth is deep, the construction method of the foundation pile work is used the cast in place concrete pile. We should adopt the cast in place concrete pile method that are used to construct the building in HCM City, and with reliability. Moreover, the job site is a soft ground with high underground water level, it is necessary to note the reliability of constructed concrete piles (securing a necessary pile section, the concrete compressive strength, etc.).

3) Concrete Works

The concrete works of the pumping station is similar to the case of the wastewater treatment plant. It is necessary to plan the temporary facilities arrangement and the construction materials carrying, etc. deliberately in consideration of nearing the job site to the city, and narrow the site area.

Main Construction Machine

Kind of Work	Machine Name	Work Content
Earthwork	Backhoe	Excavation work
	Bulldozer	Grading of earth and sand
	Dump Truck	Transport of earth and sand
	Tractor Shvel	Leveling of earth and sand
Well Point	Well Point Machine	Groundwater level lowering
Foundation Driving Machine	Pile Driver	Piling work
	Diesel Hammer	Piling work
	Crawler Crane	Transport of Pile
Foundation work	Backhoe	Excavation work
	Bulldozer	Leveling of Boulder
	Handdozer	Leveling of Boulder
	Dump Truck	Boulder, Transport of earth and sand
	Tractor Shvel	Leveling of Boulder
	Concrete Pump Car	Concrete placement
	Submersible Pump	Dewatering work
Concrete work	Crawler Crane	Landing, Transport of Material
	Truck	Landing, Transport of Material
	Concrete Pump Car	Concrete placement
	Transit Mixer	Transport of Concrete
	Vibrator	Concrete placement
	Air Compressor	Cleaning of Form, and others
	Electric Welding Machine	Welding of Reinforcing bar,etc.
Temporary road	Backhoe	Excavation work
	Bulldozer	Grading of earth and sand
	Dump Truck	Transport of earth and sand

3.2.4 Construction Schedule

The construction schedule is based on the following assumptions :

[Phase I]

A) Financial and required arrangements shall be complete by the middle of 2000.

B) Detailed design shall be commenced in the middle of 2000, and completed within a period of 9 months.

C) The construction works of the wastewater treatment plant and conveyance sewer shall be commenced in the end of 2001 and completed within a construction period of four years. These constructions are done at very soft ground, therefore, it is necessary to a period of soil improvement works.

D) The construction works of the interceptor sewer and the pumping station shall be commenced in 2002 and 2003 respectively and completed within the beginning of 2005.

E) After completion of the Phase I construction, the sewerage system shall be monitored and checked whether there are any gaps between the actual conditions and the assumed conditions.

[Phase II]

A) Financial and required arrangements shall be complete by 2004.

B) Detailed design shall be commenced in the beginning of 2005, and completed within a period of 9 months

C) All construction works shall be commenced in 2006 and completed within 2010.

The proposed implementation schedule is shown in Fig. J.3.6.

4. Cost Estimate

4.1 Urban Drainage Improvement

4.1.1 General

This report deals with the construction cost estimated for the identified priority areas of the feasibility study.

The cost estimation consists of the storm water drainage works at Thanh Da district, Ben Me Coc (1) district and Ben Me Coc (2) district, Tau Hu – Ben Nghe canal improvement works and the rehabilitation of combined sewer.

4.1.2 Basis of Cost Estimation

The construction cost for the projects is estimated on the basis of the design, construction plan and following conditions.

(1) Basic Conditions for Major Items of Works

1) Banking for Embankment
Material ;
Most embankment materials are to be brought from outside.
Equipment ;
Heavy construction machinery i.e. Backhoe, Bulldozers and Dump trucks are used due to the big scale of embankment work.

2) Dredging for Tau Hu – Ben Nghe Canal Improvement
Dredger and manpower are to be used for the excavation of the canal. The dredger is

mainly used for the portion of below the ground water.

3) Excavation
Excavation by Equipment --
Excavation work for pump stations, sluice gates and large scale excavation are to be mainly carried out by using Backhoe, Bulldozer.
Excavation by Manpower --
Small scale of the excavation work is to be carried out by manpower.

4) Concrete Work
Batching plant is used for producing large volumes of concrete and for controlling its quality. The concrete is transported by transit mixer and placed by using concrete pump car.

5) Stonemasonry, Rubble Mound and Concrete Block Works
Stonemasonry, rubble mound and concrete block works for canal improvement are carried out mainly by manpower. Truck crane is used for the transportation and lifting the materials.

6) R.C. Pile and Steel Sheet Pile Driving
For the driving work of R.C and Steel sheet pile, crawler crane with Diesel hammer / vibration hammer is used. Generator is associated for the main equipment.

7) Special consideration on construction of project offices, quarters, warehouses, workshops, water supply system, electric power supply system, communication system, etc. is not considered due to availability of these facilities nearby the construction site.

(2) Component of the Project Cost

The project cost is composed of "direct cost", "indirect cost" and contingency. They are:

1) Direct cost : Construction work
Procurement and Installation of equipment

2) Indirect cost : Land acquisition and compensation cost for house resettlement
Administration cost

3) Contingency : Physical contingency

(3) Price Level and Unit Price

The unit price is based mainly on the market price prevailing in Ho Chi Minh City in July 1999. The details are presented in Tables J.5.1 to J.5.4.

(4) Mode of Contract

All the construction works are to be contracted by general contractors in international tendering process.

(5) Currency Portion

The cost is divided into foreign currency portion (F.C.) and local currency portion (L.C.). The components of each item are given as follows:

Item	F.C. (%)	L.C. (%)
Construction Cost	30	70
Land Acquisition	0	100
Compensation Cost	0	100
Engineering Cost	70	30
Administration Cost	0	100
Physical Contingency	30	70

(6) Exchange Rate

The exchange rates of foreign currencies are follows;
US $ 1 = 13,956 VND = Yen 113.39, Yen 1 = 123.08 VND

(7) Indirect Cost

Indirect cost is based on the following assumptions :

- Administration Cost : 3.0 % of construction cost, land acquisition and compensation cost
- Engineering Cost : 7.0 % of construction cost
- Physical Contingency : 10.0 % of construction cost

The land acquisition and compensation cost are estimated by using the collected data.

4.1.3 Unit Cost and Construction Cost

(1) Unit Cost

The unit costs are determined based on the data collected from the counterpart of this study team and other agencies concerned.

The unit cost is divided into two components of foreign and local currencies based on the current data applied to similar projects.

The diverse unit costs are shown in Table J.5.3, Table J.5.4, Table J.5.6 and Table J.5.7.

(2) Land Acquisition and Compensation Cost

The unit prices of land acquisition and compensation of house resettlement are estimated based on the regulations of Ho Chi Minh City.

The list of unit price is shown in Table J.5.9.

(3) Construction Cost

The construction cost is composed of direct construction cost, site expenses, overhead and profit including tax. The rate are assumed as follows :

1) Direct construction Cost
2) Site Expenses : 15 % of (1)
3) Contractor's Overhead Profit and Tax : 10 % of [(1) + (2)]

4.1.4 Estimate of Project Cost

The total project costs consisting of direct cost, indirect cost and physical contingency are estimated as follows:

(1) Total Project Cost

(Unit: Million VND)

Item	F/C	L/C	Total
A. Construction Cost			
1) Tau Hu-Ben Nghe Canal Improve.	148,596	346,727	495,323
2) Pump Drainage Improvement			
(1) Thanh Da	6,061	14,142	20,203
(2) Ben Me Coc (1)	19,850	46,316	66,166
(3) Ben Me Coc (2)	17,210	40,157	57,367
3) Rehabilitation of Combined Sewer	40,333	94,109	134,442
4) New Storm Sewer	36,560	85,306	121,865
5) Dredging Equipment	27,660	64,540	92,200
Sub-Total	296,269	691,296	987,565
B. Administration Cost	0	41,951	41,951
C. Engineering Cost	48,391	20,739	69,130
D. Land Acquisition and Compensation Cost	0	410,806	410,806
E. Physical Contingency	29,627	69,130	98,757
F. Price Contingency	43,028	187,553	230,581
Total	417,315	1,421,457	1838,790

The construction is to be implemented in two phases; Phase I and, Phase II. Construction costs and their breakdown are shown in Tables J.5.10 to J.5.16.