Table 9.1 Flood Control Criteria for River Basin

River	Location	Occurred floods		Flood control criteria				Remarks
	Name	H (m)	Q (m^3/s)	Year	H (m)	Q (m^3/s)	Frequencies (%)	
Bang Giang - Ky Cung	Lang Son town	20.00	4,520	7/1986	17.00	2,800	2.5	
		17.00	2,800	8/1980				
Ma	Xuan Khanh	13.90	8,500	1962	13.90		0.6	
	Giang	7.50	NA	1927	7.50		1	
	Len Bridge	6.80	2,050	1973	6.80		1	
	Tao Bridge	5.60	1,250	1973	5.60		1	
	Kim Tan	13.50	NA	1996	13.50		5	
Ca	Do Luong	20.49(upstream)	8,350	1978	20.49		2	
		20.33(downstream)			20.33			
	Yen Thuong	12.95	13,060	1978	12.95		1.5	
	Nam Dan	10.16	13,160	1978	10.16		1	
	Cho Trang	7.28	16,000	1978	7.28		1	
	Linh Cam	7.88	5,970	1978	7.88		1	
	Ben Thuy	6.28	17,660	1978	6.28		1	
Thach Han	Quang Tri Citadel	7.64	NA	1999	6.50			Main flood
	Quang Tri Citadel	4.25	NA	1983	3.85			Summer-autumn flood
Huong	Kim Long	5.84	13,670	1999	3.71			Main flood
	Phu Oc	4.89	3,050	1999	4.50			
	Kim Long	4.23	42,43	1989	2.50		10	Summer-autumn flood
	Phu Oc	4.50	1,410	1989	3.50			
Vu Gia - Thu Bon	Nong Son		10,600	11/1998		9,100	10	Mail flood
	Nong Son		4,500	10/1986		4,766	5	Early floods
	Ai Nghia	10.56		1946	9.50		10	Main flood
	Giao Thuy	9.41		20/11/1998	8.40		10	Main flood
Tra Khuc	Song Giang		18,400	12/1986		10,200	10	Main flood
	Song Giang		6,560	9/1997			5	Early flood
	Tra Khuc	7.72		11/1998	6.20		10	Main flood
Kone	Cay Moung		6,340	1987		10,200	10	Main flood
	Cay Moung		978	9/1977		1,780	1	Eary flood
	Tan An	8.92		1987	7.60		10	Main flood
Ba	Cung Son		20,700	11/1993		13,675	10	Main flood
	Cung Son		4,500	9/1977		4,500	10	Early flood
	Phu Lam	5.20		11/1993	4.39		10	Main flood
Sesan	Kontum		3,620	11/1996		3,600	3	Main flood
	Kontum		2,540	9/1994		2,900	5	Early flood
	Dakbla Bridge	520.70		11/1996	517.00		3	Main flood
Srepok	Giang Son		990	10/1992			10	Main flood
	Giang Son	426.70		10/1992	425.00		10	Main flood
	Duc Xuyen	431.85	1,920	10/1992	431.00		10	Main flood
Dong Nai	Tri An			1978			10	early floods
	Bien Hoa	1.89			2.45			
	Nha Be	1.19			1.46			
	Binh Duong	1.28			1.35			
	Phu An	1.33			1.45			
				1952			1	main flood
	Bien Hoa	4.80			4.87			P=1% for Ho Chi
	Nha Be	1.52			1.54			Minh city.
	Binh Duong	1.69			1.70			P=3-5% for oter
	Phu An	1.48			1.54			cities.
Cuu Long (Mekong)	Tan Chau	4.880		30/8/1978	4.37	23,950	10	early floods
	Chau Doc	4.040		31/8/1978	3.57	7,910	10	early floods
	Tan Chau	5.280		12/10/1961	5.50	28,820	1	main floods
	Chau Doc	5.060		13/10/1961	5.17	9,220	1	main floods
								P=2-5% for towns
	Tan Chau			11/1994				Late floods and
								11/1994 flood

Table 9.2 Major Dam/Reservoir Projects in Each River Basin

							Dam			Reservoir							Power		
	River Basin	Project name	River	Investment Cost (Mil US$)*4	B/C	CA (km2)	Type	Height (m)	Crest L (m)	FWL (m)	FSL (m)	MOL (m)	Gross (10^6 m^3)	Active (10^6 m^3)	Dead (10^6 m^3)	Area (km2)	MW/GWh	Resettlement	Remarks
1	Bang Giang & Ky Cung	Ban Lai	Ky Cung	(114.3)		(550)	(R/Fill)	(40)	(400)		(320)		(345.2)	(310.5)	(34.7)	(29.4)	9/	Approx. 20,000	
2	Red River & Thai Binh	Son La	Da	2,899.4	1.7	43,760	C/Gravity				265	220		14,900		440	3600/14895	Approx. 96,000	
		Bac Me	Gam	419.4	1.2	5,000	C/Gravity	105	525		195	165	1,830	1,055	775	60	280/662	Approx. 17,000	
		Dai Thi (Pac Ta)	Gam	360.9	1.18	12,690	C/Gravity	95	467		120	95	1,626	1,091	535.3	57	300/985	Approx. 11,547	
3	Ma	Na Han	Ma																
		Cua Dat	Chu	362.0		5,700	C/Gravity	90	480		123	77.4	1,531	1,210	321	39	120/465	8,324	
4	Ca	Ban La	Nam Non	470.9	1.33	8,700	C/Gravity	133	463		200	160	1,800	1,244	556	45	300/996	Approx. 12,000	
		Ban Mai	Ca	647.3	0.97	13,272	RCCD	125			153	109.2	4,200	3,140	1,060	108	480/1226	Approx. 43,000	
		Ngan Truoi	N Sau										1,100				120/		
5	Thach Han	Rao Quan	Rao Quan	187.1		159	R/Fill	95			493	445		291			70/292	Approx. 36,000	
		Song Nhung	Thach Han	8.0			Earthfill	20	500	28	23	10	42.3	40	2.3				
		Tan Kim	Thach Han	1.8		8	Earthfill	24.4	750	34.28	34.1	19.8	6.11	5.89	0.23				
6	Huong	Ta Trach	Ta Trach	100.6	1.65	717	E/Fill and rock mixed	56	1,200	51.98	45	23	610	538	72	30	19.5/70	Approx. 5,000	Saddle dam with length 660m
		Huu Trach	Huu Trach	30		570					55	35	230	182	48	11	15/66		
		Co Bi	Bo	27.7		712					40	27	242	167	75		21/94		
7	Vu Gia-Thu Bon	Ho Song Tranh II	Thu Bon	(241.7)		1,441	R/Fill	48	640		125	90	1067	945	122	53	150/615	Approx. 25,000	
		Song Cai	Cai	128.0		1,763	Earthfill	89	450		100	75	870	550	320	28	177/	Approx. 7,100	
		A Vuong	A Vuong	245.7	1.79	682	Concrete	60	269	383.5	380	340	343.54	266.48	77.06	9.09	170/760	Approx. 1006	
8	Tra Khuc	Nuoc Trong	Thach Nham	51.9	1.52	446	C/Gravity	60	394	128.19	125	86	222.56	185.78	36.78		15.3/63.5	Approx. 10,000	Sub-dam with height 37.4m
		Drac Ring																	
9	Kone	Dinh Binh	Kone	59.7	1.38	1,040	Concrete	65.3	638	93.31	91.93	65	226	209	17	13.85	6.6/38.33	2,932	
		Dong Sim	Dong Sim			35	Earth	16	570	49	46	38	11.5	11	0.5		-		
		Suoi Xem	Suoi Xem			124	Concrete	45	(350)	84.9	83		126.208	120	6.21		-		
10	Ba	Song Ba Ha *1	Ba	318.2	1.36	11,115	Concrete	55.85	356	113.15	110	103	740.6	484.4	256.2	99.29	250/1,044	7,391	
							Earth	40	1,035										
		An Khe - Kanak *2	Ba			1,222						425	6.19	0	6.19	1.68	150/631		
						833					520	490	404.4	356.7	47.7	19.35	15/62.6		
11	Sesan	Sesan No.4	Sesan	502.4	1.1	9,326	Rockfill				215	205		471		58.4	330/664	Approx. 800	
		Dak Bla	Dak Bla	254.5	0.74	2,780	Rockfill	95			590	567		873		69	107/346	Approx. 2500	
		Plei Krong	Krong Poko	236.8	0.83	3,224	Rockfill	91	(500)		585	564		1131		80	120/405	Approx. 7300	
12	Srepok	Buon Kuop-Chupong Krong *3	Srepok	298.5	1.94	7,980	Earth	37	540	417.8	415	410	36.82	14.98	21.84	7.21	280/1025	Approx. 5,000	
						3,860	Earth	20	170	434.5	433.3	422	350.86	315.04	35.82	50.03	-		
		Krong Boung	Ea Krong Boung	4.0		790	Earthfill	30	570		447.5	444.5		21.6			-	Approx. 2,200	
		Upper Krong Pach	Ea Krong Pach	6.3		490	Earthfill	18.5	585		454.6	451.5		72			-	Approx. 1,000	
		Upper Krong Buk	Ea Krong Buk	6.8		149	Earthfill	29.3	665	700.8	699.8	686		83.4			-	Approx. 2,700	
13	Dong Nai	Dong Nai No.3	Dong Nai	413.2	0.8	4,361	RCCD	116.5	450		590	560	1,763.5	1,185.9	577.6	53.5	250/784	Approx. 1,130	
		Dong Nai No.4	Dong Nai	384.5	1.01	4,530	R/Fill		320		440	430	117.5	30.2	87.3	4.2	286/943	no resettlement	
		Dong Nai No.8	Dong Nai	267.1	1.06	9,679	Earthfill	48	3,450		124	112	1,031.5	933.8	97.7	119.4	195/609	Approx. 18,840	
14	Cuu Long	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*1 This project has a conbined dam, concrete and earth fill dam

*2 This project has two dams, An Khe dam will be constructed at downstream, and Kanak dam be constructed at upstream

*3 This project has two dams, Buon Kuop Dam will be constructed at donwnstream and Chupong Krong be constructed at upsteram

*4 Price level as of December 2001

Table 9.3 Proposed Major Projects in Each River Basin

	River Basin	Project			River	CA (km2)	Purpose			Gross (10^6 m^3)	Available Storage		Flood Control	Irrigation		Hydropower
		Type	Status	Name			WS	FC	HP		Water Supply (10^6 m^3)	Flood Control (10^6 m^3)	Structural Measure (excld. Dam)	Irrigation Area in 2000 (1,000 ha)	Irrigation Area in 2020 (1,000 ha)	Minimum Guaranteed Discharge (mil m^3/M)
1	**Bang Giang & Ky Cung**	**Dam**	**Plan**	**Ban Lai**	Ky Cung	550	X	X	X		310.5	96.2				
		Flood C.											-			
		Irrigation/Drainage	**Extension**											25.5	67.5	
2	**Red River & Thai Binh**	Dam	Plan	Son La	Da	43,760	X		X	30850.0	14,900					1,306.3
		Dam	Exist	Hoa Binh	Da	9,140/ (52,900)	X			9500.0	5,650					
		Dam	Plan	Bac Me	Gam	5,000	X		X	1,830	1,055					233.3
		Dam	Plan	Dai Thi	Gam	7,690/ (12,690)	X		X	1,626	1,091					261.0
		Dam	Exist	Thac Ba	Thao	10,980	X			1,830	1,055					
		Flood C.														
		Irrigation/Drainage	Extension	Red River Delta										1,008	1,291	
3	**Ma**	**Dam**	**Plan**	**Cua Dat**	Chu	5,700	X	X	X	1,531	1,210	105.6				80.9
		Flood C.											-			
		Irrigation/Drainage	**Extension**											112.0	199.5	
4	**Ca**	**Dam**	**Plan**	**Ban La**	Nam Non	8,700	X	X	X	1,800	1,244	216.0				140
		Dam	Plan	Ban Mai	Ca	13,272				4,200	3,140					
		Flood C.											Heightening of the existing dyke crown			
		Irrigation/Drainage	**Extension**											93.0	203.0	
5	**Thach Han**	**Dam**	**Plan**	**Rao Quan**	Rao Quan	159	X	X	X		291.0	104.7				6.6
		Flood C.											Dyke heightening & River improvement			
		Irrigation/Drainage	**Extension**											5.0	15.4	
6	**Huong**	**Dam**	**Plan**	**Ta Trach**	Ta Trach	717	X	X	X	610.0	460.0	383.0				
		Dam	Plan	Huu Trach	Huu Trach	570				230.0						
		Dam	Plan	Co Bi	Bo	712				242.0						
		Flood C.											-			
		Irrigation/Drainage	**Rehabili..**											21.2	21.2	
7	**Vu Gia -Thu Bon**	**Dam**	**Plan**	**Ho Song Tranh II**	Thu Bon	1,441	X	X	X	1,067	945.0	507.0				200.4
		Dam	**Plan**	**Song Cai**	Vu Gia	1,763		X		870	-	543.0				
		Flood C.											River improvement / Dyke system : 35 km			
		Irrigation/Drainage	**Extension**											30.9	77.0	
8	**Tra Khuc**	**Dam**	**Plan**	**Nuoc Trong**	Thach Nham	446	X	X	X	222.6	185.8	185.8				
		Flood C.											Heightening of the existing dyke crown			
		Irrigation/Drainage	**Extension**											33.0	54.0	
9	**Kone**	**Dam**	**Plan**	**Dinh Binh**	Kone	1,040	X	X	X	226.0	209.0	120.0				
		Dam	Existing	Vinh Son		97	X		X		102.0					
		Dam	Existing	Thuan Ninh		35	X				32.3					
		Dam	Existing	Nui Mot		120	X				90.0					
		Flood C.											River improvement / Dyke system : 62 km			
		Irrigation/Drainage	**Extension**											25.0	49.0	
10	**Ba**	**Dam**	**Plan**	**Song Ba Ha *1**	Ba	11,115	X	X	X	740.6	484.4	38.1				148.2
		Dam	Exist	La Yun	Dak la Yun	1,670	X				201.0					
		Dam	Exist	Hinh	Hinh	722	X				323.0					
		Dam	Plan	An Khe - Kanak *2	Ba	1,222/ 833										
		Flood C.											Heightening of the existing dyke crown			
		Irrigation/Drainage	**Extension**											41.0	186.0	
11	**Sesan**	**Dam**	**Plan**	**Dak Bla**	Dak Bla	2,780	X	X	X		873.0	78.0				
		Dam	Plan	Plei Krong	Krong Poko	3,224					1,131					94.5
		Flood C.											-			
		Irrigation/Drainage	**Extension**											22.5	50.0	
12	**Srepok**	**Dam**	**Plan**	**Buon Kuop**	Srepok	3,860	X	X	X	350.9	315.0					116.1
		Dam	**Plan**	**Krong Boung**	Krong Boung	790	X	X			21.6	21.4				
		Dam	**Plan**	**Upper Krong Pach**	Krong Pach	490	X				72.0					
		Dam	**Plan**	**Upper Krong Buk**	Krong Buk	149	X	X			83.4	26.2				
		Dam	Exist	Lower Krong Buk	Krong Buk	118	X	X			45.0	33.3				
		Flood C.											-			
		Irrigation/Drainage	**Extension**											29.0	91.0	
13	**Dong Nai**	Dam	Plan	Dong Nai No.3	Dong Nai	4,361				1,764	1,186					89.4
		Dam	Plan	Dong Nai No.4	Dong Nai	4,530				117.5	30.2					96.0
		Dam	Plan	Fu Mieng	Be	4,110					462.0					
		Dam	Existing	Dai Ninh	Da Nhim											
		Dam	Existing	Dau Tieng	Sai Gon											
		Dam	Existing	Tri An	Dong Nai											
		Irrigation/Drainage	Resevoirs & Extension	Eight Irrigation Projects										115	362	
		Water supply	Plan	Water Supply Project along Highway No.51									Pipeline			
14	**Cuu Long**	Irrigation/Drainage	Extension/Re-habilitation	-	-	-				-	-			1,487	2,242	
		Flood C.											Dyke embankment for shallow&deep protection			

Table 9.4 Overall Financial Requirement for 14 River Basins (1/2)

Unit : Million VND, Million US$

Description	Period (2002-2020)														
	Bang Giang & KY Cung	Red & Thai Binh	MA	Ca	Thach Han	Huong	Vu Gia-Thu Bon	Tra Khuc	Kone	Ba	Sesan	Srepok	Dong Nai	Cuu Long	Total
1. Multipurpose Dam, A-1															
1.1 Multipurpose Dam, A-1															
- Capital															
Dam & Appurtenant Facilities				6,479,240	2,347,594	1,250,495			735,318		3,183,796				13,996,443
Power Generating Facilities				616,281	471,628	265,501			164,241		651,010				2,168,662
Sub-total	1,722,272	5,742,415	5,454,616	7,095,521	2,819,223	1,515,996	3,641,936	782,029	899,560	4,794,638	3,834,806	4,497,798	13,380,384		56,181,193
Equivalent to US$	114.3	381.1	362.0	470.9	187.1	100.6	241.7	51.9	59.7	318.2	254.5	298.5	888.0		3,728.5
1.2 Flood Control Facilities, A-1															
- Capital															
Dike				141,531	49,341		18,531	2,429	7,555	40,223			12,248		271,857
River Dredging Works				0	1,281,397		493,802		784,816	0					2,560,014
Railway Bridge				0	238,553		42,412		58,202	0					339,167
Road Bridge				0	364,852		83,929		115,176	0					563,956
Diversion Channel				0	0		0		0	0					0
Retarding Basin				0	0		0		0	0					0
Diversion Tunnel				0	0		0		0	0					0
Sub-total				141,531	1,934,143		638,673		965,749	40,223			12,248	1,166,414	4,898,980
Equivalent to US$				9.4	128.4		42.4		64.1	2.7			0.8	77.4	325.1
1.3 Irrigation & Drainage Facilities, A-1															
- Capital															
Rehabilitation incl. Existing Intake Facilities	1,044,212	436,463	2,148,094	2,734,842	258,567	0	528,371	522,106	343,098	3,440,928	683,711	498,040			12,638,433
Improvement of Existing Canals and Structures	406,836	482,685	1,195,796	1,223,522	92,819	993,340	218,044	325,469	233,855	1,081,280	301,360	232,602			6,787,608
Development of New Irrigation System	0	0	33,978	0	0	0	31,331	0	315,072	203,870	0	606,915			1,191,166
New Construction of weir	0	0	0	0	0	0	0	0	171,314	0	0	43,809			215,623
New Construction of Pumping Stations	0	0	0	0	0	0	0	0	57,373	0	0	0			57,373
Sub-total	1,451,048	919,148	3,377,869	3,958,364	351,386	993,340	777,747	847,575	1,121,213	4,726,078	985,071	1,381,365	19,874,692	16,800,820	57,565,715
Equivalent to US$	96.3	61.0	224.2	262.7	23.3	65.9	51.6	56.3	74.4	313.7	65.4	91.7	1,319.0	1,115.0	3,820.4
1.4 Domestic & Industrial Water Supply, A-1															
- Capital	407,397		2,279,204	1,643,364	248,396	755,853	3,080,764	439,265	839,004	1,069,608	398,238	1,046,181			12,207,274
Sub-total	407,397	1,762,956	2,279,204	1,643,364	248,396	755,853	3,080,764	439,265	839,004	1,069,608	398,238	1,046,181	8,076,448	9,010,664	31,057,342
Equivalent to US$	27.0	117.0	151.3	109.1	16.5	50.2	204.5	29.2	55.7	71.0	26.4	69.4	536.0	598.0	2,061.1
Sub-total	3,580,717	8,424,519	11,111,689	12,838,780	5,353,148	3,265,189	8,139,119	2,068,870	3,825,525	10,630,547	5,218,115	6,925,344	41,343,772	26,971,720	149,703,231
Equivalent to US$	237.6	559.1	737.4	852.1	355.3	216.7	540.2	137.3	253.9	705.5	346.3	459.6	2,743.8	1,790.0	9,935.2
2. Multipurpose Dam, A-2															
2.1 Multipurpose Dam, A-2															
- Capital															
Dam & Appurtenant Facilities						346,228									346,228
Power Generating Facilities						105,812									105,812
Sub-total		4,942,304				452,040	1,928,704					60,272			7,383,320
Equivalent to US$		328.0				30.0	128.0					4.0			490.0
2.2 Flood Control Facilities, A-2															
- Capital															
Dike							19,835								19,835
River Dredging Works							528,562								528,562
Railway Bridge							45,397								45,397
Road Bridge							89,837								89,837
Diversion Channel							0								0
Retarding Basin							0								0
Diversion Tunnel							0								0
Sub-total							683,631								683,631
Equivalent to US$							45.4								45.4
2.3 Irrigation & Drainage Facilities, A-2															
- Capital															
Rehabilitation incl. Existing Intake Facilities		450,774					565,565					34,240			1,050,580
Improvement of Existing Canals and Structures		498,510					233,393					15,991			747,894
Development of New Irrigation System		0					33,537					41,725			75,262
New Construction of weir		0					0					3,012			3,012
New Construction of Pumping Stations		0					0					0			0
Sub-total		949,284					832,495					94,969			1,876,748
Equivalent to US$		63.0					55.2					6.3			124.6
2.4 Domestic & Industrial Water Supply, A-2															
- Capital							3,297,629					71,925			3,369,554
Sub-total		1,838,296					3,297,629					71,925			5,207,850
Equivalent to US$		122.0					218.8					4.8			345.6
Sub-total		7,729,884				452,040	6,742,459					227,166			15,151,549
Equivalent to US$		513.0				30.0	447.5					15.1			1,005.5

Table9.4 Overall Financial Requirement for 14 River Basins (2/2)

Description	Bang Giang & KY Cung	Red & Thai Binh	MA	Ca	Thach Han	Huong	Vu Gia-Thu Bon	Tra Khuc	Kone	Ba	Sesan	Srepok	Dong Nai	Cuu Long	Total
3. Multipurpose Dam, A-3															
3.1 Multipurpose Dam, A-3															
- Capital															
Dam & Appurtenant Facilities															0
Power Generating Facilities															0
Sub-total		39,702,673										94,928			39,797,601
Equivalent to US$		2,634.9										6.3			2,641.2
3.2 Irrigation & Drainage Facilities, A-3															
- Capital															
Rehabilitation incl. Existing Intake Facilities		6,146,261										113,615			6,259,876
Improvement of Existing Canals and Structures		6,797,151										53,062			6,850,213
Development of New Irrigation System												138,452			138,452
New Construction of weir												9,994			9,994
New Construction of Pumping Stations												0			0
Sub-total		12,943,412										315,124			13,258,536
Equivalent to US$		859.0										20.9			879.9
3.3 Domestic & Industrial Water Supply, A-3															
- Capital												238,660			238,660
Sub-total		24,967,676										238,660			25,206,336
Equivalent to US$		1,657.0										15.8			1,672.8
Sub-total		77,613,761										648,712			78,262,473
Equivalent to US$		5,150.9										43.1			5,194.0
4. Multipurpose Dam, A-4															
4.1 Multipurpose Dam, A-4															
- Capital															
Dam & Appurtenant Facilities															0
Power Generating Facilities															0
Sub-total												102,462			102,462
Equivalent to US$												6.8			6.8
4.2 Irrigation & Drainage Facilities, A-4															
- Capital															
Rehabilitation incl. Existing Intake Facilities												132,292			132,292
Improvement of Existing Canals and Structures												61,785			61,785
Development of New Irrigation System												161,212			161,212
New Construction of weir												11,637			11,637
New Construction of Pumping Stations												0			0
Sub-total												366,925			366,925
Equivalent to US$												24.4			24.4
4.3 Domestic & Industrial Water Supply, A-4															
- Capital												277,892			277,892
Sub-total												277,892			277,892
Equivalent to US$												18.4			18.4
Equivalent to US$												65.4			65.4
Total	3,580,717	93,768,164	11,111,689	12,838,780	5,353,148	3,717,229	14,881,578	2,068,870	3,825,525	10,630,547	5,218,115	8,787,162	41,343,772	26,971,720	175,781,524
Name of Dam :															
Multipurpose Dam A-1	Ban Lai	Bac Me	Cua Dat	Ban La	Rao Quan	Ta Trach	Ho Song Tranh	Nuoc Trong	Dinh Binh	Song Ba Ha	Dak Bla	Buon Kuop - Chupong	Dong Nai Basin	Cuu Long Delta Development	
Multipurpose Dam A-2		Dai Thia					Song Cai					Krong Boung			
Multipurpose Dam A-3		Son La										Upper Krong Pach			
Multipurpose Dam A-4												Upper Krong Buk			

Note:
(1) Constant price of December, 2001
(2) Exchange rate : US$ 1.0=VND 15,068=\123.39
(3) The above costs are referred from the National Hydropower Plan Study, Vietnam Sep. 1999, Red River Delta Master Plan 1995, Mekong Delta Master Plan 1991, on-going projects and other survey data.

Table 9.5 Results of Flood Damage Assessment, November 1999 (1/2)
(Source: General Statistical Office of Thua Thien Hue Province)

FROM NOVEMBER, 1st TO 6th, 1999

A. HUMAN DAMAGE
1. Dead: 352 people (357)
2. Lost: 11 people (12)
3. Injured: 305 people

CRITERIA	UNIT	QUANTITY	TOTAL (MILLION VND)
A	B	1	2
A. Flood, storm prevention structure and infrastructure		**x**	**481,123**
I. Flood and storm prevention structure		x	76,501
1. Length of bursted, floated dykes	m	20,270	x
2. Length of eroded dykes	m	132,250	x
3. Estimated quantity of landslide	m^3	595,750	14,893
4. Length of broken, floated revetment	m	1,930	x
5. Estimated quantity of floated dyke	m^3	28,950	44,343
6. Estimated quantity of eroded, floated concrete	m^3	28,776	17,266
II. Water resources		x	58,293
7. Destroyed culvert…	unit	218	14,649
8. Damaged culvert…	unit	247	7,167
9. Damaged, destroyed pumping station	unit	124	874
10. Length of eroded, floated canal	m	449,955	x
11. Estimated quantity of landslide..	m^3	959,332	23,332
12. Estimated quantity of stone slide…	m^3	218,595	6,132
13. Estimated eroded concrete	m^3	16,542	6,140
III. Transportation and fishery		x	293,082
14. Destroyed, sunk boats and ships	unit	1,431	15,240
15. Damaged boats and ships	unit	1,175	8,048
16. Lost boats and ships	unit	256	x
17. Destroyed bridges and culverts	unit	384	18,239
18. Damaged bridges and culverts	unit	1,369	8,860
19. Length of eroded, floated road	m	395,147	22,841
20.Length of inundated road	m	220,700	x
21. Estimated quantity of eroded, floated land, stone, concrete...	m^3	1,126,801	42,371
22. Destroyed, floated cars	unit	9	15
23. Damaged cars	unit	150	322
24. Other damage to transportation		x	27,146
Managed by transportation department	**million VND**		**150,000**
IV. Electricity and post office		x	53,248
Electricity	million VND	x	28,248
Post office	million VND	x	25,000
Of which:			
24. Collapsed mid and high voltage pole	pole	273	143
25. Collapsed low voltage pole	pole	624	945
26. Inundated and damaged transformer station	station	256	4,280
27. Collapsed communication pole	pole	469	237
28. Floated communication wire	km	83	4,210
B. DAMAGE TO BUSINESS		**x**	**523,549**
29. Inundated, damaged paddy area	ha	345	x
29.1. Of which, dead loss area	ha	255	1,398
30. Inundated, damaged sown area	ha	241	28
31. Inundated, damaged subsidiary crop	ha	4,450	x
31.1. Of which, dead loss area	ha	3,963	8,322
32. Damaged fruit trees area	ha	2,077	10,383
33. Inundated, damaged industrial plants	ha	2,299	9,461
34. Damaged protective forest area	ha	5,154	23,646
35. Damaged seedling garden	ha	526	10,200
36. Dead buffalo and cows	head	5,062	11,342
37. Dead pigs	head	86,862	45,460
38. Damaged livestock, poultry	head	869,872	23,316
39. Damaged aquaculture area	ha	2,459	32,852
40. Amount of damaged factories, warehouse, restaurant, shop, and others for manufacture and business.	unit	729	2,479
41.Floated machines, devices, materials and products			10,130
_ Destroyed agricultural machines	unit	330	574
_ Inundated, damaged pumping machines	unit	125	506
_ Inundated, damaged fertilizer	ton	1,258	2,515
_ Inundated, floated pesticide	ton	8	611
_ Paddy	ton	4,199	7,558

Table 9.5 Results of Flood Damage Assessment, November 1999 (2/2)
(Source: General Statistical Office of Thua Thien Hue Province)

FROM NOVEMBER, 1st TO 6th, 1999

A. HUMAN DAMAGE

1. Dead: 352 people (357)
2. Lost: 11 people (12)
3. Injured: 305 people

CRITERIA	UNIT	QUANTITY	TOTAL (MILLION VND)
A	B	1	2
_ Rice	ton	139	411
_Wet, floated cement	ton	919	16
_ Fishing devices: Fish net	ton	2,742	
_ Net	ton	127	30,930
_ Say	unit	50,700	
_ Lost fish of all kinds	ton	293	
_ Fish breed	million heads	4	11,529
_ Other kinds of fish	ton	290	
_ Others		x	46,631
42. Amount of each wet, inundated, but can be recovered machine, device, material, product			53,940
_ Paddy	ton	15,656	28,180
_ Cement	ton	500	400
_ Foods of all kinds	ton	110	1,620
_ Petrol of all kinds	litre	50,000	200
_ Others		x	23,540
Damage of sectors in provincial level	million VND		189,442
_ Industry	million VND		100,978
_ Service	million VND		58,400
_ Tourism	million VND		15,000
_ Construction	million VND		15,064
C. DAMAGE TO WELFARE, CULTURAL STRUCTURE		**x**	**86,227**
_ Damage to cultural sector	million VND		20,516
_ Damage to health care	million VND		20,000
_ Damage to education	million VND		45,712
Of which:			
43. Collapsed, floated classroom	classroom	126	
44. Inundated, damaged classroom	classroom	938	
45. Inundated, floated clinics, hospitals	room	45	
46. Partly damaged clinics, hospitals	room	192	
47. Other damaged cultural, welfare constructions, included:			
_ Floated desks, chairs	set		
_ Books and learning aids			
_ Drugs and medical device			
_ Others			
D. DAMAGED HOUSES		**x**	**235,922**
48. Collapsed, floated houses	house	12,390	112,872
49. Inundated houses	house	152,024	30,405
50. Eroded, non-roof houses	house	15,853	92,645
E. ECOLOGICAL ENVIRONMENT AND LIVELIHOOD			
51. Homeless people because of collapsed or floated houses	person	71,876	x
52. Temporarily homeless because of inundation	person	66,686	x
53. Inundated residential area because of pesticide, petrol, fertilizer, toxic chemicals…	km^2	262	x
F. OTHER DAMAGED ASSETS (IF ANY)		**x**	**419,585**
_ Wet and floated paddy, including seedling paddy	ton	78,987	126,379
_ Petrol of all kinds	litre	4,850	17
_ Subsidiary crop	ton		1,018
_ Floated Vinh Hien estuary		788	35,000
_ Others		x	225,369
Administration and armament		x	31,803
_ Administration	million VND		25,303
_ Armament	million VND		6,500
G. ESTIMATED TOTAL DAMAGE			**1,746,406**
H. INITIALLY FLOOD, STORM DAMAGE RECOVERY			
1. Human and asset safeguard			
_ Rescued people			
_ Rescued asset			
_ …			
2. Relief, support and stabilization			
_ Supported people	person		
_ Supported sum	million VND		

Table 9.6 Estimation of Probable Flood Damage (1/14)
(Ma River Basin, Without Project)

(1) Estimation of Flood Damage by Magnitude of Flood

Unit: VND Million

River System	Return Period (Year)	Early Flood			Major Flood								Total
		Crops			1. House			2. River facilities and infrastructure /1	3. Business activities /2	4. Welfare and cultural facilities /3	5. Other /4	Sub-total	
		Paddy	Upland crop	Sub-total	House	Household durable goods	Sub-total						
	a	b	c	d=b+c	e	f	g=e+f	h=g x 33%	i=g x 36%	j=g x 6%	k=g x 29%	l=g+h+i+j+k	m=d+l
Huong River	2	-	-	-	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-	-	-	-
	10	-	-	-	-	-	-	-	-	-	-	-	-
	20	-	-	-	-	-	-	-	-	-	-	-	-
	50	-	-	-	2,848	234	3,082	1,017	1,110	185	894	6,288	6,288
	100	-	-	-	33,959	3,683	37,642	12,422	13,551	2,259	10,916	76,790	76,790

Note: /1 This item includes the damages to the facilitiies for flood prevention, water utilization, transportation, fishery, electricity, and post office.
/2 This item includes the damages to crops, forest, livestock, aquaculture, factories, shops, offices, machines, materials, and products.
/3 This item includes the damages to the facilities for cultural sector, health care, and education.
/4 This item includes the damages to administrative sector, armaments, and others.

(2) Estimation of Annual Mean Flood Damage

River System	Return Period	Exceedance	Difference of Exceedance	Damage (VND Million)		Annual Damage (VND Million)		Equivalent US$ million
				Amount	Mean	Segment	Cumulative	
Huong River	-	1.00						
	2	0.50	0.50	-	-	-	-	-
	5	0.20	0.30	-	-	-	-	-
	10	0.10	0.10	-	-	-	-	-
	20	0.05	0.05	-	-	-	-	-
	50	0.02	0.03	6,288	3,144	94	94	0.01
	100	0.010	0.01	76,790	41,539	415	510	0.03

Table 9.6 Estimation of Probable Flood Damage (2/14)
(Ma River Basin, With Project)

(1) Estimation of Flood Damage by Magnitude of Flood

Unit: VND Million

River System	Return Period (Year)	Early Flood			Major Flood								Total
		Crops			1. House			2. River facilities and infrastructure /1	3. Business activities /2	4. Welfare and cultural facilities /3	5. Other /4	Sub-total	
		Paddy	Upland crop	Sub-total	House	Household durable goods	Sub-total						
	a	b	c	d=b+c	e	f	g=e+f	h=g x 33%	i=g x 36%	j=g x 6%	k=g x 29%	l=g+h+i+j+k	m=d+l
Huong River	2	-	-	-	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-	-	-	-
	10	-	-	-	-	-	-	-	-	-	-	-	-
	20	-	-	-	-	-	-	-	-	-	-	-	-
	50	-	-	-	-	-	-	-	-	-	-	-	-
	100	-	-	-	-	-	-	-	-	-	-	-	-

Note: /1 This item includes the damages to the facilitiies for flood prevention, water utilization, transportation, fishery, electricity, and post office.
/2 This item includes the damages to crops, forest, livestock, aquaculture, factories, shops, offices, machines, materials, and products.
/3 This item includes the damages to the facilities for cultural sector, health care, and education.
/4 This item includes the damages to administrative sector, armaments, and others.

(2) Estimation of Annual Mean Flood Damage

River System	Return Period	Exceedance	Difference of Exceedance	Damage (VND Million)		Annual Damage (VND Million)		Equivalent US$ million
				Amount	Mean	Segment	Cumulative	
Huong River	-	1.00						
	2	0.50	0.50	-	-	-	-	-
	5	0.20	0.30	-	-	-	-	-
	10	0.10	0.10	-	-	-	-	-
	20	0.05	0.05	-	-	-	-	-
	50	0.02	0.03	-	-	-	-	-
	100	0.010	0.01	-	-	-	-	-

Table 9.6 Estimation of Probable Flood Damage (3/14)
(Thach Han River Basin, Without Project)

(1) Estimation of Flood Damage by Magnitude of Flood

Unit: VND Million

River System	Return Period (Year)	Early Flood			Major Flood								Total
		Crops			1. House			2. River facilities and infrastructure /1	3. Business activities /2	4. Welfare and cultural facilities /3	5. Other /4	Sub-total	
		Paddy	Upland crop	Sub-total	House	Household durable goods	Sub-total						
	a	b	c	d=b+c	e	f	g=e+f	h=g x 33%	i=g x 36%	j=g x 6%	k=g x 29%	l=g+h+i+j+k	m=d+l
Huong River	2	-	-	-	-	-	-	-	-	-	-	-	-
	5	13,001	-	13,001	96,862	10,820	107,682	35,535	38,766	6,461	31,228	219,672	232,673
	10	18,343	-	18,343	140,927	15,801	156,728	51,720	56,422	9,404	45,451	319,725	338,068
	20	18,343	-	18,343	174,847	19,505	194,352	64,136	69,967	11,661	56,362	396,478	414,821
	50	18,343	-	18,343	230,108	26,016	256,124	84,521	92,205	15,367	74,276	522,493	540,836
	100	18,343	-	18,343	286,594	32,119	318,713	105,175	114,737	19,123	92,427	650,175	668,518

Note: /1 This item includes the damages to the facilitiies for flood prevention, water utilization, transportation, fishery, electricity, and post office.
/2 This item includes the damages to crops, forest, livestock, aquaculture, factories, shops, offices, machines, materials, and products.
/3 This item includes the damages to the facilities for cultural sector, health care, and education.
/4 This item includes the damages to administrative sector, armaments, and others.

(2) Estimation of Annual Mean Flood Damage

River System	Return Period	Exceedance	Difference of Exceedance	Damage (VND Million)		Annual Damage (VND Million)		Equivalent US$ million
				Amount	Mean	Segment	Cumulative	
Huong River	-	1.00						
	2	0.50	0.50	-	-	-	-	-
	5	0.20	0.30	232,673	116,337	34,901	34,901	2.32
	10	0.10	0.10	338,068	285,371	28,537	63,438	4.21
	20	0.05	0.05	414,821	376,445	18,822	82,260	5.46
	50	0.02	0.03	540,836	477,829	14,335	96,595	6.41
	100	0.010	0.01	668,518	604,677	6,047	102,642	6.81

Table 9.6 Estimation of Probable Flood Damage (4/14)
(Thach Han River Basin, With Project)

(1) Estimation of Flood Damage by Magnitude of Flood

Unit: VND Million

River System	Return Period (Year)	Early Flood			Major Flood								Total
		Crops			1. House			2. River facilities and infrastructure /1	3. Business activities /2	4. Welfare and cultural facilities /3	5. Other /4	Sub-total	
		Paddy	Upland crop	Sub-total	House	Household durable goods	Sub-total						
	a	b	c	d=b+c	e	f	g=e+f	h=g x 33%	i=g x 36%	j=g x 6%	k=g x 29%	l=g+h+i+j+k	m=d+l
Huong River	2	-	-	-	-	-	-	-	-	-	-	-	-
	5	4,236	-	4,236	25,269	3,451	28,720	9,478	10,339	1,723	8,329	58,589	62,825
	10	7,312	-	7,312	54,481	6,147	60,628	20,007	21,826	3,638	17,582	123,681	130,993
	20	7,312	-	7,312	58,660	6,606	65,266	21,538	23,496	3,916	18,927	133,143	140,455
	50	7,312	-	7,312	64,484	7,291	71,775	23,686	25,839	4,307	20,815	146,422	153,734
	100	7,312	-	7,312	72,843	8,208	81,051	26,747	29,178	4,863	23,505	165,344	172,656

Note: /1 This item includes the damages to the facilitiies for flood prevention, water utilization, transportation, fishery, electricity, and post office.
/2 This item includes the damages to crops, forest, livestock, aquaculture, factories, shops, offices, machines, materials, and products.
/3 This item includes the damages to the facilities for cultural sector, health care, and education.
/4 This item includes the damages to administrative sector, armaments, and others.

(2) Estimation of Annual Mean Flood Damage

River System	Return Period	Exceedance	Difference of Exceedance	Damage (VND Million)		Annual Damage (VND Million)		Equivalent US$ million
				Amount	Mean	Segment	Cumulative	
Huong River	-	1.00						
	2	0.50	0.50	-	-	-	-	-
	5	0.20	0.30	62,825	31,413	9,424	9,424	0.63
	10	0.10	0.10	130,993	96,909	9,691	19,115	1.27
	20	0.05	0.05	140,455	135,724	6,786	25,901	1.72
	50	0.02	0.03	153,734	147,095	4,413	30,314	2.01
	100	0.010	0.01	172,656	163,195	1,632	31,946	2.12

Table 9.6 Estimation of Probable Flood Damage (5/14)
(Huong River Basin, Without Project)

(1) Estimation of Flood Damage by Magnitude of Flood

Unit: VND Million

River System	Return Period (Year)	Early Flood			Major Flood								Total
		Crops			1. House			2. River facilities and infrastructure /1	3. Business activities /2	4. Welfare and cultural facilities /3	5. Other /4	Sub-total	
		Paddy	Upland crop	Sub-total	House	Household durable goods	Sub-total						
	a	b	c	d=b+c	e	f	g=e+f	h=g x 33%	i=g x 36%	j=g x 6%	k=g x 29%	l=g+h+i+j+k	m=d+l
Huong River	2	-	-	-	108,522	10,430	118,952	39,254	42,823	7,137	34,496	242,662	242,662
	5	2,767	-	2,767	295,193	33,738	328,931	108,547	118,415	19,736	95,390	671,019	673,786
	10	5,489	-	5,489	501,476	70,981	572,457	188,911	206,085	34,347	166,013	1,167,813	1,173,302
	20	5,489	-	5,489	841,726	142,769	984,495	324,883	354,418	59,070	285,504	2,008,370	2,013,859
	50	5,489	-	5,489	1,208,585	208,660	1,417,245	481,123	523,549	86,227	419,585	2,927,729	2,933,218
	100	5,489	-	5,489	1,670,088	283,924	1,954,012	644,824	703,444	117,241	566,663	3,986,184	3,991,673

Note: /1 This item includes the damages to the facilitiies for flood prevention, water utilization, transportation, fishery, electricity, and post office.
/2 This item includes the damages to crops, forest, livestock, aquaculture, factories, shops, offices, machines, materials, and products.
/3 This item includes the damages to the facilities for cultural sector, health care, and education.
/4 This item includes the damages to administrative sector, armaments, and others.

(2) Estimation of Annual Mean Flood Damage

River System	Return Period	Exceedance	Difference of Exceedance	Damage (VND Million)		Annual Damage (VND Million)		Equivalent US$ million
				Amount	Mean	Segment	Cumulative	
Huong River	-	1.00						
	2	0.50	0.50	242,662	121,331	60,666	60,666	4.03
	5	0.20	0.30	673,786	458,224	137,467	198,133	13.15
	10	0.10	0.10	1,173,302	923,544	92,354	290,487	19.28
	20	0.05	0.05	2,013,859	1,593,581	79,679	370,166	24.57
	50	0.02	0.03	2,933,218	2,473,539	74,206	444,372	29.49
	100	0.010	0.01	3,991,673	3,462,446	34,624	478,997	31.79

Table 9.6 Estimation of Probable Flood Damage (6/14)
(Huong River Basin, With Project)

(1) Estimation of Flood Damage by Magnitude of Flood

Unit: VND Million

River System	Return Period (Year)	Early Flood			Major Flood								Total
		Crops			1. House			2. River facilities and infrastructure /1	3. Business activities /2	4. Welfare and cultural facilities /3	5. Other /4	Sub-total	
		Paddy	Upland crop	Sub-total	House	Household durable goods	Sub-total						
	a	b	c	d=b+c	e	f	g=e+f	h=g x 33%	i=g x 36%	j=g x 6%	k=g x 29%	l=g+h+i+j+k	m=d+l
Huong River	2	-	-	-	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-	-	-	-
	10	-	-	-	-	-	-	-	-	-	-	-	-
	20	-	-	-	13,857	1,612	15,469	5,105	5,569	928	4,486	31,557	31,557
	50	-	-	-	72,649	6,837	79,486	26,230	28,615	4,769	23,051	162,151	162,151
	100	-	-	-	184,617	18,716	203,333	67,100	73,200	12,200	58,967	414,800	414,800

Note: /1 This item includes the damages to the facilitiies for flood prevention, water utilization, transportation, fishery, electricity, and post office.
/2 This item includes the damages to crops, forest, livestock, aquaculture, factories, shops, offices, machines, materials, and products.
/3 This item includes the damages to the facilities for cultural sector, health care, and education.
/4 This item includes the damages to administrative sector, armaments, and others.

(2) Estimation of Annual Mean Flood Damage

River System	Return Period	Exceedance	Difference of Exceedance	Damage (VND Million)		Annual Damage (VND Million)		Equivalent US$ million
				Amount	Mean	Segment	Cumulative	
Huong River	-	1.00						
	2	0.50	0.50	-	-	-	-	-
	5	0.20	0.30	-	-	-	-	-
	10	0.10	0.10	-	-	-	-	-
	20	0.05	0.05	31,557	15,779	789	789	0.05
	50	0.02	0.03	162,151	96,854	2,906	3,695	0.25
	100	0.010	0.01	414,800	288,476	2,885	6,579	0.44

Table 9.6 Estimation of Probable Flood Damage (7/14)
(Vu Gia-Thu Bon River Basin, Without Project)

(1) Estimation of Flood Damage by Magnitude of Flood

Unit: VND Million

River System	Return Period (Year)	Early Flood			Major Flood								Total
		Crops			1. House			2. River facilities and infrastructure /1	3. Business activities /2	4. Welfare and cultural facilities /3	5. Other /4	Sub-total	
		Paddy	Upland crop	Sub-total	House	Household durable goods	Sub-total						
	a	b	c	d=b+c	e	f	g=e+f	h=g x 33%	i=g x 36%	j=g x 6%	k=g x 29%	l=g+h+i+j+k	m=d+l
Huong River	2	-	-	-	-	-	-	-	-	-	-	-	-
	5	12,075	-	12,075	75,689	13,225	88,914	29,342	32,009	5,335	25,785	181,385	193,460
	10	14,497	-	14,497	91,048	16,142	107,190	35,373	38,588	6,431	31,085	218,667	233,164
	20	14,497	-	14,497	163,561	28,324	191,885	63,322	69,079	11,513	55,647	391,446	405,943
	50	14,497	-	14,497	527,655	91,019	618,674	204,162	222,723	37,120	179,415	1,262,094	1,276,591
	100	14,497	-	14,497	979,269	170,998	1,150,267	379,588	414,096	69,016	333,577	2,346,544	2,361,041

Note: /1 This item includes the damages to the facilitiies for flood prevention, water utilization, transportation, fishery, electricity, and post office.
/2 This item includes the damages to crops, forest, livestock, aquaculture, factories, shops, offices, machines, materials, and products.
/3 This item includes the damages to the facilities for cultural sector, health care, and education.
/4 This item includes the damages to administrative sector, armaments, and others.

(2) Estimation of Annual Mean Flood Damage

River System	Return Period	Exceedance	Difference of Exceedance	Damage (VND Million)		Annual Damage (VND Million)		Equivalent US$ million
				Amount	Mean	Segment	Cumulative	
Huong River	-	1.00						
	2	0.50	0.50	-	-	-	-	-
	5	0.20	0.30	193,460	96,730	29,019	29,019	1.93
	10	0.10	0.10	233,164	213,312	21,331	50,350	3.34
	20	0.05	0.05	405,943	319,554	15,978	66,328	4.40
	50	0.02	0.03	1,276,591	841,267	25,238	91,566	6.08
	100	0.010	0.01	2,361,041	1,818,816	18,188	109,754	7.28

Table 9.6 Estimation of Probable Flood Damage (8/14)
(Vu Gia-Thu Bon River Basin, With Project)

(1) Estimation of Flood Damage by Magnitude of Flood

Unit: VND Million

River System	Return Period (Year)	Early Flood			Major Flood								Total
		Crops			1. House			2. River facilities and infrastructure /1	3. Business activities /2	4. Welfare and cultural facilities /3	5. Other /4	Sub-total	
		Paddy	Upland crop	Sub-total	House	Household durable goods	Sub-total						
	a	b	c	d=b+c	e	f	g=e+f	h=g x 33%	i=g x 36%	j=g x 6%	k=g x 29%	l=g+h+i+j+k	m=d+l
Huong River	2	-	-	-	-	-	-	-	-	-	-	-	-
	5	8,928	-	8,928	56,546	9,903	66,449	21,928	23,922	3,987	19,270	135,556	144,484
	10	9,108	-	9,108	57,671	10,152	67,823	22,382	24,416	4,069	19,669	138,359	147,467
	20	9,108	-	9,108	69,619	12,099	81,718	26,967	29,418	4,903	23,698	166,704	175,812
	50	9,108	-	9,108	75,575	13,136	88,711	29,275	31,936	5,323	25,726	180,971	190,079
	100	9,108	-	9,108	81,547	14,239	95,786	31,609	34,483	5,747	27,778	195,403	204,511

Note: /1 This item includes the damages to the facilitiies for flood prevention, water utilization, transportation, fishery, electricity, and post office.
/2 This item includes the damages to crops, forest, livestock, aquaculture, factories, shops, offices, machines, materials, and products.
/3 This item includes the damages to the facilities for cultural sector, health care, and education.
/4 This item includes the damages to administrative sector, armaments, and others.

(2) Estimation of Annual Mean Flood Damage

River System	Return Period	Exceedance	Difference of Exceedance	Damage (VND Million)		Annual Damage (VND Million)		Equivalent US$ million
				Amount	Mean	Segment	Cumulative	
Huong River	-	1.00						
	2	0.50	0.50	-	-	-	-	-
	5	0.20	0.30	144,484	72,242	21,673	21,673	1.44
	10	0.10	0.10	147,467	145,976	14,598	36,270	2.41
	20	0.05	0.05	175,812	161,640	8,082	44,352	2.94
	50	0.02	0.03	190,079	182,946	5,488	49,840	3.31
	100	0.010	0.01	204,511	197,295	1,973	51,813	3.44

Table 9.6 Estimation of Probable Flood Damage (9/14)
(Tra Khuc River Basin, Without Project)

(1) Estimation of Flood Damage by Magnitude of Flood

Unit: VND Million

River System	Return Period (Year)	Early Flood			Major Flood								Total
		Crops			1. House			2. River facilities and infrastructure /1	3. Business activities /2	4. Welfare and cultural facilities /3	5. Other /4	Sub-total	
		Paddy	Upland crop	Sub-total	House	Household durable goods	Sub-total						
	a	b	c	d=b+c	e	f	g=e+f	h=g x 33%	i=g x 36%	j=g x 6%	k=g x 29%	l=g+h+i+j+k	m=d+l
Huong River	2	-	-	-	-	-	-	-	-	-	-	-	-
	5	16,556	-	16,556	282,252	49,924	332,176	109,618	119,583	19,931	96,331	677,639	694,195
	10	22,716	-	22,716	384,000	68,808	452,808	149,427	163,011	27,168	131,314	923,728	946,444
	20	22,716	-	22,716	502,367	89,225	591,592	195,225	212,973	35,496	171,562	1,206,848	1,229,564
	50	22,716	-	22,716	706,495	125,787	832,282	274,653	299,622	49,937	241,362	1,697,856	1,720,572
	100	22,716	-	22,716	1,052,018	186,898	1,238,916	408,842	446,010	74,335	359,286	2,527,389	2,550,105

Note: /1 This item includes the damages to the facilitiies for flood prevention, water utilization, transportation, fishery, electricity, and post office.
/2 This item includes the damages to crops, forest, livestock, aquaculture, factories, shops, offices, machines, materials, and products.
/3 This item includes the damages to the facilities for cultural sector, health care, and education.
/4 This item includes the damages to administrative sector, armaments, and others.

(2) Estimation of Annual Mean Flood Damage

River System	Return Period	Exceedance	Difference of Exceedance	Damage (VND Million)		Annual Damage (VND Million)		Equivalent US$ million
				Amount	Mean	Segment	Cumulative	
Huong River	-	1.00						
	2	0.50	0.50	-	-	-	-	-
	5	0.20	0.30	694,195	347,098	104,129	104,129	6.91
	10	0.10	0.10	946,444	820,320	82,032	186,161	12.35
	20	0.05	0.05	1,229,564	1,088,004	54,400	240,561	15.97
	50	0.02	0.03	1,720,572	1,475,068	44,252	284,813	18.90
	100	0.010	0.01	2,550,105	2,135,339	21,353	306,167	20.32

Table 9.6 Estimation of Probable Flood Damage (10/14)
(Tra Khuc River Basin, With Project)

(1) Estimation of Flood Damage by Magnitude of Flood

Unit: VND Million

River System	Return Period (Year)	Early Flood			Major Flood								Total
		Crops			1. House			2. River facilities and infrastructure /1	3. Business activities /2	4. Welfare and cultural facilities /3	5. Other /4	Sub-total	
		Paddy	Upland crop	Sub-total	House	Household durable goods	Sub-total						
	a	b	c	d=b+c	e	f	g=e+f	h=g x 33%	i=g x 36%	j=g x 6%	k=g x 29%	l=g+h+i+j+k	m=d+l
Huong River	2	-	-	-	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-	-	-	-
	10	4,327	-	4,327	55,172	11,761	66,933	22,088	24,096	4,016	19,411	136,544	140,871
	20	4,327	-	4,327	210,127	37,339	247,466	81,664	89,088	14,848	71,765	504,831	509,158
	50	4,327	-	4,327	354,666	63,875	418,541	138,119	150,675	25,112	121,377	853,824	858,151
	100	4,327	-	4,327	473,176	83,983	557,159	183,862	200,577	33,430	161,576	1,136,604	1,140,931

Note: /1 This item includes the damages to the facilitiies for flood prevention, water utilization, transportation, fishery, electricity, and post office.
/2 This item includes the damages to crops, forest, livestock, aquaculture, factories, shops, offices, machines, materials, and products.
/3 This item includes the damages to the facilities for cultural sector, health care, and education.
/4 This item includes the damages to administrative sector, armaments, and others.

(2) Estimation of Annual Mean Flood Damage

River System	Return Period	Exceedance	Difference of Exceedance	Damage (VND Million)		Annual Damage (VND Million)		Equivalent US$ million
				Amount	Mean	Segment	Cumulative	
Huong River	-	1.00						
	2	0.50	0.50	-	-	-	-	-
	5	0.20	0.30	-	-	-	-	-
	10	0.10	0.10	140,871	70,436	7,044	7,044	0.47
	20	0.05	0.05	509,158	325,015	16,251	23,294	1.55
	50	0.02	0.03	858,151	683,655	20,510	43,804	2.91
	100	0.010	0.01	1,140,931	999,541	9,995	53,799	3.57

Table 9.6 Estimation of Probable Flood Damage (11/14)
(Kone River Basin, Without Project)

(1) Estimation of Flood Damage by Magnitude of Flood

Unit: VND Million

River System	Return Period (Year)	Early Flood			Major Flood								Total
		Crops			1. House			2. River facilities and infrastructure /1	3. Business activities /2	4. Welfare and cultural facilities /3	5. Other /4	Sub-total	
		Paddy	Upland crop	Sub-total	House	Household durable goods	Sub-total						
	a	b	c	d=b+c	e	f	g=e+f	h=g x 33%	i=g x 36%	j=g x 6%	k=g x 29%	l=g+h+i+j+k	m=d+l
Huong River	2	-	-	-	-	-	-	-	-	-	-	-	-
	5	16,112	-	16,112	293,451	44,323	337,774	111,465	121,599	20,266	97,954	689,058	705,170
	10	19,377	-	19,377	345,879	51,818	397,697	131,240	143,171	23,862	115,332	811,302	830,679
	20	19,377	-	19,377	402,619	60,447	463,066	152,812	166,704	27,784	134,289	944,655	964,032
	50	19,377	-	19,377	482,039	73,282	555,321	183,256	199,916	33,319	161,043	1,132,855	1,152,232
	100	19,377	-	19,377	563,235	85,010	648,245	213,921	233,368	38,895	187,991	1,322,420	1,341,797

Note: /1 This item includes the damages to the facilitiies for flood prevention, water utilization, transportation, fishery, electricity, and post office.
/2 This item includes the damages to crops, forest, livestock, aquaculture, factories, shops, offices, machines, materials, and products.
/3 This item includes the damages to the facilities for cultural sector, health care, and education.
/4 This item includes the damages to administrative sector, armaments, and others.

(2) Estimation of Annual Mean Flood Damage

River System	Return Period	Exceedance	Difference of Exceedance	Damage (VND Million)		Annual Damage (VND Million)		Equivalent US$ million
				Amount	Mean	Segment	Cumulative	
Huong River	-	1.00						
	2	0.50	0.50	-	-	-	-	-
	5	0.20	0.30	705,170	352,585	105,776	105,776	7.02
	10	0.10	0.10	830,679	767,925	76,792	182,568	12.12
	20	0.05	0.05	964,032	897,356	44,868	227,436	15.09
	50	0.02	0.03	1,152,232	1,058,132	31,744	259,180	17.20
	100	0.010	0.01	1,341,797	1,247,015	12,470	271,650	18.03

Table 9.6 Estimation of Probable Flood Damage (12/14)
(Kone River Basin, With Project)

(1) Estimation of Flood Damage by Magnitude of Flood

Unit: VND Million

River System	Return Period (Year)	Early Flood			Major Flood								Total
		Crops			1. House			2. River facilities and infrastructure /1	3. Business activities /2	4. Welfare and cultural facilities /3	5. Other /4	Sub-total	
		Paddy	Upland crop	Sub-total	House	Household durable goods	Sub-total						
	a	b	c	d=b+c	e	f	g=e+f	h=g x 33%	i=g x 36%	j=g x 6%	k=g x 29%	l=g+h+i+j+k	m=d+l
Huong River	2	-	-	-	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-	-	-	-
	10	-	-	-	-	-	-	-	-	-	-	-	-
	20	-	-	-	20,482	4,375	24,857	8,203	8,949	1,491	7,209	50,709	50,709
	50	-	-	-	108,826	16,334	125,160	41,303	45,058	7,510	36,296	255,327	255,327
	100	-	-	-	165,675	24,901	190,576	62,890	68,607	11,435	55,267	388,775	388,775

Note: /1 This item includes the damages to the facilitiies for flood prevention, water utilization, transportation, fishery, electricity, and post office.
/2 This item includes the damages to crops, forest, livestock, aquaculture, factories, shops, offices, machines, materials, and products.
/3 This item includes the damages to the facilities for cultural sector, health care, and education.
/4 This item includes the damages to administrative sector, armaments, and others.

(2) Estimation of Annual Mean Flood Damage

River System	Return Period	Exceedance	Difference of Exceedance	Damage (VND Million)		Annual Damage (VND Million)		Equivalent US$ million
				Amount	Mean	Segment	Cumulative	
Huong River	-	1.00						
	2	0.50	0.50	-	-	-	-	-
	5	0.20	0.30	-	-	-	-	-
	10	0.10	0.10	-	-	-	-	-
	20	0.05	0.05	50,709	25,355	1,268	1,268	0.08
	50	0.02	0.03	255,327	153,018	4,591	5,858	0.39
	100	0.010	0.01	388,775	322,051	3,221	9,079	0.60

Table 9.6 Estimation of Probable Flood Damage (13/14)
(Ba River Basin, Without Project)

(1) Estimation of Flood Damage by Magnitude of Flood

Unit: VND Million

River System	Return Period (Year)	Early Flood			Major Flood								Total
		Crops			1. House			2. River facilities and infrastructure /1	3. Business activities /2	4. Welfare and cultural facilities /3	5. Other /4	Sub-total	
		Paddy	Upland crop	Sub-total	House	Household durable goods	Sub-total						
	a	b	c	d=b+c	e	f	g=e+f	h=g x 33%	i=g x 36%	j=g x 6%	k=g x 29%	l=g+h+i+j+k	m=d+l
Huong River	2	-	-	-	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-	-	-	-
	10	4,191	-	4,191	25,206	6,067	31,273	10,320	11,258	1,876	9,069	63,796	67,987
	20	4,191	-	4,191	101,613	19,739	121,352	40,046	43,687	7,281	35,192	247,558	251,749
	50	4,191	-	4,191	209,902	40,809	250,711	82,735	90,256	15,043	72,706	511,451	515,642
	100	4,191	-	4,191	340,760	66,985	407,745	134,556	146,788	24,465	118,246	831,800	835,991

Note: /1 This item includes the damages to the facilitiies for flood prevention, water utilization, transportation, fishery, electricity, and post office.
/2 This item includes the damages to crops, forest, livestock, aquaculture, factories, shops, offices, machines, materials, and products.
/3 This item includes the damages to the facilities for cultural sector, health care, and education.
/4 This item includes the damages to administrative sector, armaments, and others.

(2) Estimation of Annual Mean Flood Damage

River System	Return Period	Exceedance	Difference of Exceedance	Damage (VND Million)		Annual Damage (VND Million)		Equivalent US$ million
				Amount	Mean	Segment	Cumulative	
Huong River	-	1.00						
	2	0.50	0.50	-	-	-	-	-
	5	0.20	0.30	-	-	-	-	-
	10	0.10	0.10	67,987	33,994	3,399	3,399	0.23
	20	0.05	0.05	251,749	159,868	7,993	11,393	0.76
	50	0.02	0.03	515,642	383,696	11,511	22,904	1.52
	100	0.010	0.01	835,991	675,817	6,758	29,662	1.97

Table 9.6 Estimation of Probable Flood Damage (14/14)
(Ba River Basin, With Project)

(1) Estimation of Flood Damage by Magnitude of Flood

Unit: VND Million

River System	Return Period (Year)	Early Flood			Major Flood								Total
		Crops			1. House			2. River facilities and infrastructure /1	3. Business activities /2	4. Welfare and cultural facilities /3	5. Other /4	Sub-total	
		Paddy	Upland crop	Sub-total	House	Household durable goods	Sub-total						
	a	b	c	d=b+c	e	f	g=e+f	h=g x 33%	i=g x 36%	j=g x 6%	k=g x 29%	l=g+h+i+j+k	m=d+l
Huong River	2	-	-	-	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-	-	-	-
	10	-	-	-	-	-	-	-	-	-	-	-	-
	20	-	-	-	71,178	13,916	85,094	28,081	30,634	5,106	24,677	173,592	173,592
	50	-	-	-	180,568	35,404	215,972	71,271	77,750	12,958	62,632	440,583	440,583
	100	-	-	-	313,358	61,359	374,717	123,657	134,898	22,483	108,668	764,423	764,423

Note: /1 This item includes the damages to the facilitiies for flood prevention, water utilization, transportation, fishery, electricity, and post office.
/2 This item includes the damages to crops, forest, livestock, aquaculture, factories, shops, offices, machines, materials, and products.
/3 This item includes the damages to the facilities for cultural sector, health care, and education.
/4 This item includes the damages to administrative sector, armaments, and others.

(2) Estimation of Annual Mean Flood Damage

River System	Return Period	Exceedance	Difference of Exceedance	Damage (VND Million)		Annual Damage (VND Million)		Equivalent US$ million
				Amount	Mean	Segment	Cumulative	
Huong River	-	1.00						
	2	0.50	0.50	-	-	-	-	-
	5	0.20	0.30	-	-	-	-	-
	10	0.10	0.10	-	-	-	-	-
	20	0.05	0.05	173,592	86,796	4,340	4,340	0.29
	50	0.02	0.03	440,583	307,088	9,213	13,552	0.90
	100	0.010	0.01	764,423	602,503	6,025	19,577	1.30