

TABLES



Table 2.1 Gross Domestic Product (GDP) by Kind of Economic Activity, 1991-1994

	1991	1992	1993	1994	Annual Ave. Growth Rate 1991-93 (%)
<i>(At Current Prices)</i>					
GDP (In billion of Dong)	76,707	110,535	136,571	170,258	30.4
1. Goods					
Agriculture, forestry and fishery	31,058	37,513	40,796	48,865	16.3
Industry	15,193	23,956	29,371	37,535	35.2
Construction	3,059	6,179	10,101	12,946	61.8
2. Services					
Transport, postal service & telecommunication	2,860	4,662	6,036	6,924	34.3
Trade and material supply	9,742	15,281	17,549	23,072	33.3
Finance, banking and insurance	1,108	1,567	2,318	3,450	46.0
State management, science, education, health and sport	6,807	9,718	14,402	18,270	39.0
Housing, tourism, hotel and repairs of personal computer goods	6,880	11,659	15,998	19,196	40.8
<i>(At Constant 1989 Prices)</i>					
GDP (In billion of Dong)	31,286	33,991	36,735	39,982	8.5
1. Goods					
Agriculture, forestry and fishery	12,264	13,132	13,634	14,169	4.9
Industry	6,042	6,925	7,766	8,771	13.2
Construction	1,186	1,317	1,558	1,860	16.2
2. Services					
Transport, postal service & telecommunication	792	842	897	960	6.6
Trade and material supply	3,654	3,877	4,109	4,478	7.0
Finance, banking and insurance	448	496	578	710	16.6
State management, science, education, health and sport	2,841	3,040	3,322	3,760	9.8
Housing, tourism, hotel and repairs of personal computer goods	4,059	4,362	4,871	5,274	9.1
Growth Rate (%)	6.0	8.6	8.1	8.8	-

Source : Statistical Yearbook 1993, General Statistical Office

Table 2.2 Data for GDP Growth Rate Projection (1/2)

Case - 1 : Economic Growth Rates - Total Economy		Case - 2 : Forecast of GDP Growth Rates (%) to the year 2010				
Year	GDP - VND billion (At 1989 Constant Price)	Growth Rate Compared to the Previous Year (%)	Whole Country		SFEA *	
			Alternative I	Alternative II	Alternative I	Alternative II
1991	28,808	6.00	8.0%	9.0%	12.0 - 13.0%	14.0 - 15.0%
1992	31,286	8.60	8.0%	9.0%	10.0 - 11.0%	12.0 - 13.0%
1993	33,991	8.10	8.0%	9.0%	14.0 - 15.0%	17.0 - 19.0%
1994	36,735	8.50	8.0%	9.0%	12.0 - 13.0%	14.0 - 15.0%
1995	39,857	9.00	8.0%	9.0%	10.0 - 11.0%	12.0 - 13.0%
1996	43,445	9.00				
1997	47,355	9.00				
1998	51,853	9.50				
1999	56,779	9.50				
2000	62,457	10.00				
% Changes by Sector						
			Whole Country		SFEA *	
			1990	2000	1990	2000
Agriculture		8.98	39.1%	29.4%	15.2%	5.3%
Industry			14.0%	22.5%	32.5%	40.7%
Service			46.9%	48.1%	52.3%	54.0%
Total			100.0%	100.0%	100.0%	100.0%

Note : * SFEA = Southern Focal Economic Area, which covers the whole Ho Chi Minh City and Ba Ria-Vung Tau province and parts of Dong Nai, Song Be, Tay Ninh, Long An and Binh Thuan provinces with a land area of 12,413 km² and a population of about 7.8 million.

Source : Document on the Development Orientation on the Southern Focal Focal Economic Area (SFEA)

Source : Statistical Data of Vietnam's Economy, 1993

Table 2.2 Data for GDP Growth Rate Projection (2/2)

Case - 3 : Economic Groth Rates for "Total Economy"

Sector	1990-91	1992-96	1997-2012	Average
(Scenario 1 = Most probable forecast)				
Agriculture	3.1%	4.3%	5.9%	5.4%
Construction	4.5%	7.4%	7.7%	7.4%
Industry	6.6%	6.7%	6.8%	6.8%
Trade / Other	4.9%	5.6%	6.4%	6.1%
Total Economy	4.4%	5.4%	6.4%	6.0%
(Scenario 2 = More optimistic forecast)				
Agriculture	3.1%	5.3%	6.0%	5.9%
Construction	4.5%	8.6%	8.6%	8.6%
Industry	6.6%	8.4%	8.5%	8.5%
Trade / Other	4.9%	7.5%	7.6%	7.6%
Total Economy	4.4%	6.8%	7.3%	7.2%

Source : Viet Nam- Energy Sector Investment and Policy Review, IBRD, 1993

Case - 4 : Econmomic Groth Rates for Southern Region

Sector	1990-91	1992-96	1997-2012	Average
(Scenario 1 = Most probable forecast)				
Agriculture	3.5%	4.5%	6.5%	-
Construction	4.6%	8.2%	7.9%	-
Industry	7.5%	7.5%	7.5%	-
Trade / Other	5.5%	6.0%	6.5%	-
Total Economy	5.0%	5.8%	6.8%	6.6%
(Scenario 2 = More optimistic forecast)				
Agriculture	3.5%	5.5%	6.5%	-
Construction	4.6%	9.5%	9.0%	-
Industry	7.5%	9.0%	9.0%	-
Trade / Other	5.5%	8.0%	8.0%	-
Total Economy	5.0%	7.3%	7.8%	7.7%

Source : Viet Nam- Energy Sector Investment and Policy Review, IBRD, 1993

Table 3.1 Provinces and Districts in the Study Area (1/2)

Province	Provincial Capital	District	District Capital	Note
Tay Ninh	Tay Ninh	Tay Ninh	Tay Ninh	
		Hoa Thanh	Hoa Thanh	
		Trang Bang	Trang Bang	
		Go Dau	Go Dau	
		Ben Cau	Ben Cau	
		Chau Thanh	Chau Thanh	
		Duong Minh Chau	Duong Minh Chau	
		Tan Bien	Tan Bien	
		Tan Chau	Tan Chau	
		Song Be	Thu Dau Mot	Thu Dau Mot
Thuan An	Thuan An			
Tan Uyen	Tan Uyen			
Ben Cat	Ben Cat			
Dong Phu	Dong Phu			
Binh Long	Binh Long			
Phuoc Long	Phuoc Long			
Loc Ninh	Loc Ninh			
Bu Dang	Bu Dang			
Dac Lac	B. Ma Thuoc			Dak Nong
		Dak R'Lap	Dak R'Lap	
Lam Dong	Da Lat	Da Lat	Da Lat	
		Cat Tien	Cat Tien	
		Da Teh	Da Teh	
		Da Huoi	Da Huoi	
		Bao Lam	Bao Lam	
		Di Linh	Di Linh	
		Duc Trong	Duc Trong	
		Don Duong	Don Duong	
		Lac Duong	Lac Duong	74.0 D)
		Lam Ha	Lam Ha	
Ninh Thuan	Phan Rang	P. Rang-Tap Cham	Phan Rang	
		Ninh Son	Ninh Son	
		Ninh Hai	Ninh Chu	
		Ninh Phuoc	Ninh Phuoc	
Binh Thuan	Phan Thiet	Phan Thiet	Phan Thiet	
		Ham Tan	Lagi	
		Ham Thuan Nam	Tan Lap	
		Tanh Linh	Lac Tanh	
		Duc Linh	Vo Xu	
		Ham Thuan Bac	Ma Lam	
		Bac Binh	Bac Binh	
		Tuy Phong	Lien Huong	
		Phu Quy	Phu Quy	

Table 3.1 Provinces and Districts in the Study Area (2/2)

Province	Provincial Capital	District	District Capital	Note		
Ba Ria-Vung Tau	Ba Ria	Ba Ria town and Vung Tau	Ba Ria			
		Long Dat	Long Dien			
		Xuyen Moc	Phuoc Buu			
		Tan Thanh	Phu My			
		Chau Duc	Ngai Giao			
		Dong Nai	Bien Hoa	Bien Hoa	Bien Hoa	
				Long Thanh	Long Thanh	
				Nhon Trach	Nhon Trach	
				Thong Nhat	Thong Nhat	
				Xuan Loc	Gia Ray	
Long Khanh	Xuan Loc					
Vinh Cuu	Vinh An					
Tan Phu	Tan Phu					
Dinh Quan	Dinh Quan					
Ho Chi Minh City	Ho Chi Minh City			I	(urban district)	
		III	(ditto)			
		IV	(ditto)			
		V	(ditto)			
		VI	(ditto)			
		VIII	(ditto)			
		X	(ditto)			
		XI	(ditto)			
		Go Vap	(ditto)			
		Binh Thanh	(ditto)			
		Tan Binh	(ditto)			
		Phu Nhyan	(ditto)			
		Thu Duc	Thu Duc			
		Binh Chanh	Binh Chanh			
		Nha Be	Nha Be			
		Hoc Mon	Hoc Mon			
		Cu Chi	Cu Chi			
		Can Gio	Can Gio			
		Long An	Tan An	Can Duoc	Can Duoc	
Tran Tru	Tran Tru					
Can Giuoc	Can Giuoc					
Ben Luc	Ben Luc					
Duc Hoa	Duc Hoa					
Duc Hue	Duc Hue					
Thu Thua	Thu Thua			89.4 1)		
Thanh Hoa	Thanh Hoa			24.2 1)		
Moc Hoa	Moc Hoa			54.2 1)		

Note: 1) Areal occupying rate of the district in the Study Area by percent

Table 3.2 Area, Population and Administrative Unit in the Study Area in the Year 1994

Region / Provinces & City	Land Area (Sq. km)	Population in 1994		Pop. Density (pers./sq.km) in 1994	Population by Urban and Rural in 1993			Administrative Unit (No.)		
		Total	Urban		in 1993		Towns under Districts & Precincts	Rural Districts	Communes	
					(%)	(%)				(%)
(North Mountain and Midland) (Red River Delta)	102,961 12,510	12,387,900 14,065,400	1,583,000 2,388,000	120.3 1,124.3	13.1 17.3	86.9 82.7	22 18	121 58	243 239	2,625 1,700
0. Ha Noi (Capital)	921	2,194,400	1,106,800	2,383.7	51.2	48.8	4	5	95	129
(North Central Coast)	51,174	9,726,600	943,900	190.1	9.9	90.1	10	65	144	1,620
(South Central Coast)	45,192	7,557,600	1,694,400	167.2	23.0	77.0	19	59	138	816
1. Ninh Thuan	3,427	459,300	77,900	134.0	17.3	82.7	1	3	10	42
2. Binh Thuan	7,992	882,200	202,500	110.4	23.6	76.4	1	8	13	96
(Central Highlands)	56,119	2,998,700	668,200	53.4	22.9	77.1	4	41	65	461
3. Dac Lac *	3,841	234,837	37,966	61.1	16.7	83.3	1	16	18	159
4. Lam Dong **	7,518	569,134	186,776	75.7	33.7	66.3	1	9	23	99
(North East South)	23,467	8,878,000	4,020,700	378.3	46.2	53.8	17	32	239	494
5. Ho Chi Minh City	2,090	4,391,900	3,200,300	2,101	74.0	69.5	12	6	187	95
6. Song Be	9,519	1,113,800	53,900	117.0	5.0	95.0	1	8	4	131
7. Tay Ninh	4,029	888,100	103,100	220.4	11.9	72.2	1	8	8	75
8. Dong Nai	5,864	1,813,400	443,100	309.2	25.1	74.9	2	6	26	94
9. Ba Ria-Vung Tau	1,965	670,800	220,300	341.4	33.5	66.5	1	4	14	39
(Mekong River Delta)	39,368	15,850,600	2,364,800	400.6	15.2	84.8	15	89	190	1,118
10. Long An ***	2,225	642,122	79,412	288.5	12.6	87.4	1	13	20	158
Study Area	48,471	11,665,593	4,605,254	240.7	40.3	59.7	22	81	323	988
% to Whole Country	14.6	16.3	33.7	12.1	23.2	80.5	95	465	1258	8,774
Viet Nam	331,114	71,464,800	13,647,300	214.0	19.5	80.5	95	465	1258	8,774

Source: Statistical Yearbook 1994, General Statistical Office

Notes * In Dac Lac Province, the Study Area covers 19.4% of its total land area and population.

** In Lam Dong Province, the Study Area occupies 74.0% of its total land area and population.

*** In Long An Province, 51.3% of the total land and population belongs to the Study Area.

Table 3.3 Basic Data on Population Projection for the Study Area

Region / Provinces & City	Population (Census)		Population in 1993		Population by Urban and Rural in 1993		Annual Average Growth Rate (%) ^a					Estimated Population ^b				
	1979	1989	Total (%)	Total (%)	Urban (%)	Rural (%)	1979-89	1989-93	1993-2000	2000-2010	2010-2015	1993	2000	2010	2015	
(South Central Coast)	917,308	1,169,213					2.46									
1. Nhon Hai	(315,005)	(401,509)	449,100 (3.9)	77,900 (17.3)	371,200 (82.7)		2.46	2.84	2.84	2.44	2.23	478,708	546,387	616,380	759,873	
2. Binh Thuan	(602,303)	(767,704)	828,700 (7.5)	202,400 (23.6)	626,300 (76.4)		2.46	2.84	2.84	2.44	2.23	915,313	1,044,717	1,178,546	1,315,947	1,452,912
(Central Highlands)	91,534	189,238	227,620 (2.0)	38,451 (16.9)	189,169 (83.1)		7.30	4.72	2.84	2.44	2.23	242,627	276,929	312,404	348,825	385,131
3. Dac Lac *	287,309	473,026	549,746 (4.8)	187,072 (34.0)	362,674 (66.0)		5.11	3.83	2.84	2.44	2.23	585,990	668,836	754,514	842,479	930,165
4. Lam Dong **	3,293,146	3,924,435	4,322,300 (37.9)	3,198,500 (74.0)	1,123,800 (26.0)		1.77	2.44	2.84	2.44	2.23	4,607,262	5,258,625	5,932,258	6,623,871	7,313,289
(North East South)	650,496	937,666	1,081,700 (9.5)	50,600 (4.7)	1,031,100 (95.3)		3.72	3.64	2.84	2.44	2.23	1,153,015	1,316,025	1,484,609	1,657,692	1,830,226
5. Ho Chi Minh City	675,555	792,885	868,900 (7.6)	98,200 (11.3)	770,700 (88.7)		1.61	2.32	2.84	2.44	2.23	926,185	1,057,127	1,192,545	1,331,578	1,470,170
6. Song Be	1,291,940	2,006,837	1,762,900 (15.5)	440,500 (25.0)	1,322,400 (75.0)		4.50	3.19	2.84	2.44	2.23	1,879,125	2,144,791	2,419,540	2,701,622	2,982,809
7. Dong Nai	(91,610)	(135,054)	657,100 (5.8)	220,300 (33.5)	436,800 (66.5)		3.96	48.52	2.84	2.44	2.23	700,422	799,443	901,855	1,006,998	1,111,807
(Vung Tau - Con Dao)	486,940	574,665	628,322 (5.5)	79,412 (12.6)	548,910 (87.4)		1.67	2.26	2.84	2.44	2.23	669,747	764,434	862,358	962,896	1,063,115
(Melong River Delta)	7,977,936	10,242,019	11,464,049 (10.6)	4,893,338 (40.3)	6,570,711 (59.7)		2.74	2.83	2.68	2.44	2.23	12,158,393	13,077,516	15,655,009	17,480,149	19,299,496
10. Long An ***	(14.8)	(15.8)	(16.3)	(12.1)	(12.1)							(16.4)	(16.7)	(17.1)	(17.6)	(18.0)
Study Area	52,751,766	64,375,762	69,937,700	13,647,300 (19.5)	56,290,400 (80.5)		2.01	2.09	2.30	1.90	1.70	74,285,245	83,230,160	91,443,240	99,484,727	107,173,305
Vietnam																

Source: Statistical Yearbook 1993, General Statistical Office.

Viet Nam - Population, Health and Nutrition Sector Review, 1994 and

Vietnam - Energy Sector Investment and Policy Review, IBRD, 1993.

Note * In Dac Lac Province, the Study Area covers 19.4% of its total land area and population.

** In Lam Dong Province, 74.0% of the total land and population belongs to the Study Area.

*** In Long An Province, 51.3% of the total land and population belongs to the Study Area.

Figures in shade indicate that the present Ba Ria-Vung Tau Province was established integrating Vung Tau-Con Dao city and one part of Dong Nai Province.

Table 4.1 Geological Conditions at the Proposed Damsites (1/2)

River Basin	Proposed Damsite	Basement Rocks	Geological Conditions and Comments
Dong Nai	Dai Ninh	Dong Duong formation (sandstone interbedded with siltstone)	Sandstone interbedded with siltstone is exposed at the riverbed and the top of both banks. The weathered layer is 10 to 20 m thick. Rockfill dam is suitable. Feasibility study for the project was carried out by the Ministry of Energy.
	Dong Nai No. 1	Neogene-Quaternary basalt Dong Duong formation Neogene sediment	Both abutments are gentle with a gradient of 10 to 15°. Soft rock of Neogene is distributed on the riverbed. Geological points to be considered are extensive weathering at both banks. Bearing strength and permeability of basement rocks on the riverbed, and older river deposits under basalt lava have possibilities of leakage.
	Dong Nai No. 2	Granite in Cretaceous Dong Duong formation	Both abutments are steep with a gradient of around 30°. On condition that fresh rocks occur on the riverbed and the abutments, concrete dam will be also included as a dam type alternative for construction.
	Dong Nai No. 3	Ban Don formation	Two sites, Alternative-1 and Alternative-2, are proposed as alternative damsites. Geological conditions at both the sites are almost the same by showing fresh and hard rocks mainly composed of shale are exposed around the riverbed. Judging from the topographic condition, a rockfill type dam is recommended for Alternative-1, whilst a concrete gravity type dam for Alternative-2.
	Dong Nai No. 4	Ban Don formation Neogene-Quaternary basalt	Both abutments are steep with their gradients of 40° at the right bank and 35° at the left bank. The riverbed is 120 m wide. Basalt covers Ban Don formation around El. 500 to 600 m at both banks. Three faults have been found at the damsite. Due to the strong weathering, rockfill dam is adopted. Geological investigation was carried out as part of feasibility study by the Ministry of Energy.
	Dong Nai No. 5	Ban Don formation Neogene-Quaternary basalt	Geological condition is supposed similar to Dong Nai No. 4. The slope gradients are 35° at the right bank and 30° at the left bank. The riverbed is 100 to 150 m wide. In case of exposure of fresh rocks on the riverbed and the abutments, concrete dam will be also included as a dam type for construction.
	Dong Nai No. 6	Ban Don formation	The slope gradient is 25° at the left bank and undulating gentle slope ranges at the right bank. Rockfill dam is conceivable because of 500 to 600 m wide riverbed, deep soft foundation on the riverbed and extensive weathering at the both abutments.
	Dong Nai No. 8	Quaternary basalt Ban Don formation	The damsite is located at gentle hill. Judging from field reconnaissance, basalt occurs at and around the damsite because hard boulders of basalt are widely scattered on the surface of the left bank. Sandstone interbedded with mudstone appears on the riverbed 400 m downstream of damsite. Due to extensive weathering at both abutments, existence of old river deposits under basalt and permeability of the porous basalt, a possibility of leakage is high. Rockfill dam is acceptable.
La Nga	Ta Pao (La Nga No. 3)	Ban Don formation (Sandstone interbedded with mudstone) Granite of Cretaceous	The riverbed is about 2 km wide. Fine sandstone interbedded with mudstone is distributed about 500 m downstream of the right bank. Granite occurs at the left bank but its accurate border with sedimentary rocks is not clear. No fresh rock can be found at damsite. Rockfill dam is suitable because of thick river deposit and intensive weathering at both abutments.
	Bao Lam	Granite of cretaceous	The damsite is located at the narrow valley with a slope gradient of around 30° at both banks. Granite of Cretaceous is predicted to be distributed. If fresh rocks can be found near the surface without extensive weathered layers, concrete dam will be also discussed as an alternative of rockfill dam.

Table 4.1 Geological Conditions at the Proposed Damsites (2/2)

River Basin	Proposed Damsite	Basement Rocks	Geological Conditions and Comments
Be	Can Don	Ban Don formation (Clayey Schist) Neogene-Quaternary basalt	The damsite is in undulating hill with their maximum height of 30 to 40 m above the river bed. Clayey schist occurs on the right edge of the riverbed. The strike and dip of foliation are N10E - N25E, 60 to 80 SW, respectively. Due to the topographic condition and strong weathering of the left bank, earth dam or rockfill dam is conceivable. Outcrop of basalt excluding its boulder cannot be found around the damsite.
	Fu Mieng (Con Don 3)	Ban Don formation	The damsite is in gentle hill. From a geological point of view, weathered layers such as residual soil and decomposed rocks may be thick. An earthfill type dam is acceptable.
	Phuoc Hoa	Neogene-Quaternary deposit	The damsite is in plain composed of siltstone and mudstone overlain by coarse sand with gravel. From a view point of topography and geological conditions the dam height is strictly limited.
Coastal Zone	Ca Giay	Dong Duong formation	The damsite is in undulating hill. On both sides of the river, terrace develops widely. Hard rhyolite with joints occurs at the riverbed. Field reconnaissance tells that the weathered zone can be expected very thick at both banks. Rockfill dam is acceptable.
	Song Luy	Granite of Cretaceous Quaternary basalt	The riverbed is about 4.0 km wide. According to the geological map, granite presents on the right bank, shale, rhyolite and aplite on the left bank and Quaternary basalt on the riverbed. From topographic condition, rockfill dam is adequate due to Quaternary deposits covering basement rock in the riverbed and permeability of basalt and older river deposits overlain by basalt.
	Song Ray	Dong Duong formation Granite of Cretaceous Quaternary basalt	The riverbed is around 60 to 70 m wide. Sandstone interbedded with mudstone and intrusive granite can be found 100 to 300 m upstream of the damsite. Both banks at the damsite are covered with basalt because many hard basalt boulders are scattered on the left bank widely. In spite of fresh rock exposure on the riverbed, rockfill dam can be acceptable due to extensive weathering of both banks.
	Da Den	Neogene-Quaternary deposit	The damsite is located at the edge of undulating hill. According to the geological map, basalt may be distributed at and around the damsite. From a topographic point of view, the dam height is strictly limited.

Table 4.2 Present Land Use in the Study Area

Description	Unit : %				
	Mekong Delta	Southeast Region	Central Highland	Coastal Region	Study Area
1. Triple irrigated rice	0.06	0.00	0.00	0.00	0.00
2. Double irrigated rice	21.29	3.82	1.71	1.05	3.65
3. Single irrigated rice	5.69	6.72	0.00	0.00	3.56
4. Double rainfed rice	17.63	0.00	0.00	0.00	0.97
5. Single rainfed rice	5.97	0.00	0.00	0.00	0.33
6. Single irri/ rainfed rice + upland crops	6.16	7.95	5.24	0.00	5.38
7. Upland crops	0.00	12.27	3.49	15.95	10.45
8. Pineapple/sugar cane	7.01	2.41	0.00	0.00	1.55
9. Shifting land	0.00	1.82	2.23	3.26	2.15
10. Coffee/Tea/Mulberry	0.00	0.88	0.75	0.00	0.60
11. Rubber	0.00	11.81	0.00	0.00	5.71
12. Cashew	0.00	4.42	0.00	0.00	2.14
13. Mulberry	0.00	0.00	0.00	0.06	0.01
14. Cinnamon	0.00	0.00	0.00	0.12	0.03
15. Fruit trees	0.00	1.39	0.00	0.00	0.67
16. Forest	3.81	24.29	66.29	35.55	35.38
17. Bush/grass	0.00	4.54	0.00	23.91	7.78
18. Salt pans	0.00	0.04	0.00	0.00	0.02
19. Bare land	28.82	14.94	18.41	16.89	16.95
19. Settlement/orchards	0.50	0.25	0.25	0.34	0.28
20. Rocky hill	0.00	0.00	0.00	0.11	0.03
21. Water body	3.06	2.44	1.65	2.75	2.37
Total	100	100	100	100	100
Total (1000 ha)	223.4	2,338.8	1,142.7	1,142.2	4,847.1

Source: Sub-National Institute for Agricultural Planning and Projection, 1994

Table 4.3 Soil Classification in the Study Area

Vietnamese Soil Classification	Area		Vietnamese Soil Classification	Area	
	ha	%		ha	%
<u>SANDY SOILS</u>	206,730	4.17	<u>YELLOW-RED SOILS</u>	2,331,380	47.06
Marine sandy soils	92,400	1.86	(FERRALITIC SOILS)		
Yellow sand dune soils	33,130	0.67	Purplish-brown soils on Basalts	130	0.01
Red sand dune soils	81,200	1.64	Red-brown soils on basic and	341,320	6.89
<u>SALINE SOILS</u>	140,670	2.84	neutral igneous rocks		
Mangrove saline - potential	98,720	1.99	Yellow-brown soils on basic and	505,340	10.2
acid sulphate soils			neutral igneous rocks		
Severely saline soils	13,790	0.28	Yellow-red soils on claystones	532,980	10.76
Slightly saline soils	28,030	0.56	and metamorphic rocks		
Alkaline saline soils	130	0.01	Red-yellow soils on acid igneous	829,910	16.75
<u>ACID SULPHATE SOILS</u>	196,990	3.98	Light-yellow soils on sandstones	50,270	1.01
Potential acid sulphate soils	104,880	2.71	Yellow-brown soils on old alluvium	64,600	1.3
Actual acid sulphate soils	92,110	1.87	Yellow-red soils transformed by	6,830	0.14
<u>ALLUVIAL SOILS</u>	268,720	5.42	paddy growing		
Annual deposited alluvial soils	8,670	0.17	<u>HUMIC YELLOW-RED SOILS ON</u>	33,180	0.67
Undeposited alluvial soils	75,350	1.52	<u>MOUNTAINS</u>		
Mottled alluvial soils	62,510	1.26	Humic Yellow-red soils on clay-	5,110	0.1
Gleyic alluvial soils	90,020	1.82	stones and metamorphic rocks		
Alluvial soils of streams	32,170	0.65	Humic Yellow-Red soils on acid	28070	0.57
<u>SWAMPY AND PEATY SOILS</u>	1,340	0.03	igneous rocks		
Swampy soils	1,340	0.03	<u>HUMIC SOILS ON HIGHT</u>	610	0.01
			<u>MOUNTAINS</u>		
<u>GREY SOILS</u>	1,032,460	20.84	Humic light yellow soils on hight	610	0.01
Grey soils on old alluvium	815,440	16.46	mountains		
Grey soils on acid igneous	138,020	2.79	<u>COLLUVIAL SOILS</u>	208,940	4.22
rocks and sand stones			Colluvial soils	208,940	4.22
Humic gleyic grey soils	79,000	1.59			
<u>RED & BROWNISH GREY SOILS</u>	75,090	1.52	<u>ERODED SOILS</u>	203,710	4.12
Brownish-grey soils in semi-	75,090	1.52	Eroded rocky soils	203,710	4.12
arid area			<u>OTHERS</u>		
<u>BLACK TROPICAL SOILS</u>	122,470	2.47	Lakes, stream, rivers	117,240	2.37
Black tropical soils on volcanic	6,860	0.14	Settlement	14,100	0.28
tuff and ash					
Black tropical soil on Basalts	115,610	2.33	TOTAL PROJECT AREA	4,953,630	100

Table 4.4 Land Suitability by Scheme and by Present Land Use, ha (1/2)

Lower La Nga LAND USE CATEGORY	Paddy		Upland crops	
	Suitable	Unsuitable	Suitable	Unsuitable
Triple irrigated rice	726	0	726	0
Double irrigated rice	51	0	51	0
Single rainfed rice	18417	0	18417	0
Upland crops	4543	0	4543	0
Sugarcane	12	0	12	0
Cashew	3,175	3	3,178	0
Evergreen forests	5429	0	5429	0
Bush/Grass	527	0	528	0
Settlement/Orchards	649	9	658	0
Total	33529	12	33541	0

Phan Thiet LAND USE CATEGORY	Paddy		Upland crops	
	Suitable	Unsuitable	Suitable	Unsuitable
Triple irrigated rice	4,174	0	4,174	0
Double irrigated rice	37	0	37	0
Single rainfed rice	17,340	0	17,340	0
Upland crops	5,122	77	5,165	34
Shifting land	771	0	771	0
Cashew	785	0	785	0
Evergreen forests	1	0	1	0
Bush/Grass	15,095	746	15,702	139
Salt pans	297	0	297	0
Settlement/Orchards	850	137	850	137
Total	44,471	960	45,121	310

Phan Ri LAND USE CATEGORY	Paddy		Upland crops	
	Suitable	Unsuitable	Suitable	Unsuitable
Single irri. + rainfed rice	2,279	7	2,284	10
Single rainfed rice	9,784	0	9,841	1
Single irri./rainfed rice + Upland crops	0	477	0	0
Upland crops	3,822	0	4,254	45
Sugarcane	0	210	0	0
Shifting land	680	0	781	108
Evergreen forests	1,693	242	1,758	177
Bush/Grass	13,550	4,613	14,814	3,349
Settlement/Orchards	1,435	51	1,469	16
Total	33,243	5,664	35,201	3,706

Phan Rang LAND USE CATEGORY	Paddy		Upland crops	
	Suitable	Unsuitable	Suitable	Unsuitable
Triple irrigated rice	14,191	28	14,191	28
Single rainfed rice	3,433	0	3,433	0
Upland crops	4,895	125	5,011	8
Shifting land	581	0	581	0
Mulberry	27	110	27	110
Fruit trees	3,092	54	3,093	54
Evergreen forests	40	2	42	0
Bush/Grass	4,484	597	4,529	552
Bare land	352	162	352	162
Settlement/Orchards	969	13.6	969	14
Total	32,063	1,093	32,227	929

Table 4.4 Land Suitability by Scheme and by Present Land Use, ha (2/2)

Song Pha LAND USE CATEGORY	Paddy		Upland crops	
	Suitable	Unsuitable	Suitable	Unsuitable
Triple irrigated rice	426	0	426	0
Single irri. + rainfed rice	140	0	140	0
Upland crops	1,534	0	1,534	0
Sugarcane	978.3	0	978	0
Bush/Grass	4,975	85	5,060	0
Bare land	29	0	29	0
Settlement/Orchards	279	0	279	0
Total	8,361	85	8,446	0

Song Ray LAND USE CATEGORY	Paddy		Upland crops	
	Suitable	Unsuitable	Suitable	Unsuitable
Triple irrigated rice	5,113	5	5,113	5
Single irri. + rainfed rice	2,773	28	2,801	0
Single rainfed rice	7,834	250	8,045	39
Upland crops	38,952	857	39,575	234
Shifting land	8,943	888	9,716	115
Rubber	18,478	1,005	19,238	245
Cashew	7,939	368	8,294	13
Mangrove forests	514	583	514	583
Evergreen forests	6,209	3,216	8,424	1,001
Bush/Grass	4,647	2,040	5,256	1,431
Salt pans	0	528	0	528
Bare land	390	738	390	738
Settlement/Orchards	882.1	40.9	922	1.4
Total	102,674	10,546	108,288	4,933

Phuc Hoa LAND USE CATEGORY	Paddy		Upland crops	
	Suitable	Unsuitable	Suitable	Unsuitable
Triple irrigated rice	1,742	0	1,742	0
Double irrigated rice	4,355	115	4,355	115
Single irri. + rainfed rice	246	0	246	0
Single rainfed rice	3,878	884	3,878	884
Single irri./rainfed rice + Upland crops	3,836	0	3,836	0
Upland crops	7,743	162	7,743	162
Rubber	1,753	104	1,753	104
Cashew	1,407	0	1,407	0
Bush/Grass	406	0	406	0
Settlement/Orchards	7,941	97	7,942	97
Total	33,306	1,362	33,306	1,362

Table 4.5 Preliminary List of Main Mammals (Excluding Bats) Likely to Occur in the Study Area (1/2)

Habitat Types - UF - Undisturbed Upland Forest RF - Riverine Forests
 DF - Disturbed Forest WA - Wetland Areas

GROUP/ENGLISH NAME	SCIENTIFIC NAME	VIETNAMESE NAME	HABITAT TYPE			
			UF	DF	RF	WA
1. PRIMATES						
1.1 Stump-tailed macaque	<i>Macaca arctoides</i>					
1.2 Rhesus macaque	<i>M. mulatta</i>					
1.3 Pig-tailed macaque	<i>M. nemestrina</i>					
1.4 Silvered langur	<i>Presbytis cristata</i>					
1.5 Francois langur	<i>P. francoisi</i>					
1.6 Douc langur	<i>Pygathrix nemaeus</i>					
1.7 Concolor gibbon	<i>Hylobates concolor</i>					
2. CARNIVORES						
2.1 Dhole (Red Dog)	<i>Cuon alpinus</i>					
2.2 Sun bear	<i>Helarctos malaynus</i>					
2.3 Yellow-throated Marten	<i>Matres flavigula</i>					
2.4 Ferret badger	<i>Melogole moschata</i>					
2.5 Ferret badger	<i>M. personata</i>					
2.6 Small-clawed otter	<i>Amblonyx cinerea</i>					
2.7 Eurasian otter	<i>Lutra lutra</i>					
2.8 Smooth otter	<i>L. perspicillata</i>					
2.9 Binturong	<i>Arctictis binturong</i>					
2.10 3-Striped palm civet	<i>Arctogalidia trivirgata</i>					
2.11 Banded civet	<i>Chrotogole owstoni</i>					
2.12 Masked palm civet	<i>Paguma lorvata</i>					
2.13 Common palm civet	<i>Paradoxus hemaphroditus</i>					
2.14 Spotted Linsang	<i>Prionodon pardicolor</i>					
2.15 Large spotted civet	<i>Viverra megaspila</i>					
2.16 Small Indian civet	<i>Viverricula indica</i>					
2.17 Javan mongoose	<i>Herpestes javanicus</i>					
2.18 Crab-eating mongoose	<i>H. urva</i>					
2.19 Leopard cat	<i>Felis bengalensis</i>					
2.20 Jungle cat	<i>F. chause</i>					
2.21 Marbled cat	<i>F. marmorata</i>					
2.22 Golden cat	<i>F. temminckii</i>					
2.23 Fishing cat	<i>F. viverrina</i>					
2.24 Clouded leopard	<i>Neofelis nebulosa</i>					
2.25 Leopard/Panther	<i>Panthera pardus</i>					
2.26 Tiger	<i>P. tigris</i>					
3. ELEPHANT						
3.1 Indian elephant	<i>Elephas maximus</i>					
4. RHINOCEROS						
4.1 Javan rhinoceros	<i>Rhinoceros sondaicus</i>					

Table 4.5 Preliminary List of Main Mammals (Excluding Bats) Likely to Occur in the Study Area (2/2)

Habitat Types - UF - Undisturbed Upland Forest RF - Riverine Forests
 DF - Disturbed Forest WA - Wetland Areas

GROUP/ENGLISH NAME	SCIENTIFIC NAME	VIETNAMESE NAME	HABITAT TYPE			
			UF	DF	RF	WA
5. UNGULATES						
5.1 Eurasian wild pig	<i>Sus scrofa</i>					
5.2 Lesser mouse deer	<i>Tragulus javanicus</i>					
5.3 Large mouse deer	<i>T. napu</i>					
5.4 Sambar deer	<i>Cervus unicolor</i>					
5.5 Barking deer	<i>Muntiacus muntjak</i>					
5.6 Gaur	<i>Bos frontalis</i>					
5.7 Banteng	<i>Bos javanicus</i>					
5.8 Kouprey	<i>B. sauveli</i>					
5.9 Serow	<i>Capricornis sumatrensis</i>					
6. PANGOLINS						
6.1 Malaysian pangolin	<i>Manis javanica</i>					
7. RODENTS						
7.1 Squirrels	<i>Callosciurus spp. (3-4)(1)</i>					
7.2 Tree squirrels	<i>Taniops spp. (3)</i>					
7.3 Flying squirrels	<i>Hyloptes spp.(2)</i> <i>Petaurista spp.(2)</i>					
7.4 Bamboo rats	<i>Cannomys badius</i> <i>Rhizomys spp (3)</i>					
7.5 Bandicoot rats	<i>Bandicota spp.(2)</i>					
7.6 Spiny rats	<i>Maxomys spp. (2)</i>					
7.7 Asian mice	<i>Mus spp (4-5)</i>					
7.8 White-bellied rats	<i>Niviventer spp.(2)</i>					
7.9 Rats	<i>Rattus spp. (5-6)</i>					
7.10 Brush-tailed porcupine	<i>Atherurus macrorus</i>					
7.11 Short-tailed porcupine	<i>Hystrix brachyura</i>					
8. HARES						
8.1 Burmese hare	<i>Lepus peguensis</i>					

Notes:

- (1) Numbers in brackets ie (3-4) indicate the number of species likely to occur in the study area.
- (2) * indicates rare or endangered species as listed in the proposed IUCN Redbook for Viet Nam.

Table 5.1 List of Generation Facilities

(As of 1994/E)

Region	Name of Power Station		Inst. Cap. (MW)	Avail. Cap. (MW)	Commissioning Year
North (PC1)	Hydro	Thac Ba	3 x 36	108	#1 ('70), #2 ('71), #3 ('73)
		Hoa Binh	8 x 240 (2,028)	1,920 (2,028)	#1 ('88), #2 ('89), #3 ('91), #4 ('91), #5 ('93), #6 ('93), #7 ('93), #8 ('94)
	Thermal	Ninh Binh	4 x 25	100	#1 ('74), #2 ('75), #3 ('75), #4 ('76)
		Uong Bi	1 x 50 1 x 55	100	'75 '77
		Pha Lai	4 x 110 (645)	440 (640)	#1 ('83), #2 ('84), #3 ('85), #4 ('86)
	GT	Thai Binh	2 x 14	12	
	Total		2,701	2,680	
South (PC2)	Hydro	Da Nhim	4 x 40	160	#1 ('63), #2 ('63), #3 ('64), #4 ('64)
		Tri An	4 x 100	400	#1 ('88), #2 ('88), #3 ('89), #4 ('89)
		Thac Mo	2 x 75	150	'94
		Suoi Vang	3.1 (713)	3 (713)	'57
	Thermal	Thu Duc.	1 x 33 2 x 66	156	'66 '72
		Tra Noc Old	1 x 33 1 x 7.2 (205)	32 3 (193)	'75
		GT	Thu Duc GT1	23.4	15
	GT2		12.5	7	'91
	GT3		14.7	11	'91
	GT4/5		2 x 37.5	64	'92
	Ba Ria GT1/2		2 x 23.4	30	'91
GT3/7	5 x 37.5	160	'92, '94		
Tra Noc GT1/2	2 x 14 (388)	0 (287)	'68		
Diesel	Urban Province	126 75 (201)	41 37 (78)		
	Total		1,507	1,271	
Centre (PC3)	Hydro	Vinh Son	2 x 33	66	'94
		Dray Linh	12.0	12.0	
		An Diem	5.4	5.4	
		Pha Minh	2.0 (85)	1.6 (85)	
	Diesel		177.4	115	
Total		262	200		
Grand Total			4,470	4,151	

Source: IEV

Table 5.2 Changes in Forest Coverage by Province in the Study Area 1943 - 1991 (in '000 ha)

	Province	Total Area	1943	1973	1985	1991	1943-91 Loss (%)
1	Ninh Thuan	343	320	63	124	97	223 (70)
2	Binh Thuan	799	444	209	259	354	90 (20)
3	Dac Lac (1)	495	466	250	267	307	159 (34)
4	Lam Dong (2)	1,017	996	582	755	630	366 (37)
5	Dong Nai	586	378	318	247	172	206 (54)
6	Song Be	955	610	536	226	285	325 (53)
7	Tay Ninh	402	157	126	75	43	114 (73)
8	Ho Chi Minh City	209	0	35	39	34	+34 -
9	Vung Tau-Ba Ria	196	119	93	27	37	82 (42)
10	Long An (3)	216	0	0	19	9	+9
	Totals	5,218	3,490	2,212	2,038	1,968	1,522 (44)
	Percentage of Total Area	(100)	(69)	(44)	(40)	(38)	(29)

Notes:

- (1) Based on 19.4 % of Dac Lac province located in the Study Area.
- (2) Based on 74.0 % of Lam Dong province located in the Study Area.
- (3) Based on 51.3 % of Long An province located in the Study Area.

Table 5.3 Estimates of Fuel Consumed for Cooking in Northeast of Mekong Zone, 1993⁽¹⁾

Sector	Crop Residue ('000 tonnes)	Firewood ('000 tonnes)	Charcoal ('000 tonnes)	Kerosene ('000 m ³)	Electricity Gwh
Rural	1364	2591	45	0	26
Urban	0	1142	180	59	26
Zone Total	1364	3733	225	59	52
Viet Nam Totals	31,832	25,726	557	131	263
(%VN Total)	4 %	15 %	40 %	45 %	20%

Notes:

- (1) The Northeast of Mekong Zone contains approximately 12.5 % of Viet Nam's population including an estimated 6.2 % in Ho Chi Minh City but accounts for a disproportionate quantity of charcoal use nationally.

Table 6.1 Principal Features of Hydropower Potential in the Main Stream

Name of Scheme	Province	Tributary	Catchment Area (km ²)	Estimated Runoff (m ³ /s)	Type of Dam	High Water Level (m)	Dam Height (m)	Estimated Capacity (MW)	Estimated Energy (GWh)
Dai Ninh	Lam Dong - Binh Thuan	Da Nhim/Da Queyon	1158	30.84	Earthfill	880	54	300	1294
Dong Nai No.1	Lam Dong	Dong Nai	1869*	45.09*	Rockfill	700/736	94/131	86/136	245/312
Dong Nai No.2	Lam Dong	Dong Nai	2010*	49.34*	Rockfill	655/692	99/137	105/163	296/573
Dong Nai No.3	Lam Dong / Dac Lac	Dong Nai	2428*	63.31*	Rockfill	565/599	84/118	113/179	317/409
Dong Nai No.4	Lam Dong / Dac Lac	Dong Nai	2597*	69.47*	Rockfill	460/480	106/125	123/199	602/808
Dong Nai No.5	Lam Dong / Dac Lac	Dong Nai	4263*	131.49*	Rockfill	290	85	61	355
Dong Nai No.6	Lam Dong / Song Be	Dong Nai	5118*	163.17*	Rockfill	195/219	75/99	205/355	690/910
Dong Nai No.8	Dong Nai	Dong Nai	7889*	271.97*	Rockfill	120	45	185	838
Can Don	Song Be	Song Be	3440	160.92	Rockfill	110	37	69	251
Fu Mieng	Song Be	Song Be	4110	206.8	Earthfill	68/77	41/50	**	**
Bao Loc	Lam Dong / Binh Thuan	La Nga	1150	49.07	Rockfill	701/719	97/114	80/138	290/333
La Nga No.3	Binh Thuan	La Nga	2000	82.39	Earthfill	151/157	41/49	**	**

Notes

*: Catchment area and Runoff of Dai Ninh Project are excluded.

** : Trans-basin project with possible power generation.

94/131: Figures indicate Low case / High case

Table 6.2 Principal Features of Hydropower Potential in the Tributaries

Name of Scheme	Province	Tributary	Catchment Area (km ²)	Estimated Runoff (m ³ /s)	Type of Dam	High Water Level (m)	Dam Height (m)	Head (H) (m)	Length (L) of Waterway (m)	L/H
Da M'Bri	Lam Dong	Da M'Bri / Da Te	211	7.6	Earthfill	605/615	70/80	450/460	6,600	14.3
Da R'Keh	Dac Lac	Da R'Keh	89	3.2	Earthfill	575/580	45/50	360/370	3,400	9.2
Da Anh Kong	Dac Lac	Da Anh Kong	61	2.2	Earthfill	575/580	45/50	360/370	3,400	9.2
Da R'Tih	Dac Le	Da Nong	718	25.8	Rockfill	610/620	75/85	190/200	3,000	15
Da R'Keh	same as above	same as above	868	31.2	Rock/Earthfill	575/580	same as above	360/370	3,400	9.2
Da Anh Kong										
Da R'Tih (connected)										
Da Siat	Lam Dong	Da Siat	115	4.2	Earthfill	560/580	35/55	300/320	2,500	7.8

(Connecting tunnel of 12 km)

Table 6.3 Specific Cost for Capacity and Generation (First Screening)

Dam Site	H/WL (m)	Inst'd Capacity (MW)	Mean Annual Firm Energy (GWh)	Mean Annual Secondary E (GWh)	Mean Annual Total E (GWh)	Total Project Cost (Million US\$)	Ann. Equiv. Econ. Cost (Million US\$)	Specific Capacity Cost (US\$/kW)	Specific Generation Cost (US Cent/kWh)
Dong Nai 1									
Case 1	699	86.42	185.43	59.57	245.00	330.07	30.58	3,819	13
Case 2	716	114.70	245.10	35.68	280.78	407.94	37.80	3,557	14
Case 3	736	136.38	290.27	21.44	311.71	597.73	55.38	4,383	18
Dong Nai 2									
Case 1	655	105.41	226.02	69.91	295.93	343.96	31.87	3,263	11
Case 2	672	137.99	294.98	42.37	337.35	454.16	42.08	3,291	13
Case 3	692	162.74	346.56	25.71	372.27	605.20	56.07	3,719	15
Dong Nai 3									
Case 1	565	112.19	240.23	76.55	316.78	293.46	27.19	2,616	9
Case 2	581	149.96	320.39	47.73	368.12	373.13	34.57	2,488	10
Case 3	599	178.29	379.48	28.87	408.35	429.54	39.80	2,409	10
Dong Nai 4									
Case 1	461	123.14	264.22	338.02	602.24	333.17	30.87	2,706	6
Case 2	480	197.63	423.58	385.12	808.70	438.03	40.58	2,216	6
Dong Nai 5									
Case 1	290	61.54	132.21	222.46	354.67	328.44	30.43	5,354	10
Dong Nai 6									
Case 1	195	204.79	439.16	250.51	689.67	584.27	54.13	2,853	8
Case 2	206	285.04	611.16	196.46	807.62	682.17	63.20	2,393	8
Case 3	219	354.57	757.71	152.56	910.27	778.24	72.10	2,195	8
Dong Nai 8									
Case 1	120	185.30	397.07	441.18	838.25	677.46	62.77	3,656	8
Can Dang	110	69.56	148.77	103.31	251.08	192.85	17.87	2,772	8
Fu Mieng									
Case 1	69					59.92	(Dam cost only)	-	-
Case 2	73					77.86	-	-	-
Case 3	77					97.75	-	-	-
La Nga 3									
Case 1	152					86.75	(Dam cost only)	-	-
Case 2	157					108.59	-	-	-
Case 3						124.90	-	-	-
Bao Loc									
Case 1	702	80.50	172.90	117.62	290.52	318.02	29.46	3,951	11
Case 2	708	111.13	240.02	72.60	312.62	362.05	33.54	3,258	11
Case 3	719	137.86	297.29	35.85	333.14	428.82	39.73	3,111	12

Table 6.4 Principal Features of Candidate Projects

Name of Scheme	Catchment Area (km ²)	Mean Annual Runoff (m ³ /s)	Design Flood (m ³ /s)	HWL (EL. m)	LWL (EL. m)	TWL (EL. m)	Active Storage (mil. m)	Crest Length Main & Saddle (m)	Dam Height (m)	Max. Plant Discharge (m ³ /s)	Installed Capacity (MW)	Annual Energy Output (GWh)
Dong Nai No.3	2428*	56.8*	9,400	580	545	487	1,179	660	104	197	130	345
Dong Nai No.4 (with Dong Nai No.3)	2597*	62.7*	9,600	480	445 (475)**	287	292 (47)**	470	144	102 (209)**	147 (318)**	655 (811)**
Dong Nai No.6	5118*	150.0*	11,200	219	178	127	2,450	3,190	113	510	322	856
Dong Nai No.8 (with Dong Nai No.3)	7889*	245.6*	12,600	120	110 (110)**	62	824 (824)**	8,470	50	307 (480)**	134 (210)**	653 (858)**
Can Don	3440	145.8	5,600	110	100	80	186	1,750	48	385	80	276
Fu Mieng (diversion 60 m ³ /s (without diversion)	4110	168.8	6,200	77	69	40	462	2,800	55	220 460	60 126	229 407
Lai Nga No.3 (diversion 10 m ³ /s (without diversion)	2000	84.1	6,900	157	145	118	227	1,400	50	224 264	62 73	151 240

Notes

*: Catchment area (1933 km²) and Runoff (28.7 m³/s) of Dai Ninh Project is excluded.

** : Modified figures according to the capacity increase due effect of Dong Nai No.3

Table 6.5 Economic Comparison of Candidate Projects

Dam Site	HWL (m)	LWL (m)	TWL (m)	FWL (m)	Active Storage (mil. m ³)	Max. Plant Disch. (m ³ /s)	Inst. Capacity (MW)	Mean Annual Firm E (GWh)	Mean Annual Sec'd E (GWh)	Mean Annual Add'l Firm E at Tr An (GWh)	Add'l Firm E at Tr An (GWh)	Total Firm E (GWh)	Total Sec'd E (GWh)	Project Cost (Million US\$)	Ann. Econ. Cost (Million \$)	SCC (US\$/kWh)	SCC (Cent/kWh)	Ann. Benefit (Million \$/Year)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
A. Hydropower Only																		
Dong Nai 3	380	345	407	197	1,179	197	130	275	47	148	-125	423	-78	345	29.59	2,654	8.21	4.69
Dong Nai 4	480	445	287	102	292	102	147	320	314	56	-55	376	279	378	32.42	2,571	5.41	9.49
Dong Nai 6	219	178	127	310	2,450	310	322	670	151	345	-310	1,015	-159	1,083	92.88	3,363	10.46	-9.03
Dong Nai 8	120	110	62	307	824	307	134	292	366	135	-140	427	226	813	69.73	6,067	11.47	-32.53
Dong Nai No. 3/No. 4	580/480	580/475	487/287	197/209	1,179/47	197/209	448 (130-318)	957	176	150	-127	1,107	49	925	70.76	1,842	6.17	47.38
Dong Nai No. 2/No. 8	580/120	580/110	487/162	197/480	1,179/524	197/480	340 (130-210)	731	469	270	-261	1,001	188	1,204	103.26	3,541	8.97	-11.52
Can Don	110	100	80	385	186	385	80	178	98	n.a.	n.a.	178	98	190	16.30	2,375	6.36	5.45
B. Trans Basin Project																		
Fu Mieng 60 m ³ /s Diversion no Diversion	77	69	40	220	462	220	60	131	98	n.a.	n.a.	131	98	251,550/115	10.30	2,001	4.92	5.88
	77	69	40	462	462	460	126	274	133	n.a.	n.a.	274	133	247	21.18	1,960	5.57	11.86
La Nga No. 3 10 m ³ /s Diversion no Diversion	157	145	118	224	227	224	62	134	47	-2	-28	132	19	254,456/166	18.48	3,476	12.56	-3.67
	157	145	118	227	227	264	73	155	50	39	5	194	55	223	19.13	3,055	8.04	-0.37

***: Cost shared by firm discharge for Power Generation and Irrigation

Table 6.6 Generation Expansion Plan for Base Demand Case (2/2)

EXPANSION PLAN SUMMARY										
YEAR	PEAK LOAD, MW	ENERGY GWH	INSTALLED	RATED CAPACITY, MW	TOTAL	RESERVE CAPACITY	RESERVE PERCENT	LOSS OF LOAD PROBABILITY	NEW UNITS CAPACITY, MW	CAPITAL COST
1995	1141	6196	0	0	1756	1756	53.90	.0001	0	0
1996	1296	7041	0	0	1756	1756	35.49	.0003	0	0
1997	1458	7916	358	221	1893	1893	29.84	.0010	300	255
1998	1690	9033	600	0	2493	2493	47.51	.0013	0	0
1999	1939	10191	0	0	2493	2493	28.57	.0056	0	0
2000	2191	11534	472	32	2933	2933	33.87	.0016	0	0
2001	2474	13002	300	0	3533	3533	30.68	.0018	300	287
2002	2788	14656	300	0	3533	3533	26.72	.0025	300	295
2003	3139	16498	300	0	3833	3833	22.11	.0032	0	0
2004	3487	18325	600	0	4433	4433	27.13	.0012	600	626
2005	3918	20595	360	0	4793	4793	22.33	.0025	360	484
2006	4340	22811	448	0	5241	5241	20.76	.0023	448	1142
2007	4741	24916	600	0	5841	5841	23.20	.0009	600	684
2008	5235	27517	600	0	6441	6441	23.04	.0000	600	705
2009	5707	29997	600	0	7041	7041	23.37	.0000	600	726
2010	6293	33077	600	0	7641	7641	21.42	.0000	600	748
2011	6954	36551	900	0	8541	8541	22.82	.0000	900	1155
2012	7687	40401	900	0	9441	9441	22.82	.0000	900	1190
2013	8499	44672	1200	160	10481	10481	23.32	.0000	1200	1634
2014	9401	49409	1200	0	11681	11681	24.25	.0000	1200	1683
2015	10400	54663	1200	0	12881	12881	23.86	.0000	1200	1734

COST SUMMARY										
YEAR	PROD. COST	FIXED O & M	NEW UNITS ONLY	FIXED CHARGES	ANNUAL	CUM. ANNUAL	PRESENT WORTH	CUM. PRESENT WORTH	PRES. WORTH	EXT.
1995	4	0	0	0	4	4	4	4	4	
1996	14	0	0	0	14	14	19	13	18	
1997	27	2	28	28	57	57	75	47	64	
1998	51	2	28	28	81	81	156	61	125	
1999	89	2	28	28	119	119	276	81	207	
2000	76	2	50	50	106	106	381	66	272	
2001	116	3	92	92	180	180	561	101	374	
2002	167	5	92	92	264	264	825	136	509	
2003	195	9	161	161	292	292	1118	136	646	
2004	246	12	213	213	417	417	1535	177	822	
2005	323	17	328	328	550	550	2085	212	1035	
2006	366	21	404	404	711	711	2796	249	1284	
2007	441	26	481	481	865	865	3661	276	1560	
2008	543	31	561	561	1051	1051	4712	304	1864	
2009	646	37	644	644	1238	1238	5950	326	2190	
2010	789	45	771	771	1469	1469	7419	352	2542	
2011	934	53	902	902	1750	1750	9169	381	2923	
2012	1112	65	1082	1082	2067	2067	11237	409	3332	
2013	1352	77	1268	1268	2499	2499	13736	478	3781	
2014	1577	89	1459	1459	2922	2922	16658	505	4259	
2015	1851				3399	3399	20057	563	4764	
EXT.									10327	

NOTES - ANNUAL COSTS ARE IN MILLIONS OF CURRENT DOLLARS.
 - PRESENT WORTH COSTS ARE IN MILLIONS OF DOLLARS DISCOUNTED TO THE BEGINNING OF 1995.

Table 6.7 Screening of Candidates for Hydropower Master Plan Projects

	FIRST SCREENING			SECOND SCREENING				GENERATION EXPANSION PLAN (Year)	CANDIDATES FOR MASTER PLAN PROJECT
	Estimated Capacity (MW)	Economic Index *	Economic Assessment	Assumed Capacity (MW)	Ann. Net Benef. (M\$/Year) **	Degree of Impact on Environment	Overview Assessment		
Dong Nai No.1	80 - 130	SCC=3900/4100 SGC=13/18	Low Economic Viability	-	-	-	Less Attractive	-	
Dong Nai No.2	100 - 160	SCC=3300/3800 SGC=11/15	Low Economic Viability	-	-	-	Less Attractive	-	
Dong Nai No.3	110 - 170	SCC=2400/2600 SGC=9/10	Viable	130	4.6	Moderate	Viable	-	
Dong Nai No.4	120 - 190	SCC=2200/2700 SGC=6/7	Viable	147	9.4	Low	Viable	-	
Combined No.3.No.4				448	48.3	Low	Viable	2006 - 2008	Selected
Dong Nai No.5	60	SCC=5400 SGC=10	Low Economic Viability	-	-	-	Less Attractive	-	
Dong Nai No.6	200 - 350	SCC=2200/2900 SGC=5/9	Viable	322	-9	Moderate National Park	Less Attractive	-	
Dong Nai No.8	155	SCC=3700 SGC=8	Viable	134	-32.5	High National Park	Less Attractive	-	
Combined No.3.No.8				340	-11.5	Moderate/High National Park	Less Attractive	-	
Can Don	70	SCC=2800 SGC=8	Viable	80	5.4	Moderate	Viable	***	
Fu Mieng			Diversion involved	60 (Multi) 126 (Single)	5.8 12.9	Moderate/High	Viable	2005 - 2009 as Multipurpose	Selected
Bao Loc	60 - 140	SCC=3200/4000 SGC=11/12	Low Economic Viability	-	-	-	Less Attractive	-	
La Nga No.3			Diversion involved	62 (Multi) 73 (Single)	-3.6 -0.4	Moderate	Less Attractive	-	
Da M Bri	Further study recommended as Pumped Storage (Length of Waterway / Head = 14.3)								
Da R Kch / Anh Kong	Further study recommended as Pumped Storage (Length of Waterway / Head = 9.2)								
Da R Tih	Further study recommended as Pumped Storage (Length of Waterway / Head = 15)								
Da Siat	Further study recommended as Pumped Storage (Length of Waterway / Head = 7.8)								

Notes : * Specific Capacity Cost (SCC) = Inst. Capacity / Project Cost (\$/kW)
 Specific Generation Cost (SGC) = Annual Economic Cost / Annual Energy (Cent / kWh)
 ** Annual Net Economic Benefit assuming Coal Thermal Plant as the least cost alternative at Discount Rate of 10 %
 *** In case the cost of Combined Cycle Plant increased 20 %, then it will be required in 2013

Table 6.8 Objectives and Items of Irrigation Planning Study

Code	Schemes Classification		Study Objectives	Study Items	Name of Schemes		
	Main	Sub					
A	Existing Irrigation Schemes	A.1 Large and Medium Irrigation Schemes (Area larger than 2,000 ha)	<ul style="list-style-type: none"> - Formulate rehabilitation and improvement plans - Estimate scheme water requirements 	<ul style="list-style-type: none"> - Identify and plot schemes location - Confirm present conditions - Plan rehabilitation and improvement works - Estimate scheme water requirement - Estimate costs and evaluate project viability - Prepare implementation plan and TOR for further study 	(A.1) Vo Xu, Phan Rang, Song Pha, Dai Don, Quan Hiep, Tuyen Lam and Phuoc Chi (6 schemes)		
		A.2 Small Irrigation Schemes (Area larger than 100 ha and less than 2,000 ha)			(A.2) 161 schemes in total		
		A.3 Extension or Proposed Small Irrigation Schemes			(A.3) 65 schemes in total		
B	On-going and Planned Irrigation Schemes		<ul style="list-style-type: none"> - Confirm and evaluate development plans - Estimate scheme water requirements 	<ul style="list-style-type: none"> - Confirm present status of project implementation and project formulation - Evaluate project formulation - Re-formulate project development plan, if any - Confirm or re-estimate scheme water requirement 	Dau Tieng, Phuoc Hoa, Hoc Mon - Bac Binh Chan and Song Quao irrigation schemes		
C	Potential Irrigation Schemes	C.1 Potential Schemes in HCMC - Long An Delta (Deltaic and saline water affected area)	<ul style="list-style-type: none"> - Confirm and evaluate present and proposed development plans - Formulate irrigation development plan towards the year 2015 - Estimate requirement of fresh water 	<ul style="list-style-type: none"> - Delineate present agricultural and fishery lands - Confirm present status of development plans and future land use - Confirm development progress and further development plans - Estimate fresh water requirement - Confirm water distribution networks - Assessment of benefit by supplying fresh water 	(C.1) HCMC Long An Province: Duc Hoa, Duc Hoe, Ben Luc, Gan Giouc, Can Duoc, Tran Tru, Thu Thua, Thanh Hoa and Moc Hoa (9 Districts)		
		C.2 Potential Schemes in East Coast expecting water resources diverted from Dong Nai river basin			<ul style="list-style-type: none"> - Formulate irrigation development plan towards the year 2015 - Estimate scheme water requirements 	<ul style="list-style-type: none"> - Delineate potential irrigated agricultural development area - Formulate agricultural development plan and cropping plan - Estimate water requirements - Estimate water resources potential available in own basin 	(C.2) Phan Ri Plain, Phan Thiet Plain and Han Tan Plain (3 schemes)
		C.3 Potential Schemes in East Coast fed by Local River Basin			<ul style="list-style-type: none"> - Estimate required additional water amount diverted from other river basins - Make water balance calculation - Decide optimal scale of irrigated agricultural development schemes - Prepare preliminary plan of project facilities - Estimate implementation costs - Estimate project benefits and assess project viability - Prepare implementation plan and TOR for further study 	<ul style="list-style-type: none"> - Estimate required additional water amount diverted from other river basins - Make water balance calculation - Decide optimal scale of irrigated agricultural development schemes - Prepare preliminary plan of project facilities - Estimate implementation costs - Estimate project benefits and assess project viability - Prepare implementation plan and TOR for further study 	(C.3) Phan Rang Plain, Tuy Phong Plain, Song Phan Plain, Lower La Nga Plain, Song Ray and Song Dinh Plain (6 schemes)

Table 6.9 Summary of Existing Irrigation Schemes

Province	Agricultural Area		Irr. Schemes and Designed Area (Total)		Schemes more than 2,000 ha		Schemes less 2,000 ha and more than 100 ha		Schemes less than 100 ha or Unidentified		Data Source and Remarks
	Annual Crops	Perennial Crops, etc.	Nos.	Area (ha)	Nos.	Area (ha)	Nos.	Area (ha)	Nos.	Area (ha)	
1. Lam Dong	40,952	42,316	155	17,985	2	5,532	23	5,277	130	7,176	Source : STWRPM/Province
2. Dac Lac	4,461	1,552	12	394	0	0	1	120	11	274	(*1) : Tuyen Lam/Q. Hiep and Dai Don Source : Province
3. Ninh Thuan	39,525	2,000	50	22,585	2	17,510	15	3,932	33	1,143	Source : Province
4. Binh Thuan	82,512	17,619	153	29,855	1	5,000	56	20,033	96	4,822	(*1) : Song Pha and Phan Rang (Nha Trang and Lam Cam) Source : Province
5. Song Be	79,300	139,400	50	5,587	0	0	16	4,581	34	1,006	(*1) : Vo Xu Source : Province
6. Dong Nai	181,607	155,142	59	18,322	0	0	33	16,930	26	1,392	(*1) : Source STWRPM (*2) : Source Province
7. Ba Ria - Vung Tau	44,019	64,934	24	8,885	0	0	15	8,080	9	805	Source : Province
8. Tay Ninh	182,707	93,393	4	56,675	1	2,260	3	37,000	-	17,415	(*1) : Source Province (*2) : Excluding drainage area (*3) : Phuoc Chi
9. H. C. M.	80,822	12,424	6	31,300	6	31,300	-	-	-	-	(*4) : include 36,000 ha by Dau Tien (*1) : Source STWRPM (*2) : Source Province
10. Long An	139,696	-	9	59,200	9	59,200	-	-	-	-	(*1) : Source Province (*2) : Estimated from inventory data
Total	875,601	526,780	522	250,788	21	120,802	162	95,953	339	34,033	

STWRPM : Sub-Institute of Water Resources Planning and Management

Table 6.10 Potential Irrigation Schemes in East Coast

Potential Scheme	River Basin (Water Source)	Province	Existing Schemes included Nos. of Scheme	Area (ha)	New Aea (ha)	Total Potential Area (ha)	Proposed Hydraulic Structures
1. Phan Rang Plain (Extension)	Cai (Phan Rang)	Ninh Thuan	Total 15 - Schemes (>100 ha) 33 - Schemes (<100 ha)	5,075 3,932 1,143	10,325	15,400	Song Sat, Song Trau and Tan Giang Dams (*1)
2. Tuy Phong Plain	Long Song	Binh Thuan	Total 4 - Schemes (>100 ha) 4 - Schemes (<100 ha)	2,150 1,670 480	2,050	4,200	Long Song Dam
3. Phan Ri Plain	Luy	Binh Thuan	Total 17 - Schemes (>100 ha) 10 - Schemes (<100 ha)	6,113 5,563 550	25,887	32,000	Ca Gray, Ca Tot and Luy Dams, Diversion from Dong Nai Basin
4. Phan Thiet Plain	Cai (Phan Thiet) and Ca Ty	Binh Thuan	Total 16 - Schemes (>100 ha) 57 - Schemes (<100 ha)	11,605 8,770 2,835	12,795	24,400	Song Quao, Ba Bau, Ke Bat and Song Mong Dams, Diversion from Luy Basin
5. Song Phan Plain	Phan	Binh Thuan	Total	0	5,030	5,030	Song Phang Dam
6. Ham Tan Plain	Dinh	Binh Thuan	Total 6 - Schemes (>100 ha) 3 - Schemes (<100 ha)	1,210 1,090 120	6,790	8,000	Gieng and Dinh-3 Dams, Diversion from La Nga Basin
7. Lower La Nga Plain	La Nga	Binh Thuan Dong Nai	Total Binh Thuan Province 14 - Schemes (>100 ha) 15 - Schemes (<100 ha) Dong Nai Province 5 - Schemes (>100 ha) 3 - Schemes (<100 ha)	10,235 6,740 720 2,600 175 4,050	29,765	40,000	Ta Pao and Vo Dat Weirs
8. Ray River Area	Ray	Ba Ria - Vung Tau			9,660	13,710	Ray Dam and other 8 dams
9. Dinh River Area	Dinh	Ba Ria - Vung Tau		1,950	2,790	4,740	Da Den Dam and other 4 dams
Total				42,388	105,092	147,480	

Remarks (*1) : Rehabilitation of Phan Rang and Song Pha Irrigation Schemes are excluded.

Table 6.11 Screening of Candidate Schemes for Master Plan Projects

Code	Schemes Classification		Identified Irrigation Schemes		Factors for Screening					Formulation and Area of Candidate M/P Projects				
	Main	Sub	Name of Scheme	Area (ha)	Source of Irrigation Water	Availability of Water Resource	Maturity of Planning	Social Impact	Natural Environ. Impact	Economic Viability	Formulation	Area (ha)		
A	Existing Irrigation Schemes (excluding Minor Existing Irrigation Schemes (smaller than 100 ha), 339 schemes with 34,033 ha in total)	A.1 Large and Medium Irrigation Schemes (Area larger than 2,000 ha)	- Vo Xu	5,000	D	F	C (for rehabili.)	P	S+, G+, H+ & C+	-	Included in Ta Pao Iri. Scheme Rehabilitated independently Rehabilitated independently with Phan Rang Formulated as Rural Agricultural Development Project (RADP) including Tay Ninh Riparian Schemes, comprising of: (1) Small Existing Irri. Schemes including Dai Dong, Tuyen Lam/Quan Hiep and Phuoc Chi schemes (164 schemes) (2) New Small Irri. Scheme (65 schemes) (Total : Initially screened 231 schemes)			
			- Phan Rang	12,800	S + DV	F	A (for rehabili.)	P	S+, G+, H+ & C+	H				
			- Song Pha	4,710	S + DV	F	C (for rehabili.)	P	S+, G+, H+ & C+	M				
			- Dai Don	2,700	D	F	C (for rehabili.)	P	S+, G+, H+ & C+					
			- Tuyen Lam/Quan Hiep	2,832	D	F	C (for rehabili.)	P	S+, G+, H+ & C+					
		A.2 Small Irrigation Schemes (Area larger than 100 ha and less than 2,000 ha)	161 schemes including 2 - Tay Ninh Riparian Schemes (1,000 ha in total)	59,953	D + S + DV	A & P	C (for rehabili.)	P & J	S+, G+, H+ & C+	M				
		A.3 New Small Irrigation Schemes	65 schemes including 12 - Tay Ninh Riparian Schemes (21,870 ha in total)	61,242	D + S + DV	A & P	C (for rehabili.)	P & J	S+, G+, H+ & C+					
B	On-going and Planning Irrigation Schemes		- Dau Tieng (Existing)	45,000	D	F	In operation	P & J	G+	-	In operation			
			- Dau Tieng (Extension)	48,390	D	A	B	P & J	G+	H	Selected as candidate M/P project	48,390		
			- Phuoc Hoa	45,680	D	F	B	P & J	S+ & H+	M	Selected as candidate M/P project	45,680		
			- Hoc Mon - Bac Binh Chan	12,197	D	F	In implement.	P & J	H+ & C-	H	In implementation			
			- Song Quao	8,000	S + DV	F	In implement.	P & J	H+	-	In implementation			
C	Potential Irrigation Schemes	C.1 Potential Irrigation Schemes in HCMC - Long An Delta (including on-going Hoc Mon - Bac Binh Chanh Irrigation Scheme of 12,197 ha)	- HCMC	46,000	D	A	C	P & J	H+ & C-	M	Selected as candidate M/P project	46,000		
			- Long An	54,000	D	A	B	P & J	H+ & C-	M	Selected as candidate M/P project	54,000		
													(Total)	(100,000)
			C.2 Potential Schemes expecting water resources diverted from Dong Nai river basin (including existing irrigation schemes with 18,928 ha in total)	- Phan Ri	32,000	S + DV	A	B	P, J & T	S+, H+ & C+	H	Formulated as Phan Ri - Phan Thiet Irrigation Project, comprising (1) Phan Ri Irrigation Scheme (32,000 ha) (2) Phan Thiet Irrigation Scheme (10,000 ha) (excluding on-going Song Quao Irri. Scheme 8,000 ha)	32,000	
				- Phan Thiet	24,400	S + DV	A	B	P & J	S+, H+ & C+	H (18,000 ha in Quao river basin) L (6,400 ha in Ca Ty river basin)	(Total)	(32,000)	
												Omitted 6,400 ha in Ca Ty river basin from candidate M/P Project		
		- Ham Tan		8,000	S + DV	P	B	P & J	S+, H+ & C+	L	Omitted from candidate M/P project			
		- Phan Rang Extension		15,400	S	P	C	P & J	S+, H+ & C+	L	Omitted from candidate M/P project			
		C.3 Potential Schemes fed by own river basin (including existing irrigation schemes with 24,660 ha in total)	- Tuy Phong	4,200	S	A	C	P & J	S+, H+ & C+	L	Omitted from candidate M/P project			
			- Song Phang	5,030	S	P	C	P & J	S+, H+ & C+	L	Omitted from candidate M/P project			
- Lower La Nga	38,000		D	F	B	P & J	H+	H (Ta Pao Scheme) M (Vo Dat Scheme)	Selected as M/P project, comprising (1) Ta Pao Irrigation Scheme (23,000 ha) (2) Vo Dat Irrigation Scheme (15,000 ha)	23,000				
											(Total)	(38,000)		
- Song Ray	13,710		S	P	B	P & J	S+, H+ & C+	M	Omitted from candidate M/P project					
- Song Dinh	4,740	S	P	B	P & J	S+, H+ & C+	M	Omitted from candidate M/P project						
Abbreviation of Screening Factors					D: Dong Nai River Basin	F: Fully available	A: F/S by Ministry	P: Poverty alleviation	+: Positive	H: High				
					DV: Diversion from Dong Nai River Basin (including Possibility)	A: Available subject to water resources development	B: Pre-F/S by Ministry	J: Job opportunity	-: Negative	M: Marginal				
					S: Surrounding Basin	P: Poor or insufficient	C: Preliminary Study by Province	T: Transmigration	T: Topography	L: Low				
									S: Soil erosion					
									G: Groundwater					
									H: Hydro. situation					
									C: Coastal zone					
									F: Flora & fauna					

Table 6.12 Domestic and Industrial Water Supply in the District and Major Towns (1/4)

Province	Pro. Capital	District	District and major towns	Sources	Stage	Design Capacity m ³ /day	Note
Tay Ninh	Tay Ninh	Tay Ninh and Hoa Thanh	Tay Ninh and Hoa Thanh	West canal of the Dau Tieng Reservoir	Existing	4,000	
				Groundwater (8 wells)	Extension plan	5,000	
				Groundwater (2 wells)	Existing	4,500	
				Groundwater (2 wells)	Existing	1,200	
				Groundwater (2 wells)	Planned	1,000	
				Groundwater (2 wells)	Existing	900	
				Groundwater (2 wells)	Planned	1,000	
				Groundwater (2 wells)	Existing	1,000	
				Groundwater (2 wells)	Planned	1,000	
				Groundwater (2 wells)	Planned	1,000	
				Groundwater (1 well)	Planned	500	
				Groundwater (1 well)	Planned	500	
				Groundwater (1 well)	Planned	500	
Groundwater (2 wells)	Planned	1,000					
Song Be	Thu Dau Mot	Thu Dau Mot and Thuan An	Thu Dau Mot and Thuan An	Saigon River	Existing	7,500	
					Extension (1)	7,500	1996 (not committed yet) for Thuan An
					Extension (2)	25,000	
				Wells	Existing	5,000	
				Groundwater (4 wells)	Existing	3,700	
				Dong Nau River	Planned	20,000	Tan Ba new plant no water supply
				Wells	Existing	1,000	
				Cam Stream	Planned	5,000	no water supply at present
				Wells	Existing	360	
				Stream/Groundwater	Planned	5,000	
				Song Be River	Planned	5,000	no water supply at present (maximum)
				Wells	Existing	500	
				The Son Reservoir	Planned	3,000	no water supply at present
Dac Lac	B. Ma Thuoc	Dak Nong	Dak Nong	Stream	Existing	700	to be abandoned
				Springs	Planned	1,000	no water supply
		Dak R'Lap	Dak R'Lap				

Table 6.12 Domestic and Industrial Water Supply in the District and Major Towns (2/4)

Province	Pro. Capital	District	District and major towns	Sources	Stage	Design Capacity m ³ /day	Note	
Lam Dong	Da Lat	Da Lat	Da Lat	Suoi Vang Reservoir	Existing Extension plan	27,000 42,000	by the year 2005	
		Cat Tien	Cat Tien	Thien Huong treatment plant	Existing	6,000	no water supply	
		Da Teh	Da Teh	Than Tho treatment plant	Existing	4,000	no water supply	
		Da Huoi	Da Huoi					
		Bao Lam	Bao Lam	Groundwater (11 wells)	Existing	3,020	no water supply	
				Groundwater	Planned	7,000	by the year 2005	
		Di Linh	Di Linh	Groundwater (3 wells)	Existing	2,280		
		Duc Trong	Duc Trong	Groundwater (2 wells)	Existing	1,040	by the year 2005	
				Groundwater	Planned	2,160	no water supply	
				Don Duong	Springs	Existing	100	by the year 2005
Ninh Thuan	Phan Rang		Lac Duong	Da Dang Reservoir	Planned	1,000		
			Lam Ha					
			P. Rang-T. Cham	Groundwater (4 wells)	Existing	1,200	Rehabilitation for future use	
			Dong Hai and Ninh Chu	Thap Cham (Da Nhim HPP)	Existing	800	Rehabilitation for future use	
				New Thap Cham	Under-const.	12,000	Commission in 1995	
					Extension	12,000	Year 2000	
				Ninh Son			no water supply	
				Ninh Phuoc			no water supply	
				Phan Thiet	Phu Hoi reservoir (Muong Man River)	Existing	15,000	
					Quao reservoir (Quao R)	planned	12,000	by the year 2000
Binh Thuan	Phan Thiet		Lagi	Da Dung Weir (Dinh River)	Existing	1,500	by the year 2000	
					Extension (1)	500	by the year 2010	
					Extension (2)	3,000	no water supply	
				Tan Lap				no water supply
				Lac Tanh				no water supply
				Vo Xu				no water supply
				Ma Lam				no water supply
								no water supply
								no water supply
								no water supply

Table 6.12 Domestic and Industrial Water Supply in the District and Major Towns (3/4)

Province	Pro. Capital	District	District and major towns	Sources	Stage	Design Capacity m ³ /day	Note
Ba Ria-Vung Tau		Bac Binh	Bac Binh and Phan Ri Cua	Xuong Quang pumping station (Luy River)	Existing	800	
		Tuy Phong Phu Quy	Lien Huong Phu Quy	Groundwater (5 wells)	Extension (1) Extension (2) Existing	1,600 2,600 600	By the year 1997 By the year 2000 no water supply
Dong Nai	Bien Hoa	Ba Ria - Vung Tau and Long Dat	Ba Ria town, Long Son Vung Tau, Long Dien, Long Hai, Phuoc Tinh, Dat Do and Phuoc Hai Phuoc Bui	Dinh River Groundwater (19 wells) Da Den Reservoir (Da Den R)	Existing Planned Existing Planned	20,000 10,000 13,000 100,000	year 1978 extension year 2000
		Xuyen Moc		Groundwater (wells) Phuoc Bui weir Phuoc Bui weir Groundwater (wells) Groundwater	Planned Planned Planned Existing Planned	1,000 2,000 2,000 600 15,000	by the year 2000 by the year 2000 by the year 2010
		Tan Thanh	Phu My	Chau Pha and Suoi Sao Rivers Dong Nai River Springs	Planned Planned Planned	20,000 225,000 2,000	by the year 1997 Construction commencement in 1996 by the year 2010
		Chau Duc Bien Hoa	Ngai Giao Bien Hoa	Thien Tan (DN AIR.)	Existing Under-const. Planned	36,000 100,000 300,000	commission in 1997
				Groundwater (2 wells)	Existing	480	no water supply at present
				Groundwater (24 wells)	Existing	720	no water supply at present no water supply
				Groundwater (3 wells) Reservoir	Existing Planned	420 2,400	
				Groundwater (6 wells) Groundwater	Existing Planned	5,000 5,000	
				Groundwater (2 wells) Groundwater (1 wells)	Existing Existing	600 400	

Table 6.12 Domestic and Industrial Water Supply in the District and Major Towns (4/4)

Province	Pro. Capital	District	District and major towns	Sources	Stage	Design Capacity m ³ /day	Note
Ho Chi Minh City	HCMC	12 urban districts, Thu Duc district and parts of Binh Chanh and Nha Be	Hochiminh City, Thu Duc, Binh Chanh and Nha Be	Hoa An Intake (DNAI R.)	Existing	650,000	(first commission in 1966 with 450,000)
				Hoa An Intake (DNAI R.)	Extension/ Rehabilitation	100,000	committed in 1997
				Hoa An Intake (DNAI R.)	Extension Plan	350,000	year 2000
				Hoa An Intake (Dong Nai River)	Extension Plan	400,000	year 2010
				Binh An (Dong Nai River)	Under-const.	100,000	year 1997
				Groundwater(18 wells)	Extension Plan	50,000	year 2000
				Phu Cuong Intake(SGON R)	Existing	30,000	
				Phu Cuong Intake(SGON R)	Under-const	300,000	year 1997
				Phu Cuong Intake(SGON R)	Extension Plan	300,000	year 2000
				Groundwater (8 wells)	Extension Plan	300,000	year 2010
				Groundwater (10 wells)	Existing	20,000	year 1993
				Groundwater (22 wells)	Planned	20,000	year 1995
Groundwater (3 wells)	Existing	60,000	year 2000				
Groundwater (2 wells)	Planned	2,880					
						2,400	no water supply
Long An	Tan An	Can Duoc, Tan Tru, Can Giuoc, Ben Luc, Duc Hoa, Hiep Hoa, Huu Nghia, Duc Hue	Can Duoc, Tan Tru, Can Giuoc, Ben Luc, Duc Hoa, Hiep Hoa, Huu Nghia, Duc Hue	Groundwater	Existing	1,000	
				Groundwater (3 wells)	Existing	240	year 1995
				Groundwater	Planned	1,000	
				Groundwater	Existing	120	
				Groundwater	Planned	1,000	
				Groundwater	Existing	1,200	
				Groundwater	Existing	200	
				Groundwater	Existing	300	no water supply
				Groundwater	Existing	120	
				Reservoir plus groundwater	Planned	1,000	
				Groundwater	Existing	960	

Table 6.13 Projected Water Demand of Urban Centres (1/3)

Province	District	District and Major Towns	Projected Population		Water Demand, m ³ /day					
			2000	2015	2000			2015		
					Domestic	Others	Total	Domestic	Others	Total
Tay Ninh										
	Tay Ninh	Tay Ninh	38,184	46,829	4,582	458	5,040	7,586	759	8,345
	Hoa Thanh	Hoa Thanh	20,392	23,744	2,447	245	2,692	3,847	385	4,231
	Trang Bang	Trang Bang	13,294	16,719	1,595	160	1,755	2,708	271	2,979
	Go Dau	Go Dau	23,355	25,816	2,803	280	3,083	4,182	418	4,600
	Ben Cau	Ben Cau	-	-	-	-	-	-	-	-
	Chau Thanh	Chau Thanh	-	-	-	-	-	-	-	-
	Duong Minh Chau	Duong Minh Chau	-	-	-	-	-	-	-	-
	Tan Bien	Tan Bien	5,025	5,957	603	60	663	965	97	1,062
	Tan Chau	Tan Chau	8,261	9,792	991	99	1,090	1,586	159	1,745
							TOTAL	14,323		22,962
Song Be										
	Thu Dau Mot	Thu Dau Mot	75,088	156,326	10,250	4,100	14,349	29,264	11,706	40,970
	Thuan An	Di An	20,113	41,873	2,745	6,912	9,657	7,839	14,176	22,014
		Lai Thieu	13,409	27,915	1,830	10,025	11,855	5,226	20,284	25,510
	Tan Uyen	Tan Uyen	11,262	15,157	1,025	256	1,281	1,655	414	2,069
	Ben Cat	Ben Cat	11,262	15,157	1,025	359	1,383	1,655	579	2,234
	Dong Phu	Dong Phu	25,000	89,693	2,275	569	2,844	9,795	2,449	12,243
	Binh Long	Binh Long	21,998	27,912	2,002	500	2,502	3,048	762	3,810
	Phuoc Long	Phuoc Long	33,339	119,613	3,034	758	3,792	13,062	3,265	16,327
	Loc Ninh	Loc Ninh	16,499	20,934	1,501	375	1,877	2,286	572	2,858
	Bu Dang	Bu Dang	10,999	13,956	1,001	250	1,251	1,524	381	1,905
							TOTAL	50,792		129,940
Dac Lac										
	Dak Nong	Gia Nghia	8,302	11,919	1,058	497	1,555	1,735	816	2,551
	Dak R'Lap	Dak R'Lap	-	-	-	-	-	-	-	-
							TOTAL	1,555		2,551
Lam Dong										
	Da Lat	Da Lat	106,239	111,454	13,055	7,833	20,887	20,329	12,198	32,527
	Cat Tien	Cat Tien	11,516	33,136	1,198	275	1,473	4,092	941	5,034
	Da Teh	Da Teh	15,281	35,398	1,589	366	1,955	4,372	1,005	5,377
	Da Huoi	Da Huoi	8,397	9,562	873	201	1,074	1,181	272	1,453
	Bao Lam	Bao Lam	50,850	106,016	5,288	2,644	7,933	13,093	6,547	19,640
	Di Linh	Di Linh	17,559	31,622	1,826	822	2,648	3,905	1,757	5,663
	Duc Trong	Duc Trong	36,358	59,085	3,781	870	4,651	7,297	1,678	8,975
	Don Duong	Don Duong	14,145	19,721	1,471	338	1,809	2,436	560	2,996
	Lac Duong	Lac Duong	-	-	-	-	-	-	-	-
	Lam Ha	Lam Ha	25,342	43,015	2,636	606	3,242	5,312	1,222	6,534
							TOTAL	45,672		88,197

Table 6.13 Projected Water Demand of Urban Centres (2/3)

Province	District	District and Major Towns	Projected Population		Water Demand, m ³ /day					
			2000	2015	2000		2015			
					Domestic	Others	Total	Domestic	Others	Total
Ninh Thuan										
	Phan Rang and Ninh Hai	P.Rang-T.Cham	95,122	141,439	1,682	706	2,388	20,755	8,717	29,473
		Ninh Chu	17,800	26,467	315	132	447	3,884	1,631	5,515
		Dong Hai	23,000	34,199	407	171	577	5,019	2,108	7,126
	Ninh Son	Ninh Son	-	-	-	-	-	-	-	-
	Ninh Phuoc	Ninh Phuoc	-	-	-	-	-	-	-	-
							TOTAL	3,412		42,114
Binh Thuan										
	Phan Thiet	Phan Thiet	152,808	227,214	6,189	1,980	8,169	33,128	10,601	43,729
	Ham Tan	Lagi	30,770	45,753	1,246	87	1,333	6,671	467	7,138
	Ham Thuan Nam	Tan Lap	17,691	26,306	716	50	767	3,835	268	4,104
	Tanh Linh	Lac Tanh	11,756	17,481	476	33	509	2,549	178	2,727
	Duc Linh	Vo Xu	19,289	28,682	781	55	836	4,182	293	4,475
	Ham Thuan Bac	Ma Lam	12,898	19,178	522	37	559	2,796	196	2,992
	Bac Binh	Bac Binh	39,466	58,683	1,598	112	1,710	8,556	599	9,155
		Phan Ri Cua	34,812	51,763	1,410	99	1,509	7,547	528	8,075
	Tuy Phong	Lien Huong	28,847	42,893	1,168	82	1,250	6,254	438	6,691
	Phu Quy	Phu Quy	-	-	-	-	-	-	-	-
							TOTAL	16,642		89,085
Ba Ria- Vung Tau										
	B.Ria-V.Tau	Vung Tau								
		- Dwellers	225,000	436,690	21,938	31,809	53,747	87,338	126,640	213,978
		- Domestic Tourists	70,000	219,597	8,750	-	8,750	41,175	-	41,175
		- Foreign Tourists	7,000	24,196	2,625	-	2,625	15,123	-	15,123
			302,000	680,484	33,313	31,809	65,122	143,635	126,640	270,275
	and Long Dat	Ba Ria	62,000	167,028	4,650	6,743	11,393	25,054	36,329	61,383
		Long Son	20,000	40,464	1,500	2,175	3,675	6,070	8,801	14,871
		Long Hai	25,000	41,401	1,875	2,719	4,594	6,210	9,005	15,215
		Phuoc Tinh	20,000	29,652	1,500	2,175	3,675	4,448	6,449	10,897
		Long Dien	28,000	40,790	2,100	3,045	5,145	6,119	8,872	14,990
		Dat Do	28,000	40,790	2,100	3,045	5,145	6,119	8,872	14,990
		Phuoc Hai	15,000	26,627	1,125	1,631	2,756	3,994	5,791	9,785
	Xuyen Moc	Phuoc Bui	12,000	25,816	900	225	1,125	3,872	968	4,841
	Tan Thanh	Phu My	200,000	1,038,907	19,500	64,450	83,950	187,003	143,700	330,704
	Chau Duc	Ngai Giao	15,000	19,718	1,125	281	1,406	2,958	739	3,697
							TOTAL	187,986		751,648

Table 6.13 Projected Water Demand of Urban Centres (3/3)

Province	District	District and Major Towns	Projected Population		Water Demand, m ³ /day					
			2000	2015	2000		2015			
					Domestic	Others	Total	Domestic	Others	Total
Dong Nai										
	Bien Hoa	Bien Hoa	450,000	873,381	67,500	90,500	158,000	196,511	156,977	353,487
		Tam Phuoc	20,000	632,264	1,950	18,945	20,895	113,808	130,131	243,938
	Long Thanh	Long Thanh	30,000	64,541	2,925	878	3,803	11,617	3,485	15,103
	Nhon Trach	Nhon Trach	120,000	1,020,658	15,600	39,840	55,440	183,719	185,058	368,776
	Thong Nhat	Thong Nhat	20,000	72,850	2,496	624	3,120	9,092	2,273	11,365
	Xuan Loc	Gia Ray	13,000	21,466	1,622	406	2,028	2,679	670	3,349
	Long Khanh	Xuan Loc	52,000	75,091	6,490	1,622	8,112	9,371	2,343	11,714
	Vinh Cuu	Vinh An	55,000	77,812	6,864	1,716	8,580	9,711	2,428	12,139
	Tan Phu	Tan Phu	21,000	28,346	2,621	655	3,276	3,538	884	4,422
	Dinh Quan	Dinh Quan	42,800	61,176	5,341	1,335	6,677	7,635	1,909	9,543
						TOTAL	269,930			1,033,836
HCMC										
	17 districts	-	5,062,270	7,288,877	586,818	420,162	1,006,980	1,176,862	842,633	2,019,495
	Cu Chi	Cu Chi	280,429	404,365	18,228	4,557	22,785	26,284	35,821	62,105
						TOTAL	1,029,765			2,081,600
Long An										
	Can Duoc	Can Duoc	11,271	17,281	394	39	434	1,089	109	1,198
	Tan Tru	Tan Tru	5,339	8,186	187	19	206	516	52	567
	Can Giuoc	Can Giuoc	10,085	15,462	353	35	388	974	97	1,071
	Ben Luc	Ben Luc	21,381	32,876	748	75	823	2,071	207	2,278
	Duc Hoa	Huu Nghia	22,828	41,350	799	80	879	2,605	261	2,866
		Hiep Hoa	10,780	19,527	377	38	415	1,230	123	1,353
		Duc Hoa	12,048	21,824	422	42	464	1,375	137	1,512
	Duc Hue	Duc Hue	5,932	9,095	208	21	228	573	57	630
	Thu Thua	Thu Thua	14,754	15,409	516	52	568	971	97	1,068
						TOTAL	4,405			12,544
						GRAND TOTAL	1,624,484			4,254,478

Table 6.14 Future Water Balance (1/3)

Province	District	District and Major Towns	Water Demand		Supply Capacity			Deficit	
			2000	2015	Existing	by 2000	by 2015	in 2000	in 2015
			(m ³ /day)						
Tay Ninh									
	Tay Ninh	Tay Ninh	5,040	8,345	9,700	6,000			
	Hoa Thanh	Hoa Thanh	2,692	4,231	-	-			
		Sub-Total	7,732	12,576	9,700	6,000	-	0	0
	Trang Bang	Trang Bang	1,755	2,979	900	1,000	-	0	1,079
	Go Dau	Go Dau	3,083	4,600	1,000	1,000	-	1,083	2,600
	Ben Cau	Ben Cau	-	-	-	1,000	-	0	0
	Chau Thanh	Chau Thanh	-	-	-	500	-	0	0
	Duong Minh Chau	Duong Minh Chau	-	-	-	500	-	0	0
	Tan Bien	Tan Bien	663	1,062	-	500	-	163	562
	Tan Chau	Tan Chau	1,090	1,745	-	1,000	-	90	745
		TOTAL						1,337	4,986
Song Be									
	Thu Dau Mot	Thu Dau Mot	14,349	40,970	12,500	7,500	-		
	Thuan An	Di An	9,657	22,014	3,700	25,000	20,000		
		Lai Thieu	11,855	25,510	16,200	32,500	20,000		
		Sub-Total	35,861	88,494	32,400	65,000	40,000	0	0
	Tan Uyen	Tan Uyen	1,281	2,069	-	-	-	1,281	2,069
	Ben Cat	Ben Cat	1,383	2,234	1,000	-	-	383	1,234
	Dong Phu	Dong Phu	2,844	12,243	-	5,000	-	0	7,243
	Binh Long	Binh Long	2,502	3,810	360	5,000	-	0	0
	Phuoc Long	Phuoc Long	3,792	16,327	-	500	-	3,292	15,827
	Loc Ninh	Loc Ninh	1,877	2,858	500	-	-	1,377	2,358
	Bu Dang	Bu Dang	1,251	1,905	-	3,000	-	0	0
		TOTAL						6,334	28,731
Dac Lac									
	Dak Nong	Gia Nghia	1,555	2,551	700	1,000	-	0	851
	Dak R'Lap	Dak R'Lap	-	-	-	-	-	0	0
		TOTAL						-	851
Lam Dong									
	Da Lat	Da Lat	20,887	32,527	37,000	-	42,000	0	0
	Cat Tien	Cat Tien	1,473	5,034	-	-	-	1,473	5,034
	Da Teh	Da Teh	1,955	5,377	-	-	-	1,955	5,377
	Da Huoi	Da Huoi	1,074	1,453	-	-	-	1,074	1,453
	Bao Lam	Bao Lam	7,933	19,640	3,020	-	7,000	4,913	9,620
	Di Linh	Di Linh	2,648	5,663	2,280	-	-	368	3,383
	Duc Trong	Duc Trong	4,651	8,975	1,040	-	2,160	3,611	5,775
	Don Duong	Don Duong	1,809	2,996	-	-	-	1,809	2,996
	Lac Duong	Lac Duong	-	-	100	-	-	0	0
	Lam Ha	Lam Ha	3,242	6,534	-	-	1,000	3,242	5,534
		TOTAL						18,445	39,171

Table 6.14 Future Water Balance (2/3)

Province	District	District and Major Towns	Water Demand		Supply Capacity			Deficit	
			2000	2015	Existing	by 2000	by 2015	in 2000	in 2015
			(m ³ /day)						
Ninh Thuan									
	Phan Rang and Ninh Hai	P.Rang-T.Cham	2,388	29,473					
		Ninh Chu	447	5,515					
		Dong Hai	577	7,126					
		Sub-Total	3,412	42,114	14,000	12,000	-	0	16,114
	Ninh Son	Ninh Son	-	-	-	-	-	0	0
	Ninh Phuoc	Ninh Phuoc	-	-	-	-	-	0	0
		TOTAL						-	16,114
Binh Thuan									
	Phan Thiet	Phan Thiet	8,169	43,729	15,000	12,000	-	0	16,729
	Ham Tan	Lagi	1,333	7,138	1,500	500	3,000	0	2,138
	Ham Thuan Nam	Tan Lap	767	4,104	-	-	-	767	4,104
	Tanh Linh	Lac Tanh	509	2,727	-	-	-	509	2,727
	Duc Linh	Vo Xu	836	4,475	-	-	-	836	4,475
	Ham Thuan Bac	Ma Lam	559	2,992	-	-	-	559	2,992
	Bac Binh	Bac Binh	1,710	9,155					
		Phan Ri Cua	1,509	8,075					
		Sub-Total	3,219	17,230	-	-	-	3,219	17,230
	Tuy Phong	Lien Huong	1,250	6,691	600	-	-	650	6,091
	Phu Quy	Phu Quy	-	-	-	-	-	0	0
		TOTAL						6,540	56,455
Ba Ria-Vung Tau									
	B.Ria-V.Tau	Vung Tau							
		- Dwellers	53,747	213,978					
		- Domestic Tourists	8,750	41,175					
		- Foreign Tourists	2,625	15,123					
		Sub-Total	65,122	270,275					
	and Long Dat	Ba Ria	11,393	61,383					
		Long Son	3,675	14,871					
		Long Hai	4,594	15,215					
		Phuoc Tinh	3,675	10,897					
		Long Dien	5,145	14,990					
		Dat Do	5,145	14,990					
		Phuoc Hai	2,756	9,785					
		Sub-Total ¹⁾	101,504	412,407	33,000	110,000	-	0	269,407
	Xuyen Moc	Phuoc Bui	1,125	4,841	-	3,000	2,000	0	0
	Tan Thanh	Phu My	83,950	330,704	600	35,000	225,000	48,350	70,104
	Chau Duc	Ngai Giao	1,406	3,697	-	2,000	-	0	1,697
		TOTAL						48,350	341,205

Note: 1) Future water balance for Vung Tau, Ba Ria, Long Son, Long Hai, Phuoc Tinh, Long Dien, Dat Do and Phuoc Hai is calculated by treating as a water supply system.

Table 6.14 Future Water Balance (3/3)

Province	District	District and Major Towns	Water Demand		Supply Capacity			Deficit	
			2000	2015	Existing	by 2000	by 2015	in 2000	in 2015
Dong Nai									
	Bien Hoa	Bien Hoa	158,000	353,487					
		Tam Phuoc	20,895	243,938					
		Sub-Total	178,895	597,426	36,480	100,000	300,000	42,415	160,946
	Long Thanh	Long Thanh	3,803	15,103	720	-	-	3,083	14,383
	Nhon Trach	Nhon Trach	55,440	368,776	-	-	-	55,440	368,776
	Thong Nhat	Thong Nhat	3,120	11,365	-	-	-	3,120	11,365
	Xuan Loc	Gia Ray	2,028	3,349	420	2,820	-	0	109
	Long Khanh	Xuan Loc	8,112	11,714	5,000	5,000	-	0	1,714
	Vinh Cuu	Vinh An	8,580	12,139	600	-	-	7,980	11,539
	Tan Phu	Tan Phu	3,276	4,422	400	-	-	2,876	4,022
	Dinh Quan	Dinh Quan	6,677	9,543	-	-	-	6,677	9,543
								TOTAL	121,590
									582,396
HCMC									
	17 districts		1,006,980	2,019,495	700,000	620,000	700,000	0	0
	Cu Chi	Cu Chi	22,785	62,105	2,000	2,400	-	18,385	57,705
								TOTAL	18,385
									57,705
Long An									
	Can Duoc	Can Duoc	434	1,198	1,000	-	-	0	198
	Tan Tru	Tan Tru	206	567	240	1,240	-	0	0
	Can Giuoc	Can Giuoc	388	1,071	120	1,120	-	0	0
	Ben Luc	Ben Luc	823	2,278	1,200	-	-	0	1,078
	Duc Hoa	Huu Nghia	879	2,866	300	-	-	579	2,566
		Hiep Hoa	415	1,353	-	-	-	415	1,353
		Duc Hoa	464	1,512	200	-	-	264	1,312
	Duc Hue	Duc Hue	228	630	120	1,000	-	0	0
	Thu Thua	Thu Thua	568	1,068	960	1,000	-	0	0
								TOTAL	1,258
									6,507
								GRAND TOTAL	222,238
									1,134,153

Table 6.15 Water Supply Projects to Seek Water Sources to the Dong Nai River and the Saigon River in the Year 2015

Province	Town	Water Sources, m ³ /day		Notes
		Dong Nai River	Saigon River	
Song Be	Thu Dau Mot		15,000	
	Thuan An	20,000	25,000	
Ba Ria - Vung Tau	Ba Ria - Vung Tau -	252,000		Out of total demand of 410,000 m ³ /day, a capacity of 158,000 m ³ /day is sought to other sources.
	Long Son - Long Dien -			
	Long Hai - Phuoc Tinh -			
	Dat Do - Phuoc Hai			
	Go Dau - Phu My - Thi Vai	315,000		Out of total demand of 330,000 m ³ /day, a capacity of 15,000 m ³ /day is sought to groundwater.
Dong Nai	Bien Hoa - Ho Nai	350,000		
	Tam Phuoc - An Phuoc	240,000		
	Nhon Trach - Long Thanh	380,000		
Ho Chi Minh City	17 districts	1,630,000	900,000	Out of total demand of 2,000,000 m ³ /day, (300,000) a capacity of 70,000 m ³ /day is sought to groundwater.
		3,187,000	940,000	
			(340,000)	

Note: The figure in the parentheses shows the requirement of the Saigon River in case that the first stage of the Phu Cuong intake under construction is implemented.

Table 6.16 Performance of Rural Water Supply in the Study Area (1/3)

Province	District	Population in Rural Area		Number of water sources	Number of Beneficiaries	Performance Rate %
		1,989	1,994			
Tay Ninh	Tay Ninh	4,210	4,805	46	5,520	100.0
	Trang Bang	108,322	123,636	62	7,440	6.0
	Go Dau	93,495	106,713	64	7,680	7.2
	Ben Cau	49,413	56,399	48	5,760	12.2
	Chau Thanh	100,978	115,254	97	11,640	10.1
	Hoa Thanh	163,095	186,153	83	9,960	5.4
	Duong Minh Chau	74,779	85,351	75	9,000	10.5
	Tan Bien	56,599	64,601	66	7,920	12.3
	Tan Chau	57,938	<u>66,129</u>	<u>57</u>	<u>6,840</u>	<u>10.3</u>
			809,041	598	71,760	8.9
Song Be	Thu Dau Mot	71,203	81,270	59	7,080	8.7
	Thuan An	135,491	154,646	103	12,360	8.0
	Tan Uyen	106,824	121,927	96	11,520	9.4
	Ben Cat	150,347	171,603	134	16,080	9.4
	Dong Phu	87,505	99,876	-	-	0.0
	Binh Long	136,202	155,458	101	12,120	7.8
	Phuoc Long	96,424	110,056	-	-	0.0
	Loc Ninh	80,324	91,680	-	-	0.0
	Bu Dang	29,497	<u>33,667</u>	-	-	<u>0.0</u>
			1,020,183	493	59,160	5.8
Dac Lac	Dak Nong		14,985	-	-	0.0
	Dak R'Lap		<u>22,330</u>	<u>20</u>	<u>2,400</u>	<u>10.7</u>
			37,315	20	2,400	6.4

Notes: (1) An annual increase rate of population is estimated as 2.68 %.
(2) The number of beneficiaries is estimated at 120 persons for a water source.

Table 6.16 Performance of Rural Water Supply in the Study Area (2/3)

Province	District	1989	1994	Number of water sources	Number of Beneficiaries	Performance Rate %
Lam Dong	Da Lat	13,376	15,276	1	120	0.8
	Cat Tien	20,627	23,543	-	-	0.0
	Da Teh	26,245	29,955	74	8,880	29.6
	Da Huoi	14,406	16,443	62	7,440	45.2
	Bao Lam	98,916	112,900	20	2,400	2.1
	Di Linh	63,601	72,593	76	9,120	12.6
	Duc Trong	74,088	84,562	100	12,000	14.2
	Don Duong	49,117	56,061	80	9,600	17.1
	Lac Duong	17,974	20,515	23	2,760	13.5
	Lam Ha	42,279	<u>48,256</u>	<u>128</u>	<u>15,360</u>	<u>31.8</u>
			480,095	564	67,680	14.1
Ninh Thuan	P.Rang-T.Cham	59,526	67,942	571	68,520	100.0
	Ninh Son	61,889	70,639	369	44,280	62.7
	Ninh Hai	76,329	87,120	346	41,520	47.7
	Ninh Phuoc	120,114	<u>137,095</u>	<u>673</u>	<u>80,760</u>	<u>58.9</u>
				1,959	235,080	64.8
Binh Thuan	Phan Thiet	36,363	41,504	490	58,800	100.0
	Ham Tan	84,106	95,997	257	30,840	32.1
	Ham Thuan Nam	62,434	71,261	441	52,920	74.3
	Tanh Linh	65,489	74,748	313	37,560	50.2
	Duc Linh	86,740	99,003	249	29,880	30.2
	Ham Thuan Bac	109,455	124,929	649	77,880	62.3
	Bac Binh	87,714	100,115	603	72,360	72.3
	Tuy Phong	45,635	52,087	350	42,000	80.6
	Phu Quy	14,000	<u>15,979</u>	<u>58</u>	<u>6,960</u>	<u>43.6</u>
			3,410	409,200	60.6	
Ba Ria-Vung Tau	Ba Ria-Vung Tau	219,427	250,449	38	25,560	10.2
	Tan Thanh			173		
	Chau Duc			2		
	Long Dat	77,370	88,308	300	36,000	40.8
	Xuyen Moc	87,063	<u>99,372</u>	<u>142</u>	<u>17,040</u>	<u>17.1</u>
			438,129	655	78,600	17.9

Table 6.16 Performance of Rural Water Supply in the Study Area (3/3)

Province	District	Population in Rural Area		Number of Water Sources	Number of Beneficiaries	Performance Rate %
		1989	1994			
Dong Nai	Bien Hoa	39,937	45,583	42	5,040	11.0
	Long Thanh	225,786	257,707	250	30,000	11.6
	Thong Nhat	252,000	287,627	11	1,320	0.5
	Xuan Loc	317,572	362,470	11	2,520	0.7
	Long Khanh			10		
	Vinh An	51,082	58,304	4	480	0.8
	Tan Phu	246,622	281,489	4	960	0.3
	Dinh Quan			4		
			<u>1,293,180</u>	<u>332</u>	<u>40,320</u>	<u>3.1</u>
Ho Chi Mi	District 8			52		
	District 11			5		
	Binh Thanh			24		
	Tan Binh			133		
	Go Vap			128		
	Cu Chi			784		
	Hoc Mon			1,011		
	Binh Chanh			728		
	Nha Be			189		
	Thu Duc			789		
Can Gio			<u>106</u>			
		<u>1,128,256</u>	<u>1,287,766</u>	<u>3,949</u>	<u>473,880</u>	<u>36.8</u>
Long An	Can Duoc	59,795	68,249	157	18,840	27.6
	Tan Tru	27,194	31,039	153	18,360	59.2
	Can Giuoc	59,795	68,249	105	12,600	18.5
	Ben Luc	35,722	40,722	274	32,880	80.7
	Duc Hoa	48,043	54,835	2,444	293,280	100.0
	Duc Hue	23,556	26,886	233	27,960	100.0
	Thu Thua	21,328	<u>24,343</u>	98	<u>11,760</u>	<u>48.3</u>
			<u>3,464</u>	<u>415,680</u>	<u>100.0</u>	
Total in the Study Area			<u>6,718,451</u>	<u>15,448</u>	<u>1,853,760</u>	<u>27.6</u>

Table 6.17 Communes Requiring Rural Water Supply (RWS) Projects Urgently (1/7)

District	Commune	Population in 1994	Population in 2015	Number of water sources	Number of beneficiaries with RWS ¹⁾	Number of people requiring RWS	Number of RWS projects needed
Tay Ninh Province							
Duong Minh Chau	Phan	5,828	9,007	0	0	9,007	6
Chau Thanh	Hao Duoc	15,958	24,664	0	0	24,664	16
Trang Bang	An Hoa	18,455	28,523	0	0	28,523	19
	Don Thuan	13,165	20,347	0	0	20,347	14
	Gia Loc	15,426	23,842	0	0	23,842	16
	Gia Binh	9,728	15,035	0	0	15,035	10
	Loc Hung	16,269	25,145	0	0	25,145	17
Tan Chau	An Tinh	16,831	26,013	0	0	26,013	17
	Tan Ha	3,616	5,589	0	0	5,589	4
							119
Song Be Province							
Bu Dang	Duc Lieu	4,750	7,341	0	0	7,341	5
	Tho Son	3,850	5,950	0	0	5,950	4
	Nghia Trung	6,493	10,035	0	0	10,035	7
Loc Ninh	Thien Hung	7,938	12,269	0	0	12,269	8
	Thanh Hoa	7,557	11,680	0	0	11,680	8
	Loc Hiep	6,094	9,419	0	0	9,419	6
	Loc Quang	4,203	6,496	0	0	6,496	4
Phuoc Long	Long Tan	4,734	7,317	0	0	7,317	5
	Binh Phuoc	12,082	18,673	0	0	18,673	12
	Phuoc Tinh	6,869	10,616	0	0	10,616	7
	Long Hoa	12,083	18,675	0	0	18,675	12
							78
Dac Lac Province							
Dac Nong	Gia Nghia ³⁾	7,621	11,779	0	0	11,779	8
	Dak Rung	1,685	2,604	0	0	2,604	2
	Quang Son	1,698	2,624	0	0	2,624	2
	Quang Thanh	1,943	3,003	0	0	3,003	2

- Notes: 1) The number of beneficiaries for the rural water supply projects carried out by UNICEF's programme is 120 persons per water source except for 200 persons/water source for Long An province.
- 2) The number of beneficiaries for the rural water supply projects with a small distribution proposed in this study is 1,500 persons/project.
- 3) For Gia Nghia which is the district town of Dac Nong, Dac Lac province, population only in the rural area is given.

Table 6.17 Communes Requiring Rural Water Supply (RWS) Projects Urgently (2/7)

District	Commune	Population in 1994	Population in 2015	Number of water sources	Number of beneficiaries with RWS	Number of people requiring RWS	Number of RWS projects needed	
Dak R'Lap	Quang Khe	1,987	3,071	0	0	3,071	2	
	Dac B Lao	1,505	2,326	0	0	2,326	2	
	Dak Nia	1,498	2,315	0	0	2,315	2	
	Truong Xuan	1,615	2,496	0	0	2,496	2	
	Dac R Mang ⁴⁾	1,042	1,610	1	1,500	110	0	
	Dac Ha	630	974	0	0	974	1	
	Kien Duc	4,322	6,680	8	960	5,720	4	
	Quang Truc	1,158	1,790	0	0	1,790	1	
	Quang Tin	2,491	3,850	0	0	3,850	3	
	Quang Tan	2,304	3,561	0	0	3,561	2	
	Nhan Co	3,501	5,411	0	0	5,411	4	
	Dak Tit	2,500	3,864	12	1,440	2,424	2	
	Dao Nghia	3,984	6,157	0	0	6,157	4	
Dak Sin	1,569	2,425	0	0	2,425	2		
Dac Buk So	1,195	1,847	0	0	1,847	1		
							46	
5)								
<u>Lam Dong Province</u>								
Da Huoai	Da Ploa	2,491	3,850	3	360	3,490	2	
	Da Ton	1,220	1,886	1	120	1,766	1	
	Madagui	2,895	4,474	3	360	4,114	3	
	Madaqui town	6,483	10,020	8	960	9,060	6	
	Da Oai	3,543	5,476	4	480	4,996	3	
	Da M'Ri town	3,186	4,924	4	480	4,444	3	
	Da M'Ri	830	1,283	1	120	1,163	1	
	Ha Lam	3,215	4,969	4	480	4,489	3	
	Da Te	Da Lay	2,749	4,249	2	240	4,009	3
		Huong Lam	1,795	2,774	1	120	2,654	2
An Nhon		3,297	5,096	3	360	4,736	3	
Da Teh town		12,804	19,789	10	1,200	18,589	12	

Notes: 4) A rural water supply project with a small distribution system is implemented for the whole area of Dac R Mang.

5) The performance rate of rural water supply projects in Lam Dong province is given in percentage by district, so the number of water sources is assumed to be proportional to the number of people in communes.

Table 6.17 Communes Requiring Rural Water Supply (RWS) Projects Urgently (4/7)

District	Commune	Population in 1994	Population in 2015	Number of water sources	Number of beneficiaries with RWS	Number of people requiring RWS	Number of RWS projects needed
Binh Thuan Province 6)							
Tuy Phong	Chi Cong	13,739	21,234	23	2,739	18,495	12
	Hoa Minh	4,450	6,878	4	450	6,428	4
	Hoa Phu	4,280	6,615	2	280	6,335	4
Bac Binh	Binh Tan	5,394	8,337	3	394	7,943	5
	Song Luy	9,430	14,575	12	1,430	13,145	9
	Phan Hoa	5,780	8,933	7	780	8,153	5
	Hong Thai	9,896	15,295	16	1,896	13,399	9
Ham Thuan Bac	Luong Son	10,982	16,973	33	3,982	12,991	9
	Hong Son	8,977	13,874	4	477	13,397	9
	Ham Chinh	9,651	14,916	18	2,151	12,765	9
	Thuan Minh	4,620	7,140	1	120	7,020	5
	Ham Tri	6,332	9,786	7	832	8,954	6
	Ham Phu	9,203	14,224	2	203	14,021	9
Ham Thuan Nam	Thuan Hoa	3,794	5,864	2	294	5,570	4
	Ham My	11,790	18,222	22	2,590	15,632	10
	Muong Man	5,526	8,541	9	1,126	7,415	5
	Ham Cuong	6,181	9,553	5	581	8,972	6
	Ham Kiem	6,009	9,287	7	809	8,478	6
Ham Tan	Tan Lap	14,163	21,890	35	4,163	17,727	12
	Tan Ha	5,294	8,182	6	694	7,488	5
	Tan Nghia	12,883	19,911	27	3,283	16,628	11
	Song My	7,603	11,751	3	403	11,348	8
	Tan Thang	9,470	14,636	4	470	14,166	9
	Tan Minh	9,329	14,418	6	729	13,689	9
	Tan Hai	13,989	21,621	17	1,989	19,632	13
							193

Notes: 6) The number of people requiring rural water supply projects in 1994 is given as the information from Binh Thuan province, so the number of water sources and beneficiaries is reversely estimated as the balance between population in 1994 and the number of people requiring rural water supply.

Table 6.17 Communes Requiring Rural Water Supply (RWS) Projects Urgently (5/7)

District	Commune	Population in 1994	Population in 2015	Number of water sources	Number of beneficiaries with RWS	Number of people requiring RWS	Number of RWS projects needed
Ba Ria-Vung Tau Province							
Tan Thanh	Hac Dinh	8,547	13,210	0	0	13,210	9
	Song Xoai	4,498	6,952	0	0	6,952	5
	Chau Pha	7,553	11,674	0	0	11,674	8
	Toc Tien	2,324	3,592	0	0	3,592	2
Chau Duc	Binh Be	8,742	13,511	0	0	13,511	9
	Suoi Nghe	12,147	18,774	0	0	18,774	13
	Xuan Son	16,967	26,223	0	0	26,223	17
	Binh Gia	14,118	21,820	0	0	21,820	15
	Quang Thanh	8,206	12,683	0	0	12,683	8
	Nghia Thanh	10,594	16,374	0	0	16,374	11
	Ngai Giao	16,846	26,036	0	0	26,036	17
	Long Dat	Long Hai	26,761	41,361	0	0	41,361
Long Dat	Phuoc Thanh	6,886	10,643	0	0	10,643	7
	Phuoc Long Tho	13,410	20,726	0	0	20,726	14
	Phuoc Tinh	18,446	28,509	0	0	28,509	19
Xuyen Moc	Bau Lam	12,128	18,744	0	0	18,744	12
	Hoa Binh	12,485	19,296	0	0	19,296	13
	Phuoc Tan	14,847	22,947	0	0	22,947	15
	Hoa Hoi	9,835	15,201	0	0	15,201	10
	Hoa Hiep	6,755	10,440	0	0	10,440	7
							239
Dong Nai Province							
Tan Phu	Phu Binh	9,054	13,993	2	240	13,753	9
	Phu Thinh	7,268	11,233	2	240	10,993	7
	Phu Loc	9,068	14,015	0	0	14,015	9
	Phu Thanh	10,964	16,945	0	0	16,945	11
	Phu Lap	7,256	11,215	0	0	11,215	7
	Tai Lai	7,361	11,377	0	0	11,377	8
	Phu Lam	14,062	21,734	0	0	21,734	14
	Phu Dien	8,952	13,836	0	0	13,836	9
	Nam Cat Tien	6,182	9,555	0	0	9,555	6
	Nui Tuong	5,226	8,077	0	0	8,077	5

Table 6.17 Communes Requiring Rural Water Supply (RWS) Projects Urgently (6/7)

District	Commune	Population in 1994	Population in 2015	Number of water sources	Number of beneficiaries with RWS	Number of people requiring RWS	Number of RWS projects needed
Dinh Cuan	Phu Tuc	12,265	18,956	2	240	18,716	12
	Tuc Trung	8,927	13,797	2	240	13,557	9
	Suoi Nho	10,068	15,561	0	0	15,561	10
	Phu Ngoc	15,104	23,344	0	0	23,344	16
	La Nga	10,986	16,979	0	0	16,979	11
	Thanh Son	20,118	31,093	0	0	31,093	21
	Gia Canh	13,616	21,044	0	0	21,044	14
	Phu Loi	11,398	17,616	0	0	17,616	12
							190
<u>Long An Province</u>							
Tan Tru	An Nhut Tan	5,510	8,516	1	200	8,316	6
	Binh Trinh Dong	5,571	8,610	1	200	8,410	6
	Tan Phuoc Tay	5,945	9,188	1	200	8,988	6
	Nhut Ninh	6,878	10,630	4	800	9,830	7
	My Binh	3,420	5,286	3	600	4,686	3
Can Duoc	Long Dinh	9,429	14,573	0	0	14,573	10
	Long Son	8,157	12,607	0	0	12,607	8
	Phuoc Tuy	8,060	12,457	0	0	12,457	8
	Tan Trach	10,019	15,485	0	0	15,485	10
	Long Cang	5,049	7,803	0	0	7,803	5
Can Giuoc	Phuoc Vinh Tay	7,572	11,703	0	0	11,703	8
	Tan Tap	12,447	19,237	0	0	19,237	13
	Vinh Dong	6,275	9,698	0	0	9,698	6
	Long Thuong	7,408	11,449	0	0	11,449	8
	Phuoc Lai	9,569	14,789	1	200	14,589	10
Thu Thua	Long Thanh	3,229	4,991	0	0	4,991	3
	Long Thuan	3,999	6,181	0	0	6,181	4
	Tan Thanh	4,376	6,763	0	0	6,763	5
	My Lac	6,544	10,114	0	0	10,114	7
	My An	6,631	10,249	0	0	10,249	7

Table 6.17 Communes Requiring Rural Water Supply (RWS) Projects Urgently (7/7)

District	Commune	Population in 1994	Population in 2015	Number of water sources	Number of beneficiaries with RWS	Number of people requiring RWS	Number of RWS projects needed
Ben Luc	Thanh Hoa	4,161	6,431	0	0	6,431	4
	Luong Hoa	8,458	13,072	1	200	12,872	9
	Long Hiep	11,263	17,408	2	400	17,008	11
	Thanh Loi	6,767	10,459	2	400	10,059	7
	Binh Duc	4,661	7,204	2	400	6,804	5
Duc Hue	My Thanh Bac	7,501	11,593	0	0	11,593	8
	Binh Hoa Nam	5,855	9,049	0	0	9,049	6
	Binh Hoa Hung ⁷⁾						
	Binh Hoa Bac	7,902	12,213	1	200	12,013	8
	Binh Thanh	4,065	6,283	1	200	6,083	4
							202
Grand Total							1,207

Notes: 7) A new village

Table 7.1 Summary of Calculated Peak Discharge

Location	Case	Calculated Peak Discharge (m ³ /s)					
		100-yr	50-yr	20-yr	10-yr	5-yr	2-yr
Cat Tien/ Dong Nai R.	Basic discharge	6,590	5,810	4,789	4,022	3,256	2,202
	With 4 reservoirs	6,590	5,810	4,789	4,022	3,256	2,202
	With 7 reservoirs	4,499	3,814	3,201	2,237	2,269	1,621
Ta Lai/ Dong Nai R.	Basic discharge	6,558	5,843	4,904	4,198	3,495	2,529
	With 4 reservoirs	6,558	5,843	4,904	4,198	3,495	2,529
	With 7 reservoirs	5,136	4,448	3,800	3,308	2,814	2,129
Ta Pao/ La Nga R.	Basic discharge	2,100	1,890	1,614	1,406	1,196	896
	With 4 reservoirs	1,551	1,390	1,186	1,034	899	708
	With 7 reservoirs	1,551	1,390	1,186	1,034	899	708
Phu Dien/ La Nga R.	Basic discharge	1,235	1,130	995	893	792	659
	With 4 reservoirs	1,167	1,075	955	864	775	650
	With 7 reservoirs	1,175	1,075	955	864	775	650
Tri An/ Dong Nai R.	Basic discharge	8,265	7,494	6,459	5,662	4,844	3,915
	With 4 reservoirs	6,257	5,649	4,943	4,427	3,890	3,144
	With 7 reservoirs	5,938	5,284	4,666	4,199	3,717	3,046
Phuoc Hoa/ Be R.	Basic discharge	3,230	3,002	2,691	2,446	2,189	1,805
	With 4 reservoirs	2,388	2,209	1,976	1,801	1,624	1,370
	With 7 reservoirs	1,894	1,778	1,623	1,503	1,378	1,194
Be R. at Dong Nai R. jct.	Basic discharge	3,173	2,941	2,630	2,391	2,146	1,810
	With 4 reservoirs	2,483	2,319	2,116	1,959	1,795	1,551
	With 7 reservoirs	2,200	2,078	1,907	1,774	1,637	1,437
Dong Nai R. at Saigon R. jct.	Basic discharge	10,784	9,871	8,635	7,673	6,688	5,411
	With 4 reservoirs	8,980	8,187	7,284	6,586	5,858	4,843
	With 7 reservoirs	8,266	7,501	6,712	6,095	5,478	4,580
Dau Tieng/ Saigon R.	Basic discharge	3,197	2,828	2,351	1,997	1,645	1,151
	With 4 reservoirs	556	514	459	416	373	309
	With 7 reservoirs	556	514	459	416	373	309
Thu Dau Mot/ Saigon R.	Basic discharge	2,200	1,954	1,667	1,466	1,254	937
	With 4 reservoirs	1,227	1,099	930	803	675	495
	With 7 reservoirs	1,227	1,099	930	803	675	495
Saigon R. at Dong Nai R. jct.	Basic discharge	2,274	2,029	1,706	1,461	1,223	929
	With 4 reservoirs	1,147	1,029	872	754	635	486
	With 7 reservoirs	1,147	1,029	872	754	635	486

Remarks:

- 1) Basic discharge: With no dam
- 2) With 4 dams: Including existing Dau Tieng, Tri An and Thac Mo dams, and Ham Thuan dam under construction.
- 3) With 7 dams: Including proposed Dong Nai No.3, No.4, and Fu Mieng dams in addition to the above 4 dams.

Table 8.1 Screening of Candidates Schemes for Irrigation Master Plan Projects

Code	Schemes Classification		Identified Irrigation Schemes		Factors for Screening					Formulation and Area of Candidate M/P Projects				
	Main	Sub	Name of Scheme	Area (ha)	Source of Irrigation Water	Availability of Water Resource	Maturity of Planning	Social Impact	Natural Environ. Impact	Economic Viability	Formulation	Area (ha)		
A	Existing Irrigation Schemes (excluding Minor Existing Irrigation Schemes [smaller than 100 ha], 339 schemes with 34,033 ha in total)	A.1 Large and Medium Irrigation Schemes (Area larger than 2,000 ha)	- Vo Xu	5,000	D	F	C (for rehabili.)	P	S+, G+, H+ & C+	-	Included in Ta Pao Irr. Scheme Rehabilitated independently			
			- Phan Rang	12,800	S + DV	F	A (for rehabili.)	P	S+, G+, H+ & C+	H				
			- Song Pha	4,710	S + DV	F	C (for rehabili.)	P	S+, G+, H+ & C+	M				
			- Dai Don	2,700	D	F	C (for rehabili.)	P	S+, G+, H+ & C+					
			- Tuyen Lam/Quan Hiep	2,832	D	F	C (for rehabili.)	P	S+, G+, H+ & C+					
			- Phuoc Chi	2,260	S	F	C (for rehabili.)	P	S+, G+, H+ & C+					
		A.2 Small Irrigation Schemes (Area larger than 100 ha and less than 2,000 ha)	161 schemes including 2 - Tay Ninh Riparian Schemes (1,000 ha in total)	59,953	D + S + DV	A & P	C (for rehabili.)	P & J	S+, G+, H+ & C+	M	Formulated as Rural Agricultural Development Project (RADP) Including Tay Ninh Riparian Schemes, comprising of: (1) Small Existing Irr. Schemes Including Dai Dong, Tuyen Lam/Quan Hiep and Phuoc Chi schemes (164 schemes) (2) New Small Irr. Scheme (65 schemes)	67,745		
A.3 New Small Irrigation Schemes	65 schemes including 12 - Tay Ninh Riparian Schemes (21,870 ha in total)	61,242	D + S + DV	A & P	C (for rehabili.)	P & J	S+, G+, H+ & C+		61,242					
(Total : Initially screened 231 schemes) (128,987)														
B	On-going and Planned Irrigation Schemes		- Dau Tieng Existing	45,000	D	F	In operation	P & J	G+	-	In operation			
			- Dau Tieng Extension	48,390	D	A	B	P & J	G+	H	Selected as candidate M/P project	48,390		
			- Phuoc Hoa	45,680	D	F	B	P & J	S+ & H+	M	Selected as candidate M/P project	45,680		
			- Hoc Mon - Bac Binh Chan	12,197	D	F	In implement.	P & J	H+ & C-	H	In implementation			
			- Song Quao	8,000	S + DV	F	In implement.	P & J	H+	-	In implementation			
C	Potential Irrigation Schemes	C.1 Potential Irrigation Schemes in HCMC - Long An Delta (including on-going Hoc Mon - Bac Binh Chan Irrigation Scheme of 12,197 ha)	- HCMC	46,000	D	A	C	P & J	H+ & C-	M	Selected as candidate M/P project	46,000		
			- Long An	54,000	D	A	B	P & J	H+ & C-	M	Selected as candidate M/P project	54,000		
		(Total) (100,000)												
		C.2 Potential Schemes in East Coast expecting water resources diverted from Dong Nai river basin (including existing irrigation schemes with 18,928 ha in total)	- Phan Ri	29,700	S + DV	A	B	P, J & T		S+, H+ & C+	H	Formulated as Phan Ri - Phan Thiet Irrigation Project, comprising (1) Phan Ri Irrigation Scheme (2) Phan Thiet Irrigation Scheme (excluding on-going Song Quao Irr. Scheme 8,000 ha)	29,700	
			- Phan Thiet	24,400	S + DV	A	B	P & J		S+, H+ & C+	H (18,000 ha in Quao river basin) L (6,400 ha in Ca Ty river basin)	10,000		
		(Total) (39,700)												
		C.3 Potential Schemes in La Nga River and other basins (including existing irrigation schemes with 24,660 ha in total)	- Ham Tan	8,000	S + DV	P	B	P & J		S+, H+ & C+	L	Omitted from candidate M/P project		
			- Lower La Nga	38,000	D	F	B	P & J		H+	H (Ta Pao Scheme) M (Vo Dat Scheme)	Selected as M/P project, comprising (1) Ta Pao Irrigation Scheme (2) Vo Dat Irrigation Scheme	23,000	
			(Total) (38,000)											
			- Phan Rang Extension	15,400	S	P	C	P & J		S+, H+ & C+	L	Omitted from candidate M/P project		
			- Tuy Phong	4,200	S	A	C	P & J		S+, H+ & C+	L	Omitted from candidate M/P project		
			- Song Phang	5,030	S	P	C	P & J		S+, H+ & C+	L	Omitted from candidate M/P project		
			- Song Ray	13,710	S	P	B	P & J		S+, H+ & C+	M	Omitted from candidate M/P project		
- Song Dinh	4,740	S	P	B	P & J		S+, H+ & C+	M	Omitted from candidate M/P project					
Abbreviation of Screening Factors					D: Dong Nai River Basin	F: Fully available	A: F/S by Ministry	P: Poverty alleviation	+: Positive	H: High				
				DV: Diversion from Dong Nai River Basin (including Possibility)	A: Available subject to water resources development	B: Pre-F/S by Ministry	J: Job opportunity	T: Transmigration	-: Negative	M: Marginal				
				S: Surrounding Basin	P: Poor or insufficient	C: Preliminary Study by Province			T: Topography	L: Low				
									S: Soil erosion					
									G: Groundwater					
									H: Hydro. situation					
									C: Coastal zone					
									F: Flora & fauna					

Table S.2 Irrigation Water Requirement

Site Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Site 6 Phuoc Hoa	0.62	0.87	0.57	0.57	0.92	0.19	0.19	0.29	0.24	0.16	0.37	0.47
Site 7 Dau Tieng (Extension)	0.79	0.97	0.73	0.24	0.68	0.36	0.21	0.29	0.45	0.48	0.19	0.45
Site 8 Phan Ri	0.78	1.18	0.78	0.48	0.62	0.66	0.62	0.1	0.3	0.69	1.09	0.79
Site 9 Phan Thiet	0.78	1.18	0.78	0.48	0.62	0.66	0.62	0.1	0.3	0.69	1.09	0.79
Site 10 Ta Pao	1.28	1.07	1.14	1.12	0.31	0	0.03	0.04	0.04	0.06	0.57	0.97
Site 11 Vo Dat	1.21	1.02	1.06	1.03	0.29	0	0.03	0.04	0.04	0.05	0.46	0.79
Site 12 Dau Tieng (Existing)	0.79	0.97	0.73	0.24	0.68	0.36	0.21	0.29	0.45	0.48	0.19	0.45
Site 13 Tay Ninh Upper	0.79	0.97	0.73	0.24	0.68	0.36	0.36	0.21	0.29	0.45	0.48	0.19
Site 14 Tay Ninh Lower	0.79	0.97	0.73	0.24	0.68	0.36	0.36	0.21	0.29	0.45	0.48	0.19
Site 15 Dong Nai Riparian*	0.61	0.72	0.38	0.25	1.19	0.43	0.49	0.11	0.06	0.12	0.23	0.92
Site 16 Long An Delta	0.89	1.09	1.16	0.96	0.29	0.02	0.28	0.69	0.19	0.17	0.69	0.79
Site 17 HCMC	0.89	1.09	1.16	0.96	0.29	0.02	0.28	0.69	0.19	0.17	0.69	0.79

* existing irrigation scheme

(Unit: m³/sec/1,000 ha)

Table 8.3 Optimal Solution Obtained from the Model

Item	Optimum Output	Max Irrigable Area
Net Benefit	492	
Generated Energy		
Dai Ninh	1,128	
Tri An	1,245	
Fu Mieng	329	
Irrigation Development		
Phuoc Hoa	45,680	(45,680)
Dau Tieng (Extension)	48,390	(48,390)
Phan Ri	29,700	(29,700)
Phan Thiet	10,000	(10,000)
Ta Pao	19,000	(23,000)
Vo Dat	12,617	(15,000)
Dau Tieng (Exisitng)	45,000	(45,000)
Tay Ninh Upper	10,825	(15,100)
Tay Ninh Lower	14,300	(14,300)
Dong Nai Riparian	23,400	(23,400)
Long An Delta	31,170	(54,000)
HCMC	46,000	(46,000)
Reservoirs		
Dai Ninh	Alternative (Alt) 1 (Storage capacity: 252 milli	
Dong Nai 3	*	
Dong Nai 4	*	
Fu Mieng	Alt 1 (Storage capacity:460 million m ³)	
Song Luy	Alt 7 (Storage capacity:150 million m ³)	

Note: Irrigation areas in the parentheses show the maximum potential area.

*: In this model, the 4-year drought flow is applied and consequently the p project is underestimated. The project is eventually selected as one of t projects based on the generation expansion planning study (refer to App Hydropower Generation).

Table 8.4 Master Plan Projects in the Study Area

Project	Scale	Remarks
<u>Rural Development</u>		
Small irrigation schemes	229 schemes	- 164 for rehabilitation and 65 for new construction
Rural water supply	1,207 schemes	
<u>Hydropower Projects</u>		
	475 MW	
Dong Nai No. 3	180 MW*	
Dong Nai No. 4	240 MW*	- Combined develop with Dong Nai No. 3
<u>Reservoir Projects</u>		
Be-Saigon Diversion Project (in case of Fu Mieng Multipurpose) Reservoir	55 MW*	- With a diversion channel on Dau Tieng
<u>Irrigation Projects</u>		
	242,560 ha	
	150 Mill. m ³	
Phuoc Hoa	45,680 ha	- Pump-up scheme
Dau Tieng Extension	48,390 ha	- Supplemented to Dau Tieng I
Phan Ri	29,700 ha	- Song Luy reservoir
Phan Thiet	10,000 ha	- Song Luy reservoir
Ta Pao	19,000 ha	
Vo Dat	12,620 ha	
HCMC-Long An Delta	77,170 ha	- LA Delta and Hoc Mon- North Binh Chanh
<u>Water Supply Projects</u>		
Area along National Highway No. 51	1.7 Mill. m ³ /day in demand	Domestic and industrial uses

Note*: In the optimal water allocation study in Phase II, the power output of Dong Nai No. 3, No. 4 and Fu Mieng were assumed to be 130 MW, 318 MW and 60 MW. However, the figures are eventually modified based on the results of the topographic survey and the optimization study carried out in Phase III.

Table 9.1 Principal Feature of Hydropower Master Plan Projects

Description	Unit	Dong Nai No.3	Dong Nai No.4	Combined Total	Fu Mieng (Multi-purpose)
1. Hydrology					
Catchment Area	km ²	2,428 *1)	2,597 *1)	-	4,110
Mean Inflow	m ³ /s	56.8 *1)	62.7 *1)	-	168.8
Maximum Flood	m ³ /s	9,400	9,550	-	6,200
		*1) excluding catchment of Da Nhim and Dai Ninh Projects			
2. Reservoir					
Surface Area at HWL	km ²	40	6	46	70
HWL	m	570	440	-	77
LWL	m	540	430 *2)	-	69
Active Capacity	mil.m ³	899	47 *2)	946	462
Firm Discharge	m ³ /s	47.5	50.3 *2)	-	55.0
3. Major Structures					
3-1 Dam					
Type	-	Rockfill	Rockfill	-	Earthfill
Crest Length	m	690	290	-	2,820
Height	m	84	102	-	35
Volume	1,000m ³	4,280	2,700	6,980	3,430
3-2 Waterway					
Number of Tunnel	-	2	2	-	-
Tunnel Length	m	5,030	5,650	10,680	-
3-3 Diversion Canal					
Canal Capacity	m ³ /s	-	-	-	60
Canal Length	m	-	-	-	7,200
3-4 Power Plant					
Tail Water Level	m	440	287	-	45
Plant Discharge	m ³ /s	190	201 *2)	-	220
Effective Head	m	112	141	254	28
Installed Capacity	MW	180	240 *2)	420	55
Number of Unit	-	2	2	-	2
4. Energy Generation					
Annual Firm Energy	GWh	377	506 *2)	883	111
Annual Secondary Energy	GWh	80	121 *2)	201	85
Annual Total Energy	GWh	457	627 *2)	1084	196
Add. Firm E at Tri An	GWh	-	-	147	0
Add. Secondary E at Tri An	GWh	-	-	-126	0
Total Firm Energy	GWh	-	-	1030	111
Total Secondary Energy	GWh	-	-	75	85
5. Project Cost					
Preparatory Works	mil.US\$	11.0	10.0 *2)	21.0	5.7
Civil Work	mil.US\$	307.6	237.8 *2)	545.4	150.9
Hydro-Mechanical Work	mil.US\$	24.5	27.5 *2)	52.0	14.8
Electro-Mechanical Work	mil.US\$	40.9	47.4 *2)	88.3	28.2
Indirect Cost including Contingency	mil.US\$	106.2	75.4 *2)	181.6	86.0
Total Project Cost	mil.US\$	490.2	398.1	888.3	285.6
		*2) under the condition of "with Dong Nai No.3 Project"			

Table 9.2 Total Project Cost of Dong Nai No. 3 (1/2)

Work Item	Unit	Unit Price	Dong Nai 3	
			Work Quantity	Amount (000 \$)
(A) Direct Cost				383,990
[A1] Preparatory Works				10,948
Access Road	km	100,000	15	1,500
Power supply	km	14,600	15	219
Others	ls	-	1	9,229
[A2] Civil Work				307,649
1 Reservoir				188,972
1-1 Care of River				2,235
1-2 Diversion Tunnel				59,723
Common excavation	m ³	5.5	8,200	45
Rock excavation	m ³	16.0	12,200	195
Tunnel excavation	m ³	72.0	238,000	17,136
Lining concrete	m ³	150.0	75,600	11,340
Plug concrete	m ³	167.0	162,400	27,121
Reinforcement-bar	ton	690.0	1,510	1,042
Others	ls	-	1	2,844
1-3 Dam				74,513
Common excavation	m ³	5.5	1,371,000	7,541
Rock excavation	m ³	16.0	343,000	5,488
Embankment core	m ³	9.4	642,000	6,035
Embankment filter	m ³	29.5	214,000	6,313
Embankment rock	m ³	10.9	3,424,000	37,322
Wall Concrete	m ³	100.0	20,300	2,030
Reinforcement-bar	ton	650.0	100	65
Grouting & others	ls	-	1	9,719
1-4 Spillway				40,751
Common excavation	m ³	5.5	865,000	4,758
Rock excavation	m ³	16.0	741,000	11,856
Structure concrete	m ³	142.0	131,800	18,716
Reinforcement-bar	ton	650.0	2,640	1,716
Others	ls	-	1	3,705
1-5 Miscellaneous Works				11,750
ls			1	11,750
2 Power Waterway and Power Plant				118,677
2-1 Power Intake				13,614
Common excavation	m ³	5.5	54,600	300
Rock excavation	m ³	16.0	105,100	1,682
Shaft excavation	m ³	53.0	3,700	196
Shaft lining concrete	m ³	153.0	1,000	153
Structure concrete	m ³	142.0	56,700	8,051
Canal lining concrete	m ³	142.0	5,500	781
Reinforcement bar	ton	670.0	1,810	1,213
Others	ls	-	1	1,238
2-2 Headrace Tunnel				61,686
Tunnel excavation	m ³	67.0	428,900	28,736
Tnl. Lining concrete	m ³	132.0	115,300	15,220
Reinforcement bar	ton	690.0	3,460	2,387
Work Adit	m	6,490.0	1,500	9,735
Grouting & others	ls	-	1	5,608
2-3 Surgetank				4,607
Common excavation	m ³	5.5	28,000	154
Rock excavation	m ³	16.0	19,000	304
Shaft excavation	m ³	53.0	13,800	731
Open excavation	m ³	142.0	13,000	1,845
Shaft lining concrete	m ³	153.0	4,600	704
Reinforcement bar	ton	690.0	650	449
Others	ls	-	1	419

Table 9.2 Total Project Cost of Dong Nai No. 3 (2/2)

Work Item	Unit	Unit Price	Dong Nai 3	
			Work Quantity	Amount (,000 \$)
2-4 Penstock				3,402
Tunnel excavation	m ³	79.0	13,500	1,067
Shaft excavation	m ³	99.0	4,500	446
Backfill concrete	m ³	120.0	12,300	1,476
Reinforcement bar	ton	690.0	150	104
Others	ls	-	1	309
2-5 Power Outlet				223
Common excavation	m ³	5.5	1,600	9
Rock excavation	m ³	16.0	6,400	102
Lining concrete	m ³	142.0	600	85
Reinforcement bar	ton	650.0	10	7
Others	ls	-	1	20
2-6 Powerhouse & Switchyard				24,356
Common excavation	m ³	5.5	52,000	286
Rock excavation	m ³	16.0	208,100	3,330
Powerhouse concrete	m ³	156.0	15,900	2,480
Slope protection conc.	m ³	142.0	109,200	15,506
Reinforcement bar	ton	650.0	830	540
Others	ls	-	1	2,214
2-7 Miscellaneous Works	ls	-	1	10,789
[A3] Hydraulic Equipment and Metal Work				24,503
1. Reservoir				11,330
Spillway Gate	ton	10,000.0	1,030	10,300
Others	ls	-	1	1,030
2. Power Waterway				13,173
Intake gate	ton	10,000.0	200	2,000
Trashrack / screen	ton	7,000.0	140	980
Penstock steel	ton	6,500.0	1,230	7,995
Draft gate	ton	10,000.0	100	1,000
Others	ls	-	1	1,198
[A4] Electro-mechanical Equipment and Transmission Line				40,890
1. Powerhouse and Switchyard				38,090
Turbine	ls	-	1	17,140
Generator	ls	-	1	15,240
Transformer	ls	-	1	1,900
Others	ls	-	1	3,810
2. Transmission Line	km	140,000	20	2,800
[B] Indirect Cost				106,235
[B1] Compensation Cost				23,270
Reservoir inundation	km ²	400,000	55	22,160
Power Waterway / Plant	ls	-	1	1,110
[B2] Administration Cost	ls	-	1	7,680
[B3] Engineering Fee	ls	-	1	30,719
[B4] Physical Contingency	ls	-	1	44,566
[C] Total Construction Cost				490,225

Table 9.3 Total Project Cost of Dong Nai No. 4 (1/2)

Work Item	Unit	Unit Price	Dong Nai 4	
			Work Quantity	Amount (,000 \$)
[A] Direct Cost				322,686
[A1] Preparatory Works				9,993
Access Road	km	100,000	25	2,500
Power supply	km	14,600	25	365
Others	ls	-	1	7,133
[A2] Civil Work				237,767
1 Reservoir				114,820
1-1 Care of River				1,364
1-2 Diversion Tunnel				33,995
Common excavation	m ³	5.5	8,300	46
Rock excavation	m ³	16.0	12,500	200
Tunnel excavation	m ³	72.0	135,000	9,720
Lining concrete	m ³	150.0	42,500	6,375
Plug concrete	m ³	167.0	92,500	15,448
Reinforcement-bar	ton	690.0	850	587
Others	ls	-	1	1,619
1-3 Dam				45,473
Common excavation	m ³	5.5	864,000	4,752
Rock excavation	m ³	16.0	216,000	3,456
Embankment core	m ³	9.4	405,000	3,807
Embankment filter	m ³	29.5	135,000	3,983
Embankment rock	m ³	10.9	2,160,000	23,544
Grouting & others	ls	-	1	5,931
1-4 Spillway				26,640
Common excavation	m ³	5.5	440,000	2,420
Rock excavation	m ³	16.0	660,000	10,560
Structure concrete	m ³	142.0	72,500	10,295
Reinforcement-bar	ton	650.0	1,450	943
Others	ls	-	1	2,422
1-5 Miscellaneous Works	ls	-	1	7,348
2 Power Waterway and Power Plant				122,947
2-1 Power Intake				7,762
Common excavation	m ³	5.5	35,800	197
Rock excavation	m ³	16.0	103,000	1,648
Structure concrete	m ³	142.0	26,500	3,763
Canal lining concrete	m ³	142.0	5,900	838
Reinforcement bar	ton	670.0	910	610
Others	ls	-	1	706
2-2 Headrace Tunnel				72,157
Tunnel excavation	m ³	67.0	508,500	34,070
Tnl. Lining concrete	m ³	132.0	133,500	17,622
Reinforcement bar	ton	690.0	1,340	925
Work Adit	m	6,490.0	2,000	12,980
Grouting & others	ls	-	1	6,560
2-3 Surtank				4,251
Common excavation	m ³	154.0	34,000	187
Rock excavation	m ³	304.0	23,000	368
Shaft excavation	m ³	731.0	9,700	514
Open concrete	m ³	1,846.0	15,900	2,258
Shaft lining concrete	m ³	704.0	3,200	490
Reinforcement bar	ton	449.0	800	552
Others	ls	419.0	1	437

Table 9.3 Total Project Cost of Dong Nai No. 4 (2/2)

Work Item	Unit	Unit Price	Dong Nai 4	
			Work Quantity	Amount (,000 \$)
2-4 Penstock				4,110
Tunnel excavation	m ³	79.0	15,600	1,232
Shaft excavation	m ³	99.0	6,100	604
Backfill concrete	m ³	120.0	14,800	1,776
Reinforcement bar	ton	690.0	180	124
Others	ls	-	1	374
2-5 Power Outlet				677
Common excavation	m ³	5.5	4300	26
Rock excavation	m ³	16	19200	307
Lining concrete	m ³	142	1800	256
Reinforcement bar	ton	650.0	40	26
Others	ls	-	1	62
2-6 Powerhouse & Switchyard				22,813
Common excavation	m ³	5.5	43,100	265
Rock excavation	m ³	16.0	192,400	3,078
Powerhouse concrete	m ³	156.0	19,700	3,073
Slope protection conc.	m ³	142.0	96,200	13,660
Reinforcement bar	ton	650.0	1,020	663
Others	ls	-	1	2,074
2-7 Miscellaneous Works	ls	-	1	11,177
[A3] Hydraulic Equipment and Metal Work				27,511
1. Reservoir				11,660
Spillway Gate	ton	10,000.0	1,060	10,600
Others	ls	-	1	1,060
2. Power Waterway				15,851
Intake gate	ton	10,000.0	190	1,900
Trashrack / screen	ton	7,000.0	140	980
Penstock steel	ton	6,500.0	1,620	10,530
Draft gate	ton	10,000.0	100	1,000
Others	ls	-	1	1,441
[A4] Electro-mechanical Equipment and Transmission Line				47,410
1. Powerhouse and Switchyard				45,310
Turbine	ls	-	1	20,390
Generator	ls	-	1	18,120
Transformer	ls	-	1	2,270
Others	ls	-	1	4,530
2. Transmission Line	km	140,000.0	15	2,100
[B] Indirect Cost				75,409
[B1] Compensation Cost				6,950
Reservoir inundation	km ²	400,000.0	17	6,620
Power Waterway / Plant	ls	-	1	330
[B2] Administration Cost	ls	-	1	6,454
[B3] Engineering Fee	ls	-	1	25,815
[B4] Physical Contingency	ls	-	1	36,190
[C] Total Construction Cost				398,095

Table 9.4 Cash Flow Analysis for Dong Nai No.3 and No.4

Year	Cash Flow of Cost			Cash Flow of Benefit			Unit US \$ 1,000
	Capital Cost		O & M Cost	Capital Cost Combined Cycle	O&M Cost	Fuel Cost	Balance B-C
	Dong Nai No.3	Dong Nai No.4					
-5	41,669	33,838					-75,507
-4	83,338	67,676		87,890			-63,124
-3	83,338	67,676		131,836			-19,179
-2	125,007	101,514		131,836			-94,686
-1	83,338	67,676		87,890			-63,124
0			3,003		21,973	20,348	39,317
1			3,003		21,973	20,348	39,317
2			3,003		21,973	20,348	39,317
3			3,003		21,973	20,348	39,317
4			3,003		21,973	20,348	39,317
5			3,003		21,973	20,348	39,317
6			3,003		21,973	20,348	39,317
7			3,003		21,973	20,348	39,317
8			3,003		21,973	20,348	39,317
9			3,003		21,973	20,348	39,317
10			3,003		21,973	20,348	39,317
11			3,003		21,973	20,348	39,317
12			3,003		21,973	20,348	39,317
13			3,003		21,973	20,348	39,317
14			3,003		21,973	20,348	39,317
15			3,003		21,973	20,348	39,317
16			3,003		21,973	20,348	39,317
17			3,003	79,101	21,973	20,348	118,419
18			3,003	118,652	21,973	20,348	157,969
19			3,003	138,427	21,973	20,348	177,745
20			3,003	59,326	21,973	20,348	98,643
21			3,003		21,973	20,348	39,317
22			3,003		21,973	20,348	39,317
23			3,003		21,973	20,348	39,317
24			3,003		21,973	20,348	39,317
25			3,003		21,973	20,348	39,317
26			3,003		21,973	20,348	39,317
27			3,003		21,973	20,348	39,317
28			3,003		21,973	20,348	39,317
29			3,003		21,973	20,348	39,317
30			3,003		21,973	20,348	39,317
31			3,003		21,973	20,348	39,317
32			3,003		21,973	20,348	39,317
33			3,003		21,973	20,348	39,317
34			3,003		21,973	20,348	39,317
35			3,003		21,973	20,348	39,317
36			3,003		21,973	20,348	39,317
37			3,003	79,101	21,973	20,348	118,419
38	11,267	13,108	3,003	118,652	21,973	20,348	133,595
39	16,900	19,662	3,003	138,427	21,973	20,348	141,183
40	16,900	19,662	3,003	59,326	21,973	20,348	62,082
41			3,003		21,973	20,348	39,317
42			3,003		21,973	20,348	39,317
43			3,003		21,973	20,348	39,317
44			3,003		21,973	20,348	39,317
45			3,003		21,973	20,348	39,317
46			3,003		21,973	20,348	39,317
47			3,003		21,973	20,348	39,317
48			3,003		21,973	20,348	39,317
49			3,003		21,973	20,348	39,317
50			3,003		21,973	20,348	39,317

Total Benefit at DR=10% 1,100,893
 Total Cost at DR=10% 1,019,042
 Net Benefit at DR=10% 81,852
 EIRR= 0.1141

Table 9.5 Total Project Cost of Fu Mieng Multipurpose Project (1/2)

Work Item	Unit	Unit Price	Fu Mieng	
			Work Quantity	Amount (000 \$)
[A] Direct Cost				199,511
[A1] Preparatory Works				5,672
Access Road	km	100,000	10	1,000
Power supply	km	14,600	10	146
Others	ls	-	1	4,526
[A2] Civil Work				150,873
1 Reservoir				71,841
1-1 Care of River				1,957
1-2 Dam				48,921
Common excavation	m ³	5.5	309,200	1,701
Rock excavation	m ³	16.0	35,200	563
Embankment core	m ³	9.4	2,890,000	27,166
Embankment filter	m ³	29.5	170,000	5,015
Embankment rock	m ³	10.9	340,000	3,706
Wall Concrete	m ³	100.0	67,200	6,720
Reinforcement-bar	ton	690.0	340	235
Grouting & others	ls	-	1	3,815
1-3 Spillway				14,432
Common excavation	m ³	5.5	390,000	2,145
Rock excavation	m ³	16.0	132,000	2,112
Structure concrete	m ³	142.0	57,200	8,122
Reinforcement-bar	ton	650.0	1,140	741
Others	ls	-	1	1,312
1-4 Miscellaneous Works	ls	-	1	6,531
2 Power Waterway and Power Plant				20,986
2-1 Power Intake				9,617
Common excavation	m ³	5.5	136,800	752
Rock excavation	m ³	16.0	34,200	547
Structure concrete	m ³	142.0	23,600	3,351
Canal lining concrete	m ³	142.0	23,300	3,309
Reinforcement bar	ton	670.0	1,170	784
Others	ls	-	1	874
2-2 Penstock				375
Common excavation	m ³	5.5	10,600	58
Rock excavation	m ³	16.0	2,600	42
Base / block concrete	m ³	156.0	1,500	234
Reinforcement bar	ton	690.0	10	7
Others	ls	-	1	34
2-3 Power Outlet				6,873
Common excavation	m ³	5.5	148,500	817
Rock excavation	m ³	16.0	99,000	1,584
Lining concrete	m ³	142.0	24,800	3,522
Reinforcement bar	ton	650.0	500	325
Others	ls	-	1	625
2-4 Powerhouse				1,981
Common excavation	m ³	5.5	6,000	33
Rock excavation	m ³	16.0	23,900	382
Powerhouse concrete	m ³	156.0	7,300	1,139
Reinforcement bar	ton	650.0	380	247
Others	ls	-	1	180
2-5 Switchyard				232
Base concrete	m ³	122.0	1,350	165
Reinforcement bar	ton	650.0	70	46
Others	ls	-	1	21
2-6 Miscellaneous Works	ls	-	1	1,908

Table 9.5 Total Project Cost of Fu Mieng Multipurpose Project (2/2)

Work Item	Unit	Unit Price	Fu Mieng	
			Work Quantity	Amount (,000 \$)
3	Diverson Works			58,046
3-1	Diverson Intake			2576
	Common excavation	m ³	5.5	22200
	Rock excavation	m ³	16	7200
	Structure concrete	m ³	129	10500
	Intake wire concrete	m ³	129	4200
	Reinforcement-bar	ton	650.0	320
	Others	ls	-	1
3-2	Diverson Canal			50,193
	Common excavation	m ³	5.5	1,560,000
	Rock excavation	m ³	16.0	1,560,000
	Lining concrete	m ³	142.0	78,000
	Reinforcement bar	ton	650.0	1,560
	Others	ls	-	1
3-3	Miscellaneous Works	ls	-	1
[A3]	Hydraulic Equipment and Metal Work			14,806
1.	Reservoir			7,480
	Spillway Gate	ton	10,000.0	680
	Others	ls	-	1
2.	Power Waterway			5,390
	Intake gate	ton	10,000.0	210
	Trashrack / screen	ton	7,000.0	150
	Penstock steel	ton	6,500.0	100
	Draft gate	ton	10,000.0	110
	Others	ls	-	1
3.	Diverson Work			1,936
	Intake gate	ton	10,000.0	120
	Screen	ton	7,000.0	80
	Others	ls	-	1
[A4]	Electro-mechanical Equipment and Transmission Line			28,160
1.	Powerhouse and Switchyard			26,060
	Turbine	ls	-	1
	Generator	ls	-	1
	Transformer	ls	-	1
	Others	ls	-	1
2.	Transmission Line	km	140,000.0	15
[B]	Indirect Cost			86,095
[B1]	Compensation Cost			40,180
	Reservoir inundation	km ²	400,000	82
	Power Waterway / Plant	ls	-	1
	Diverson Work	km ²	-	7
[B2]	Administration Cost	ls	-	1
[B3]	Engineering Fee	ls	-	1
[B4]	Physical Contingency	ls	-	1
[C]	Total Construction Cost			285,607

Table 9.6 Cash Flow Analysis for Fu Mieng Multipurpose Project

Unit US \$ 1,000

Year	Fu Mieng				Hy Dis-Benefit				Balance			
	Dam & Canal	Dam Opn. Cost	Dai Tuon Tr.	HCMC Tr.	Long An Tr.	Capital Cost	QAM Cost	Fuel Cost		Dai Tuon Tr.	HCMC Tr.	Long An Tr.
-5	24,277		0	0	0				0	0	0	-24,277
-4	48,553		0	0	0	16,785			0	0	0	-31,768
-3	48,553		0	0	0	25,177			0	0	0	-21,376
-2	72,830		0	0	0	25,177			0	0	0	-47,653
-1	48,553		6,291	7,960	6,365	16,785			0	0	0	-52,354
0		895	6,571	8,117	6,510		4,196	2,887	708	320	245	-13,696
1		895	6,551	8,274	6,555		4,196	2,887	2,124	951	856	-11,650
2		895	7,151	8,832	6,879		4,196	2,887	4,249	1,933	1,711	-8,292
3		895	7,411	8,589	6,945		4,196	2,887	7,082	3,265	2,852	-3,517
4		895	7,697	8,746	7,090		4,196	2,887	10,522	4,837	4,276	2,368
5		895	7,971	8,703	7,235		4,196	2,887	13,153	6,409	5,763	8,255
6		895	8,251	9,060	7,380		4,196	2,887	17,704	8,011	7,129	14,242
7		895	8,491	9,217	7,525		4,196	2,887	21,245	9,514	8,555	20,429
8		895	8,541	9,375	7,670		4,196	2,887	24,786	11,015	9,981	26,585
9		895	2,370	1,572	1,450		4,196	2,887	28,326	12,518	11,407	32,741
10		895	2,170	1,572	1,450		4,196	2,887	31,159	14,000	12,547	38,902
11		895	2,370	1,572	1,450		4,196	2,887	33,283	15,061	13,403	45,063
12		895	2,370	1,572	1,450		4,196	2,887	34,700	15,702	13,973	51,224
13		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	57,385
14		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	63,546
15		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	69,707
16		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	75,868
17		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	82,029
18		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	88,190
19		895	8,670	9,532	7,810		4,196	2,887	35,408	16,023	14,258	94,351
20		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	100,512
21		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	106,673
22		895	2,370	1,572	1,450	15,106	4,196	2,887	35,408	16,023	14,258	112,834
23		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	118,995
24		895	2,370	1,572	1,450	22,639	4,196	2,887	35,408	16,023	14,258	125,156
25		895	2,370	1,572	1,450	22,639	4,196	2,887	35,408	16,023	14,258	131,317
26		895	2,370	1,572	1,450	15,106	4,196	2,887	35,408	16,023	14,258	137,478
27		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	143,639
28		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	149,800
29		895	8,670	9,532	7,810		4,196	2,887	35,408	16,023	14,258	155,961
30		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	162,122
31		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	168,283
32		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	174,444
33		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	180,605
34		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	186,766
35		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	192,927
36		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	199,088
37		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	205,249
38		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	211,410
39	11,736	895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	217,571
40	14,715	895	8,670	9,532	7,810		4,196	2,887	35,408	16,023	14,258	223,732
41	11,736	895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	229,893
42		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	236,054
43		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	242,215
44		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	248,376
45		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	254,537
46		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	260,698
47		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	266,859
48		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	273,020
49		895	8,670	9,532	7,810		4,196	2,887	35,408	16,023	14,258	279,181
50		895	2,370	1,572	1,450		4,196	2,887	35,408	16,023	14,258	285,342

Total Cost at DR=10% -526,289
 Total Benefit at DR=10% 594,112
 Net Benefit at DR=10% 67,823

Table 9.8 Reservoir Projects for Water Supply to the Areas along National Highway No. 51

Reservoir project	Development stage ¹⁾	Proposed supply centre ²⁾	Catchment area, km ²	Proposed FSL, m ³⁾	Proposed MOL, m ³⁾	Active Storage, million m ³	Development capacity, m ³ /day ⁴⁾
La Buong	M/P	Tam Phuoc	246	50.0	48.0	8.5	220,000
Song Ca-1	M/P	Nhon Trach	56	80.0	61.0	27.4	270,000 ⁵⁾
Song Ca-2	M/P	Nhon Trach	49	60.0	52.0	10.4	
Phuoc Thai	M/P	Phu My	90	20.0	16.0	9.0	120,000
Da Den	F/S	Vung Tau	127	40.0	27.0	56.7	250,000 ⁶⁾
Song Ray	Pre-F/S	Vung Tau	750	70.0	48.0	239.2	1,400,000

Notes: 1) Feasibility study for the Da Den has been completed by a local company, whilst pre-feasibility study for the Song Ray. Others are originally identified for irrigation, but further detailed studies have not been done yet.

2) The area to receive water supply from the proposed reservoir is selected based on the geographical condition, i.e. nearest to the demand centre, as well as provincial boundary. The Tam Phuoc area includes the An Phuoc area, whilst the Long Thanh for the Nhon Trach, and the Go Dau and Thi Vai for the Phu My. The Ba Ria-Vung Tau includes the nearby towns as well.

3) The proposed Full Supply Level, FSL, is tentatively selected so as that the reservoir can secure the maximum active storage. On the other hand, the proposed Minimum Operation Level, MOL, is determined by assuming the denudation rate of 1.0 mm/year/km².

4) Development capacity of the reservoir for water supply is estimated by giving right-of-way to irrigation in terms of water use. For the reservoir simulation, hydrological data with a drought once in 10 years are used. Furthermore, river maintenance flow besides the irrigation use is not taken into account in the simulation.

5) A development capacity of 270,000 m³/day is obtained as the result of the joint operation of the Song Ca-1 & 2 reservoirs.

6) The tentative development capacity is estimated under the condition that water level in the reservoir returns to FSL at the end of wet season in a 10-year drought.

Table 9.9 Construction Costs for the Proposed Six Reservoir Projects for Water Supply along National Highway No. 51

Work Item	Unit	Unit Price (US\$)	La Buong Project		Song Ca-1 Project		Song Ca-2 Project		Phuoc Tai Project		Dn Dam Project		Song Ray Project	
			Work Quantity	Amount (,000 \$)	Work Quantity	Amount (,000 \$)	Work Quantity	Amount (,000 \$)	Work Quantity	Amount (,000 \$)	Work Quantity	Amount (,000 \$)	Work Quantity	Amount (,000 \$)
(A) Direct Cost:			14,410	24,873	10,979	16,295	19,049	1,111	48,252					
(A1) Preparatory Works			642	1,281	1,210	1,031	500	5	1,517					
Access road	km	100,000	2	200	8	800	5	500	1	100				
Power supply	km	14,600	2	29	8	117	5	73	1	15				
Other	ls		413	708	1	293	1	458	1	1,402				
(A2) Civil Work			13,768	23,592	9,769	15,264	17,938		46,735					
Reservoir														
1-1 Care of River	ls		191	695	191	407	442	930	23,238					
1-2 Dam			4,772	17,381	6,266	10,181	11,062	23,238						
1-2-1 Main Dam			4,772	17,381	4,772	10,181	11,062	23,238						
Common excavation	m ³	5.5	99,000	545	87,500	481	1,144	1,154						
Rock excavation	m ³	16.0	0	0	0	0	0	667						
Embankment: core	m ³	9.4	305,410	2,871	310,930	2,923	6,140	2,345						
Embankment: filter	m ³	29.5	17,970	530	19,290	540	1,133	1,108						
Embankment: rock	m ³	10.9	35,930	392	36,580	399	838	1,450						
Grouting & others	ls		434	1,580	434	926	1,006	2,113						
1-2-2 Auxiliary Dam			0	0	1,489	0	0	0						
Common excavation	m ³	5.5	0	0	57,600	317	0	0						
Embankment: core	m ³	9.4	0	0	83,470	785	0	0						
Embankment: filter	m ³	29.5	0	0	4,910	145	0	0						
Embankment: rock	m ³	10.9	0	0	9,820	107	0	0						
Grouting & others	ls		0	0	135	135	0	0						
1-3 Spillway			4,958	1,868	1,557	2,567	3,102	9,884						
Common excavation	m ³	5.5	50,630	278	21,070	116	106	444						
Rock excavation	m ³	16.0	62,830	1,005	11,870	190	211	2,000						
Structural concrete	m ³	142.0	20,790	2,951	7,170	1,018	1,679	5,995						
Reinforcement: bar	ton	650.0	420	273	140	91	156	546						
Others	ls		451	1,701	142	215	282	899						
1-4 River Outlet			2,595	1,503	867	921	1,701	8,434						
Common excavation	m ³	5.5	29,450	162	12,170	67	44	272						
Rock excavation	m ³	16.0	34,000	544	16,000	256	268	2,984						
Structural concrete	m ³	142.0	9,360	1,329	2,340	332	342	3,810						
Reinforcement: bar	ton	650.0	190	124	50	33	65	351						
Intake gate	ton	10,000.0	20	200	10	100	150	25						
Others	ls		236	137	79	84	155	767						
1-5 Miscellaneous Works			1,252	2,145	868	1,388	1,631	4,249						
(B) Indirect Cost			4,566	6,763	3,186	4,743	7,520	18,053						
(B1) Compensation Cost														
(B2) Reservoir inundation	km ²	400,000	4	1,400	2	800	1,200	3,200						
(B3) Administration Cost	ls		288	497	220	326	381	965						
(B4) Engineering fee	ls		1,153	1,990	878	1,304	1,524	3,860						
(B4) Physical Contingency	ls		1,725	2,876	1,288	1,913	2,415	6,028						
(C) Total Construction Cost			18,976	31,636	14,165	21,038	26,569	66,305						

Table 9.10 Installation Programme of Water Supply Projects for Alternative I

Year	Demand Centre												
	Bien Hoa		Tam Phuoc		Nhon Trach		Phu My		Vung Tau				
	Project	Supply Capacity m ³ /day	Project	Supply Capacity m ³ /day	Project	Supply Capacity m ³ /day	Project	Supply Capacity m ³ /day	Project	Supply Capacity m ³ /day	Project	Supply Capacity m ³ /day	
1995	Existing	36,000			Existing	720			Existing	600		Existing	33,000
1996													
1997	Thien Tan I	100,000	Groundwater I	10,000	Groundwater I	20,000	Groundwater I	15,000	Dinh River	10,000			
1998			Groundwater II	10,000	Groundwater II	20,000	Chau Pha & Suoi Sao	20,000	Groundwater	15,000			
1999					Groundwater II	10,000	Groundwater II	10,000					
2000			Groundwater II	10,000			Da Den 1)	125,000	Da Den 1)	125,000			
2001													
2002	Thien Tan II	150,000	Thien Tan I 2)	100,000	Thien Tan I 2)	200,000							
2003													
2004													
2005													
2006													
2007													
2008													
2009			Thien Tan II 4)	150,000	Thien Tan II 4)	150,000							
2010	Thien Tan III	150,000											
2011													
2012													
2013													
2014													
2015													
Total Supply		436,000		280,000		400,720		370,600		433,000			
Demand in 2015		354,000		244,000		374,000		331,000		412,000			

- Notes:
- 1) A development of 250,000 m³/day for the Da Den reservoir is shared by two demand centres, Phu My and Vung Tau.
 - 2) A pipeline with a conveyance capacity of 300,000 m³/day is developed for the Tam Phuoc and Nhon Trach demand centres.
 - 3) The Song Ray is developed with a scale of 450,000 m³/day of which 200,000 m³/day is for Phu My and 250,000 m³/day is for Vung Tau.
 - 4) Another pipeline with a conveyance capacity of 300,000 m³/day is developed for both of Phuoc and Nhon Trach demand centres.

Table 9.11 Installation Programme of Water Supply Projects for Alternative 2

Year	Demand Centre											
	Bien Hoa		Tam Phuoc		Nhon Trach		Phu My		Vung Tau			
	Project	Supply Capacity m ³ /day	Project	Supply Capacity m ³ /day	Project	Supply Capacity m ³ /day	Project	Supply Capacity m ³ /day	Project	Supply Capacity m ³ /day	Project	Supply Capacity m ³ /day
1995	Existing	36,000			Existing	720	Existing	600	Existing			
1996												
1997	Thien Tan I	100,000	Groundwater I	10,000	Groundwater I	20,000	Groundwater I	15,000	Dinh River	10,000		
1998			Groundwater II	10,000	Groundwater II	20,000	Chau Pha & Suoi Sao	20,000	Groundwater	15,000		
1999					Groundwater II	10,000	Groundwater II	10,000				
2000			Groundwater II	10,000			Da Den 1)	125,000	Da Den 1)	125,000		
2001												
2002	Thien Tan II	150,000	Thien Tan I 2)	100,000	Thien Tan I 2)	200,000						
2003												
2004												
2005												
2006												
2007												
2008												
2009			Thien Tan II 4)	150,000	Thien Tan II 4)	150,000						
2010	Thien Tan III	150,000										
2011												
2012												
2013												
2014												
2015												
Total Supply		436,000		280,000		400,720		370,600		433,000		
Demand in 2015		354,000		244,000		374,000		331,000		412,000		

Notes:

- 1) A development of 250,000 m³/day for the Da Den reservoir is shared by two demand centres, Phu My and Vung Tau.
- 2) A pipeline with a conveyance capacity of 300,000 m³/day is developed for the Tam Phuoc and Nhon Trach demand centres.
- 3) Another pipeline with a conveyance capacity of 450,000 m³/day is developed for the Phu My and Vung Tau demand centres.
- 4) The second pipeline for Tam Phuoc and Nhon Trach is placed with a conveyance capacity of 300,000 m³/day.

Table 9.12 Installation Programme of Water Supply Projects for Alternative 3

Year	Demand Centre											
	Bien Hoa		Tam Phuoc		Nhon Trach		Phu My		Vung Tau			
	Project	Supply Capacity m ³ /day	Project	Supply Capacity m ³ /day	Project	Supply Capacity m ³ /day	Project	Supply Capacity m ³ /day	Project	Supply Capacity m ³ /day	Project	Supply Capacity m ³ /day
1995	Existing	36,000			Existing	720	Existing	600	Existing			
1996												
1977	Thien Tan I	100,000	Groundwater I	10,000	Groundwater I	20,000	Groundwater I	15,000	Dinh River	10,000		
1998			Groundwater II	10,000	Groundwater II	20,000	Chau Pha & Suoi Sao	20,000	Groundwater	15,000		
1999					Groundwater II	10,000	Groundwater II	10,000				
2000			Groundwater II	10,000			Da Den 1)	125,000	Da Den 1)	125,000		
2001												
2002	Thien Tan II	150,000	Thien Tan I ²⁾	100,000	Song Ca	270,000						
2003												
2004												
2005												
2006							Song Ray ³⁾	200,000	Song Ray ³⁾	250,000		
2007												
2008												
2009			Thien Tan II ²⁾	150,000	La Buong	80,000						
2010	Thien Tan III	150,000										
2011												
2012												
2013												
2014												
2015												
Total Supply		436,000		280,000		400,720		370,600		433,000		
Demand in 2015		354,000		244,000		374,000		331,000		412,000		

Notes: 1) A development of 250,000 m³/day for the Da Den reservoir is shared by two demand centres, Phu My and Vung Tau.

2) A pipeline with a conveyance capacity of 250,000 m³/day is placed for the Tam Phuoc demand centre. Thus, the second stage development, i.e. Thien Tan II, is the construction of treatment plant.

3) The Song Ray is developed with a scale of 450,000 m³/day, of which 200,000 m³/day is for Phu My and 250,000 m³/day is for Vung Tau.

Table 9.13 Construction Cost Required for Alternative 1

Projects	Name	Year	Groundwater		Treatment Plant		Pipeline				Dam			
			Water supply capacity (m ³ /day)	Total construction cost ('000US\$)	Water supply capacity (m ³ /day)	Total construction cost ('000US\$)	Water supply capacity (m ³ /day)	Distance (km)	Total construction cost ('000US\$)	Shared capacity (m ³ /day)	Development supply capacity (m ³ /day)	Total construction cost ('000US\$)	Shared capacity (m ³ /day)	Cost shared by demand centre ('000US\$)
Bien Hoa														
	Thien Tan II	2002	-	30,000	150,000	30,000	3.48	8	4,733	300,000	4,733	-	-	-
	Thien Tan III	2010	-	30,000	150,000	30,000	-	-	-	-	-	-	-	-
Tam Phuoc														
	Groundwater I	1997	10,000	2,500	-	-	-	-	-	-	-	-	-	-
	Groundwater II	1998	10,000	2,500	-	-	-	-	-	-	-	-	-	-
	Groundwater III	2000	10,000	2,500	-	-	-	-	-	-	-	-	-	-
	Thien Tan I	2002	-	20,000	100,000	300,000	3.48	21	12,424	100,000	4,141	-	-	-
	Thien Tan II	2009	-	30,000	150,000	300,000	3.48	21	12,424	150,000	6,212	-	-	-
Nhon Trach														
	Groundwater I	1997	20,000	5,000	-	-	-	-	-	-	-	-	-	-
	Groundwater II	1998	20,000	5,000	-	-	-	-	-	-	-	-	-	-
	Groundwater III	1999	10,000	2,500	-	-	-	-	-	-	-	-	-	-
	Thien Tan I	2002	-	40,000	200,000	300,000	3.48	21	12,424	200,000	8,282	-	-	-
	Thien Tan II	2009	-	30,000	150,000	300,000	3.48	21	12,424	150,000	6,212	-	-	-
			-		150,000	150,000	1.74	9	2,662	150,000	2,662	-	-	-
Phu My														
	Groundwater I	1997	15,000	3,750	-	-	-	-	-	-	-	-	-	-
	Groundwater II	1999	10,000	2,500	-	-	-	-	-	-	-	-	-	-
	Da Den	2000	-	25,000	125,000	250,000	2.90	1	493	125,000	247	250,000	125,000	13,285
			-	40,000	200,000	450,000	1.45	5	1,233	125,000	1,233	1,400,000	200,000	9,473
	Song Ray	2006	-	50,000	250,000	200,000	5.21	27	23,914	75,000	3,986	1,400,000	200,000	9,473
			-	50,000	250,000	200,000	2.32	5	1,972	200,000	1,972	1,400,000	200,000	9,473
Vung Tau														
	Groundwater	1998	15,000	3,750	-	-	-	-	-	-	-	-	-	-
	Da Den	2000	-	25,000	125,000	250,000	2.90	1	493	125,000	247	250,000	125,000	13,285
			-	50,000	250,000	450,000	1.45	12	2,958	125,000	2,958	1,400,000	250,000	9,473
	Song Ray	2006	-	50,000	250,000	450,000	5.21	27	23,914	375,000	19,928	1,400,000	250,000	9,473

Table 9.14 Construction Cost Required for Alternative 2

Projects	Groundwater		Treatment Plant		Pipeline			Dam				
	Water supply capacity (m ³ /day)	Total construction cost ('000US\$)	Water supply capacity (m ³ /day)	Total construction cost ('000US\$)	Water supply capacity (m ³ /day)	Distance (km)	Total construction cost ('000US\$)	Shared capacity (m ³ /day)	Development supply capacity (m ³ /day)	Total construction cost ('000US\$)	Shared capacity (m ³ /day)	Cost shared by demand centre ('000US\$)
Siem Hoa												
Thien Tan II	-	-	150,000	30,000	300,000	3.48	8	4,733	300,000	-	-	-
Thien Tan III	-	-	150,000	30,000	-	-	-	-	-	-	-	-
Tam Phuoc												
Groundwater I	10,000	2,500	-	-	-	-	-	-	-	-	-	-
Groundwater II	10,000	2,500	-	-	-	-	-	-	-	-	-	-
Groundwater III	10,000	2,500	-	-	-	-	-	-	-	-	-	-
Thien Tan I	-	-	100,000	20,000	300,000	3.48	21	12,424	100,000	-	-	4,141
Thien Tan II	-	-	150,000	30,000	300,000	3.48	21	12,424	150,000	-	-	6,212
Nhon Trach												
Groundwater I	20,000	5,000	-	-	-	-	-	-	-	-	-	-
Groundwater II	20,000	5,000	-	-	-	-	-	-	-	-	-	-
Groundwater III	10,000	2,500	-	-	-	-	-	-	-	-	-	-
Thien Tan I	-	-	200,000	40,000	300,000	3.48	21	12,424	200,000	-	-	8,282
Thien Tan II	-	-	150,000	30,000	300,000	3.48	21	12,424	150,000	-	-	6,212
Thien Tan II	-	-	150,000	30,000	150,000	1.74	9	2,662	150,000	-	-	2,662
Phu My												
Groundwater I	15,000	3,750	-	-	-	-	-	-	-	-	-	-
Groundwater II	10,000	2,500	-	-	-	-	-	-	-	-	-	-
Da Den	-	-	125,000	25,000	250,000	2.90	1	493	125,000	247	250,000	13,285
Thien Tan	-	-	200,000	40,000	125,000	1.45	5	1,233	125,000	1,233	-	-
Thien Tan	-	-	200,000	40,000	450,000	5.21	45	39,857	200,000	17,714	-	-
Vung Tau												
Groundwater	15,000	3,750	-	-	-	-	-	-	-	-	-	-
Da Den	-	-	125,000	25,000	250,000	2.90	1	493	125,000	247	250,000	13,285
Thien Tan	-	-	250,000	50,000	125,000	1.45	12	2,958	125,000	2,958	-	-
Thien Tan	-	-	250,000	50,000	450,000	5.21	45	39,857	250,000	22,143	-	-
Thien Tan	-	-	250,000	50,000	250,000	2.90	23	11,339	250,000	11,339	-	-

Table 9.15 Construction Cost Required for Alternative 3

Projects	Groundwater		Treatment Plant		Pipeline			Dam				
	Water supply capacity (m ³ /day)	Total construction cost ('000US\$)	Water supply capacity (m ³ /day)	Total construction cost ('000US\$)	Distance (km)	Water supply capacity (m ³ /day)	Total construction cost ('000US\$)	Shared capacity (m ³ /day)	Development supply capacity (m ³ /day)	Total construction cost ('000US\$)	Shared capacity (m ³ /day)	Cost shared by demand centre ('000US\$)
Bien Hoa												
Thien Tan II	-	-	150,000	30,000	-	300,000	4,733	300,000	-	4,733	-	-
Thien Tan III	-	-	150,000	30,000	8	-	-	-	-	-	-	-
Tam Phuoc												
Groundwater I	10,000	2,500	-	-	-	-	-	-	-	-	-	-
Groundwater II	10,000	2,500	-	-	-	-	-	-	-	-	-	-
Groundwater III	10,000	2,500	-	-	-	-	-	-	-	-	-	-
Thien Tan I	-	-	100,000	20,000	21	250,000	10,353	250,000	-	10,353	-	-
Thien Tan II	-	-	150,000	30,000	-	-	-	-	-	-	-	-
Nhon Trach												
Groundwater I	20,000	5,000	-	-	-	-	-	-	-	-	-	-
Groundwater II	20,000	5,000	-	-	-	-	-	-	-	-	-	-
Groundwater III	10,000	2,500	-	-	-	-	-	-	-	-	-	-
Song Ct	-	-	270,000	54,000	17	270,000	9,046	270,000	-	9,046	270,000	45,810
La Buong	-	-	80,000	16,000	12	80,000	1,897	80,000	-	1,897	80,000	18,980
Phu My												
Groundwater I	15,000	3,750	-	-	-	-	-	-	-	-	-	-
Groundwater II	10,000	2,500	-	-	-	-	-	-	-	-	-	-
Da Den	-	-	125,000	25,000	1	250,000	493	125,000	247	250,000	125,000	13,285
Song Ray	-	-	200,000	40,000	5	450,000	1,233	125,000	1,233	1,400,000	200,000	9,473
Vung Tau												
Groundwater	15,000	3,750	-	-	-	-	-	-	-	-	-	-
Da Den	-	-	125,000	25,000	1	250,000	493	125,000	247	250,000	125,000	13,285
Song Ray	-	-	250,000	50,000	27	450,000	2,958	125,000	2,958	1,400,000	250,000	11,841

Table 10.1 Disbursement Schedule of the Master Plan Projects

Unit : Million US\$

Master Plan Projects	Project Cost	Phase I			Phase II			Phase III			Phase IV											
		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
(1) Rural agricultural development projects	231				3.9	3.9	15.9	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	14.9	11.5	11.5	
(2) Rural water supply projects	72		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
(3) Hydropower projects	490								49.0	98.0	98.0	147.0	98.0									
- Dong Nai No.3	398								39.8	79.6	79.6	119.4	79.6									
- Dong Nai No.4	888								88.8	177.6	177.6	266.4	177.6									
Sub-total (3)																						
(4) Be-Saigon Diversion Project (in case of Fu Mieng Multipurpose project)	285										28.5	57.0	57.0	85.5	57.0							
(5) Large scale irrigation packages	180						12.8	12.8	12.8	17.8	41.5	32.5	21.5	19.6	4.2	4.2						
- Phan Ri - Phan Thiet	160										11.5	19.3	19.3	15.4	11.5		12.4	20.8	20.8	16.6	12.4	
- Lower La Nga	220				11.0		33.0	46.2	35.2	55.0	39.6											
- Phuoc Hoa	243									7.4	7.4	24.3	24.3	24.3	24.3	24.3	24.3	24.3	24.3	24.3	16.9	16.9
- Dau Tieng and HCMC - Long An Delta	803	0.0	0.0	0.0	0.0	11.0	45.8	59.0	48.0	80.2	100.0	76.1	65.1	59.3	40.0	28.5	36.7	45.1	45.1	45.1	33.5	29.3
Sub-total (5)																						
(6) Water supply project along National Highway No.51	65						6.9	17.4	10.4													
- Bien Hoa demand centre	68		2.5	2.5			7.3	12.1	7.2													
- Tam Phuoc demand centre	103		5.0	5.0	2.5	10.4	25.9	15.5														
- Nhon Trach demand centre	101		3.8	8.0	22.4	11.9				11.1	27.7	16.6										
- Phu My demand centre	127				12.0	20.7	12.4															
- Vung Tau demand centre	464	0.0	11.3	27.5	45.6	49.0	55.4	33.2	0.0	27.4	68.6	41.2	15.0	43.5	37.5	9.0	0.0	0.0	0.0	0.0	0.0	0.0
Sub-total (6)	2,750	0	16	32	54	68	117	112	157	305	395	456	335	208	154	57	52	65	65	50	50	45
Ground Total																						
Total by Phase		170	(= VND 1,870 billion)	1,090	(= VND 12,010 billion)	1,210	(= VND 13,330 billion)	1,210	(= VND 13,330 billion)	280	(= VND 3,080 billion)											

Note: The costs in VND are estimated by using an exchange rate of US\$ 1.00 = VND 11,014.

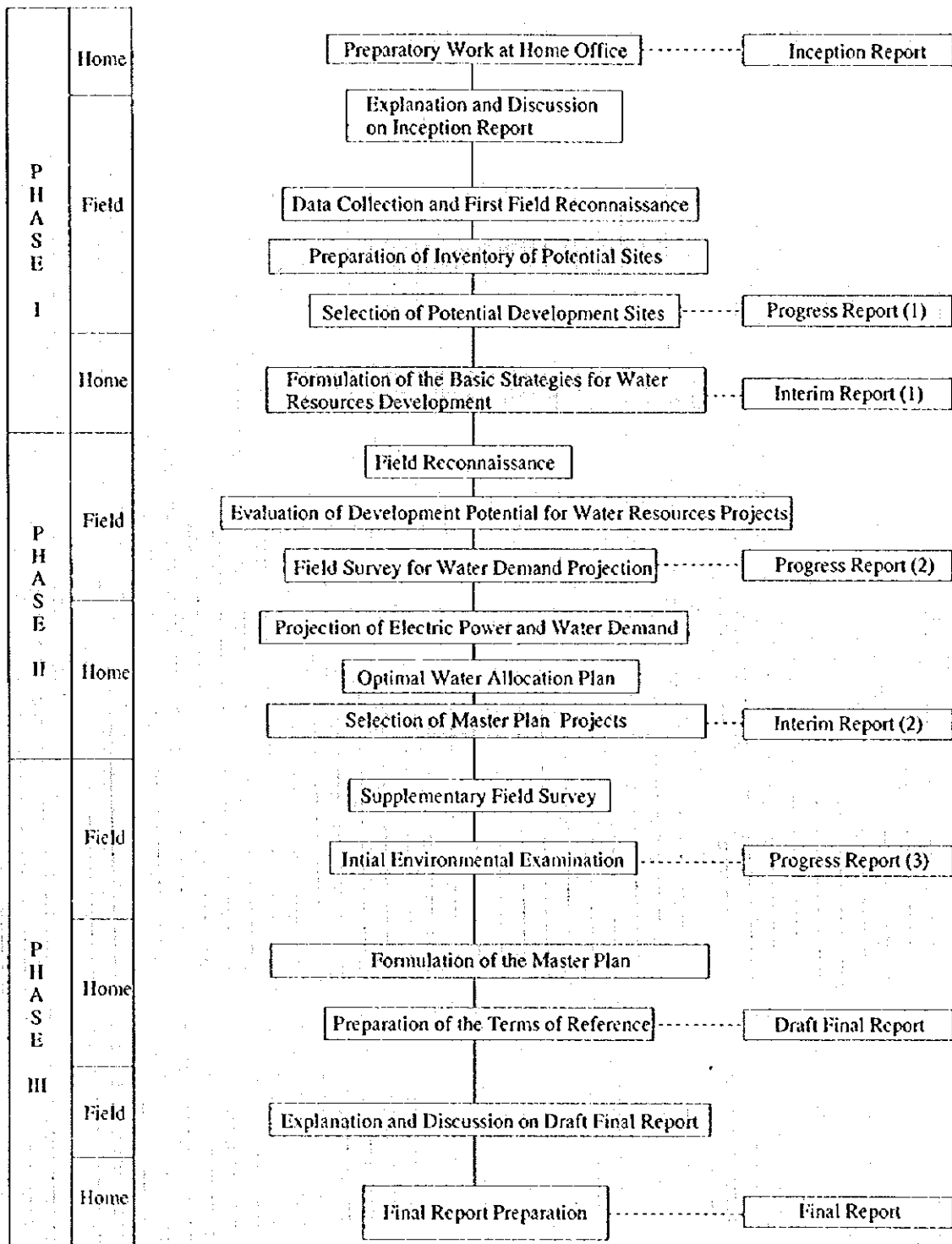
Table 10.2 Fund Availability for the Master Plan Project

Unit: billion VND

Phase	Year	Projected GDP	Public Investment	Public Fund in the Study Area		Funds for Three Sectors 1) in the Study Area	Funds Necessary for MPP 2)	(3)/(1) %	(3)/(2) %
				(1)		(2)	(3)		
	1994	170,258	11,067	3,021					
	1995	185,581	12,063	3,293					
	1996	202,284	13,148	3,590					
I	1997	220,489	14,332	3,913					
	1998	240,333	15,622	4,265					
	1999	261,963	17,028	4,649					
	2000	285,540	18,560	5,067	21,484	7,519	1,870	8.7	24.9
	2001	311,238	20,230	5,523					
	2002	339,250	22,051	6,020					
II	2003	369,782	24,036	6,562					
	2004	403,063	26,199	7,152					
	2005	439,338	28,557	7,796	33,053	11,569	12,010	36.3	103.8
	2006	474,485	30,842	8,420					
	2007	512,444	33,309	9,093					
III	2008	553,440	35,974	9,821					
	2009	597,715	38,851	10,606					
	2010	645,532	41,960	11,455	49,395	17,288	13,330	27.0	77.1
	2011	690,719	44,897	12,257					
	2012	739,070	48,040	13,115					
	2013	790,804	51,402	14,033					
IV	2014	846,161	55,000	15,015					
	2015	905,392	58,850	16,066	70,486	24,670	3,080	4.4	12.5
				Total	174,418	61,046	30,290	17.4	49.6

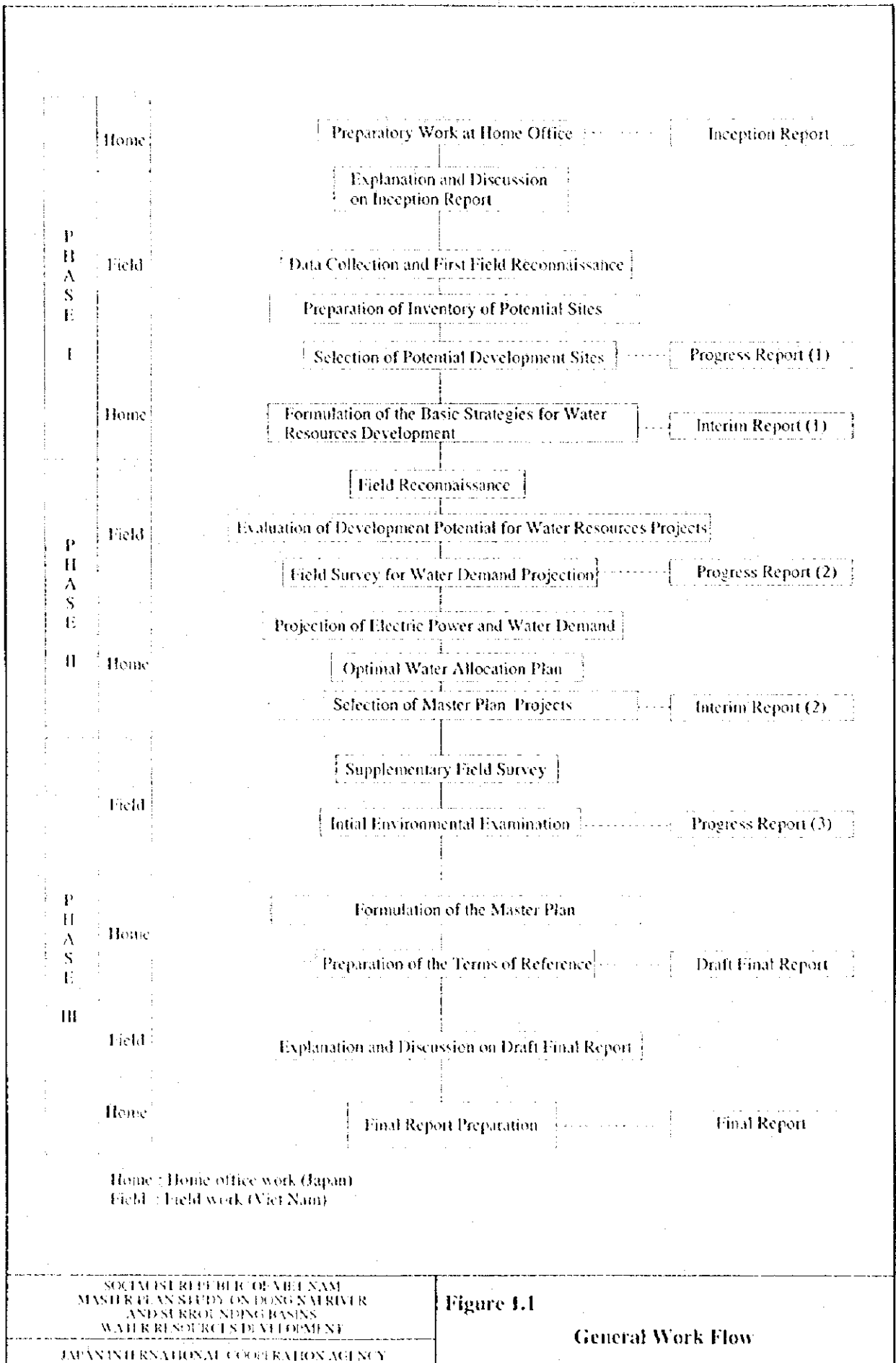
- Note:
- 1) Three sectors include hydropower, irrigation and water supply.
 - 2) MPP means the master plan projects, and the costs in VND are estimated by using an exchange rate of US\$ 1.00 = VND 11,014
 - 3) GDP in 1994 price

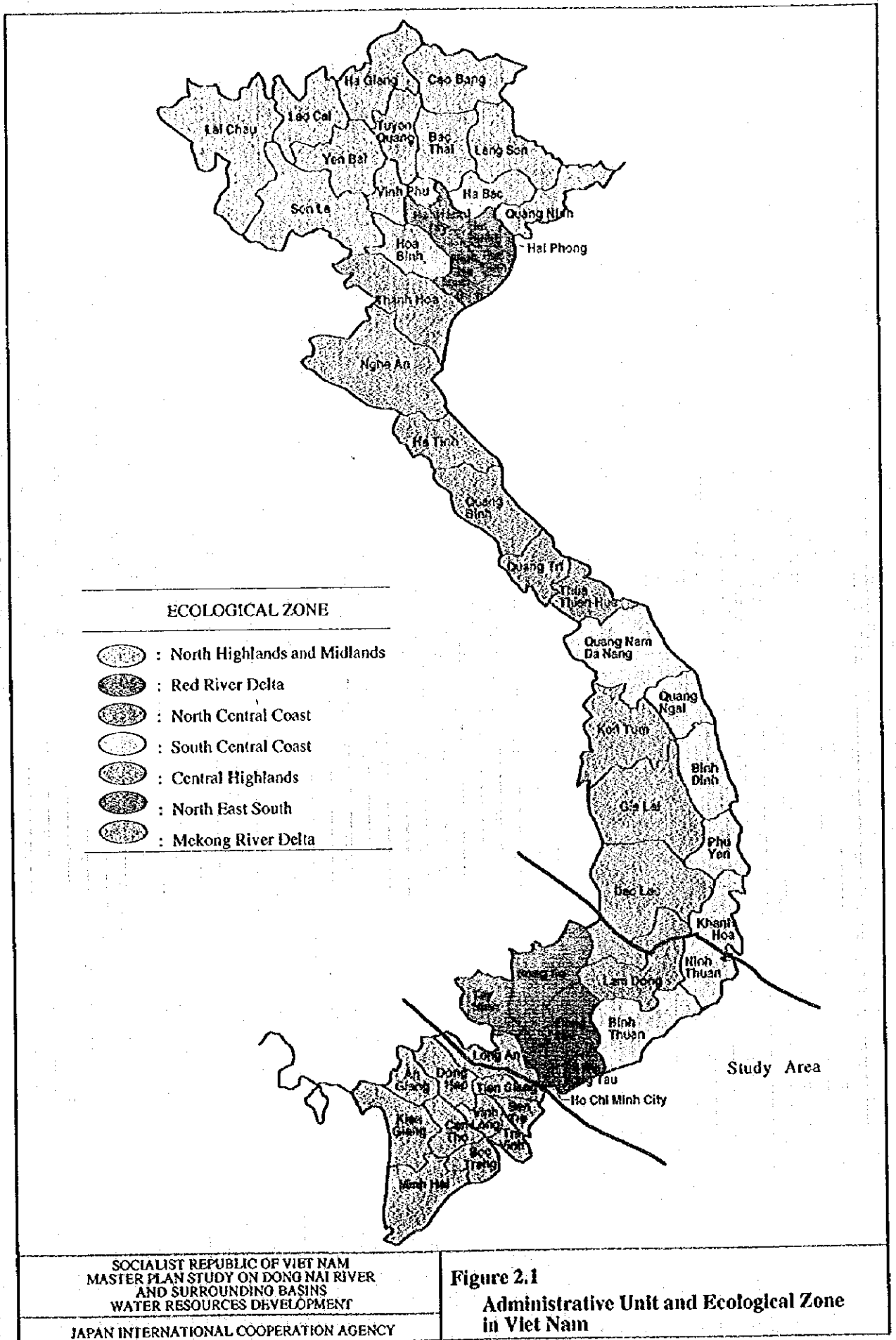
FIGURES



Home : Home office work (Japan)
 Field : Field work (Viet Nam)

Figure 1.1
 General Work Flow





SOCIALIST REPUBLIC OF VIET NAM
 MASTER PLAN STUDY ON DONG NAI RIVER
 AND SURROUNDING BASINS
 WATER RESOURCES DEVELOPMENT

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 2.1
Administrative Unit and Ecological Zone
in Viet Nam