4 DISCUSSIONS ON DEVELOPMENT DIRECTIONS

4.1 Classification of Inland Waterway Transport

1) Waterway

At present, waterways are categorized into six classes according to dimension and recently into three classes according to management, but there is no classification by function and national strategic importance. The existing waterway network should be reclassified from more strategic and functional viewpoints.

The inland waterways could be classified into three classes according to function, namely “Class A”, “Class B” and “Class C”. Class A waterways play an important role as “routes for international transportation network”. Class B waterways serve as “routes for interprovincial transportation network”. Class C waterways are “other routes functioning as provincial transportation network and capillary routes for local transportation and local life support”. Class B is divided into two subclasses: Class B1 as interprovincial trunk routes and Class B2 as other interprovincial routes (see Table 4.1.1).

To appraise each inland waterway, representative data that should be considered are also shown in Table 4.1.1. Other data can be added, if necessary. The team listed the representative data by route as shown in Table 4.1.2.

Based on the above procedure, the team classified waterways in the north and south as shown in Figure 4.1.1, Figure 4.1.2 and Table 4.1.3. The classification indicates which waterway has importance in the international, interprovincial and provincial/local level development strategies. If the situation and policy should greatly change in future, this classification would have to be revised.

Table 4.1.1
Classification of Inland Waterways

Classification		Status	Expected Role	Representative Data as Criteria for determining Class
Class A		Routes for international transportation network	- International trade route from/to the neighboring country, and the routes linking to the international seaports	- Traffic volume and OD matrix - Existence and future plan of the key national industries such as coal, cement plant, etc. ,which need the waterway route and generate a large quantity of traffic - Availability of other transportation mode (road, rail) - Stability of the waterway (Influence by hydro-meteorological specifics such as difference of water level between dry and rainy season, formation of sand banks, inflow of obstacles like stones from the upper stream, etc.)
Class B	B1	Trunk routes for inter-provincial transportation network	- Inter-provincial trade route as a part of national transportation network, and the routes linking to the major ports (Class A and Class B ports) - Indispensable route for transporting materials and products for the key national industries	
	B2	Other routes for inter-provincial transportation network		
Class C		Other routes - Routes for provincial transportation network - Capillary routes for local transportation and local life support	- Provincial trade route for transporting necessary goods for regional markets - Indispensable route for transporting materials and products for the regional industries - Local route for supporting the peoples' livelihood in less developed districts	

Table 4.1.2
Representative Data for Appraising Inland Waterways

Area	Route	Length (km)	Traffic Volume: Forecasted data on principal section of waterway by TDSI: River	Section	Traffic Volume (1000Ton): 1995	2000	2010	2020	OD matrix data: Related province	1999	2020	Existence/ future plan of the key induced industries such as coal, cement plant, etc.
North	Quang Ninh-Ninh Binh (via Luoc River)	322,5	Ven Bien	H.Gai-N3 S.Chanh	4.000	7.231	10.637	12.800	Quang Ninh			
			Luoc	N3 Phuong Tra-Qui Cao	2.000	3.654	5.891	10.158	Hai Phong			•
			Hong	Phuong Tra-Pham Lo	1.200	3.324	4.884	6.544	Hai Duong			
				Pham Lo-Hung Long	1.200	2.398	3.221	4.316	Thai Binh	(See Other Chapter)		
			Nam Dinh	N3 Hung Long-N3 Doc Bo	2.000	2.216	3.013	4.200	Hung Yen			
			Day	N3 Doc Bo-Cang Ninh Binh	1.200	2.270	3.093	(-)	Ha Nam			
									Nam Dinh			
									Ninh Binh			
	Quang Ninh-Pha Lai (via Chanh, Da Bach, Kinh Thay rivers)	172	Ven Bien	H.Gai-N3 S.Chanh	4.000	7.231	10.637	12.800	Quang Ninh			
			Da Bach	N3 S.Chanh-Pha Dun	2.000	5.042	6.845	7.500	Hai Phong			•
			Phi Liet	Phu Dun-N3 Trai Son	[-]	3.531	5.110	5.800	Hai Duong			
			Kinh Thay	N3 Trai Son-N3 Trieu	2.500	4.300	6.211	7.763				
				N3 Trieu-N3 Lau Khe	[-]	5.390	7.040	8.500				
	Hai Phong-Hanoi (via Duong River)	150,5	Cam	Hai Phong-Nga Ba Nong	400	1.164	1.945	3.350	Hai Phong			
			Han	N3 Nong-N3 Trai Son	400	1.164	1.945	3.350	Hai Duong			
			Kinh Thay	N3 Trai Son-N3 Trieu	2.500	4.300	6.211	7.763	Bac Ninh			
				N3 Trieu-N3 Lau Khe	[-]	5.390	7.040	8.500	Ha Noi			
			Duong	Cua Dau-My Loc	1.200	3.654	5.230	8.500				
	Viet Tri-Tuyen Quang	105	Lo	Viet Tri-Bai Bang	1.500	2.832	4.320	6.000	Phu Tho			
				Bai Bang-Tuyen Quang	[-]	672	840	1.400	Vinh Phuc			
									Tuyen Quang			
	Cua Day-Ninh Binh	72	Day	Cua Day	[-]	50	200	340	Nam Dinh			
					[-]		1.000	1.300	Ninh Binh			•
				N3 Doc Bo-Cang Ninh Binh	1.200	2.270	3.093					
	Lach Giang-Hanoi (via Ninh Co River, Red River)	187	Hong	Hanoi-Hong Chau	400	3.050	4.424	5.900	Nam Dinh			
				Hong Chau-Phuong Tra	400	1.548	2.928	3.920	Thai Binh			
				Phuong Tra-Pham Lo	1.200	3.324	4.884	6.544	Ha Nam			
				Pham Lo-Hung Long	1.200	2.398	3.221	4.316	Hung Yen			
				Cua Lach Giang	[-]	200	610	880	Ha Tay			
									Ha Noi			
	International route Lach Giang-Hanoi-Lao Cai	446,5	Hong	Yen Bai-Viet Tri	150	192	252	435	Nam Dinh			
				Viet Tri-Hanoi	1.500	3.870	5.514	7.400	Thai Binh			
				Hanoi-Hong Chau	400	3.050	4.424	5.900	Ha Nam			
				Hong Chau-Phuong Tra	400	1.548	2.928	3.920	Hung Yen			
				Phuong Tra-Pham Lo	1.200	3.324	4.884	6.544	Ha Tay			
				Pham Lo-Hung Long	1.200	2.398	3.221	4.316	Ha Noi			
				Cua Lach Giang	[-]	200	610	880	Vinh Phuc			
									Phu Tho			
									Yen Bai			
									Lao Cai			
	Da River	269	Da	N3 H.Ha-Cang H.Binh	450	602	632	850	Ha Tay			
				Ho Hoa Binh	[-]	300	624	650	Phu Tho			•
									Hoa Binh			
									Son La			
	Other routes in the North				[-]	(-)	[-]	(-)				

Note: (-) Data unavailable

Table 4.1.2 continued

Area	Route	Length (km)	Traffic Volume				
			Forecasted data on principal section of waterway by TDSI				
			River	Section	Traffic Volume (1000Ton)		
					1995	2000	2010	2020	
South	Sai Gon-Kien Luong (via Cho Gao Canal, Tien River, Lap Vo Canal, Hau River and Rach Soi Canal)	320	Tien	Cay Kho-Cho Gao My Tho-N3 Sa Dec Kenh Sa Dec-Lap Vo Rach Soi-Hau Giang	9.270 7.350 6.160 1.920	11.205 9.702 8.200 3.435	16.750 11.041 12.136 6.600	19.500 14.360 16.252 9.000	HC Lo Tie Be Vin Do Ca Kie
	Sai Gon-Ca Mau (via Cho Gao Canal, Tien River, Mang Thit River, Hau River, Xa No River)	332		Cay Kho-Cho Gao My Tho-(N3 Sa Dec) Mang Thit Xa No	9.270 7.350 3.530 1.160	11.205 9.702 4.685 2.550	16.750 11.041 6.685 3.300	19.500 14.360 8.890 4.000	HC Lo Tie Be Vin Ca Ca
	Sai Gon-Kien Luong (via Dong Thap Muoi)	268		Dong Tien-Lagrange	(-)	1.200	1.600	2.150	HC Lo Do An Kie
	Thi Vai-Nuoc Man Canal	70			(-)	(-)	(-)	(-)	HC Lo
	Sai Gon-Moc Hoa (from Binh Phuoc to Moc Hoa mainly on Vam Co River and Vam Co tay River)	129			(-)	(-)	(-)	(-)	HC Lo
	Sai Gon-Ben Keo (from Binh Phuoc to Go Dau, Ben Keo, mainly on Vam Co Dong River)	168			(-)	(-)	(-)	(-)	HC Lo Tay
	Ho Chi Minh City-Ben Suc	101.5			(-)	(-)	(-)	(-)	HC Be
	Cua Dinh An-Tan Chau (Hau River)	(-)	Hau	Cua Dinh An-Can Tho Can Tho-Long Xuyen	(-) (-)	1.500 1.200	3.000 1.900	3.720 2.560	So Tra Ca Vin Do An
	International route Cua Tieu-Hong Ngu-Cambodia	227	Tien	Cua Tieu-My Tho My Tho-N3 Sa Dec N3 Sa Dec-Cao Lanh	(-) 7.350 (-)	1.800 9.702 2.200	2.100 11.041 3.000	2.820 14.360 4.000	Tie Be Vin Do An
	Other routes in the South				(-)	(-)	(-)	(-)	

Note: (-) Data unavailable

Figure 4.1.1
Proposed Classification of Inland Waterways in Northern Vietnam

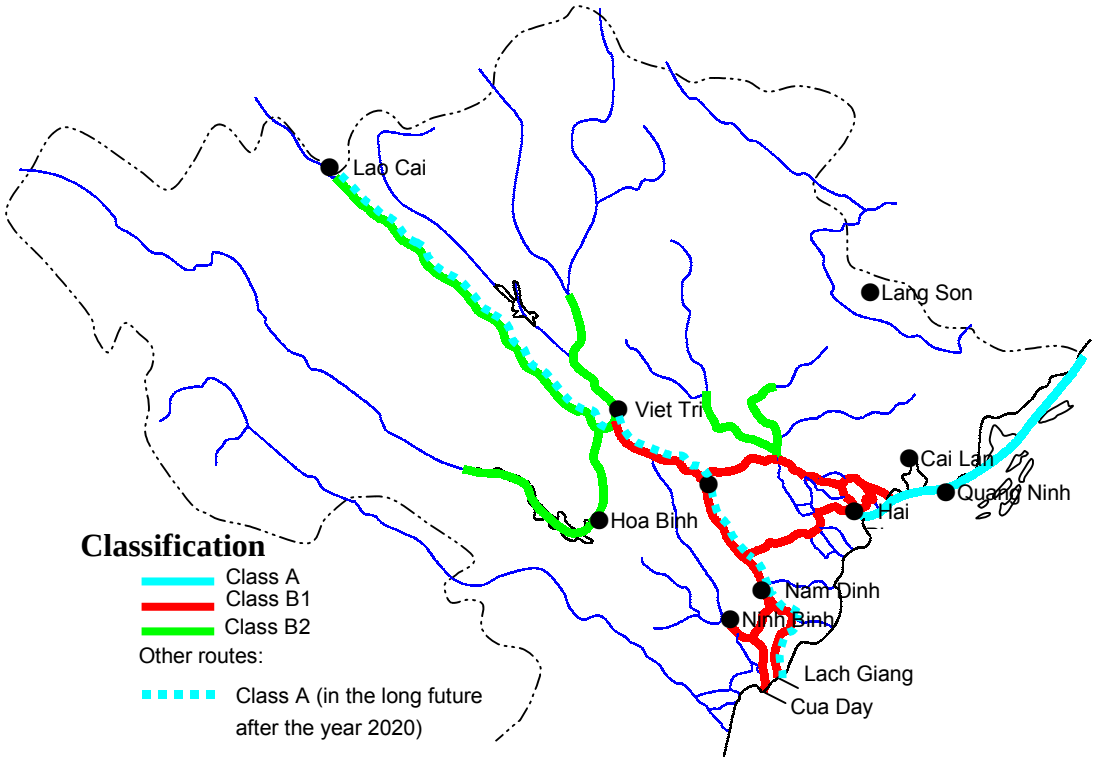


Figure 4.1.2
Proposed Classification of Inland Waterways in Southern Vietnam

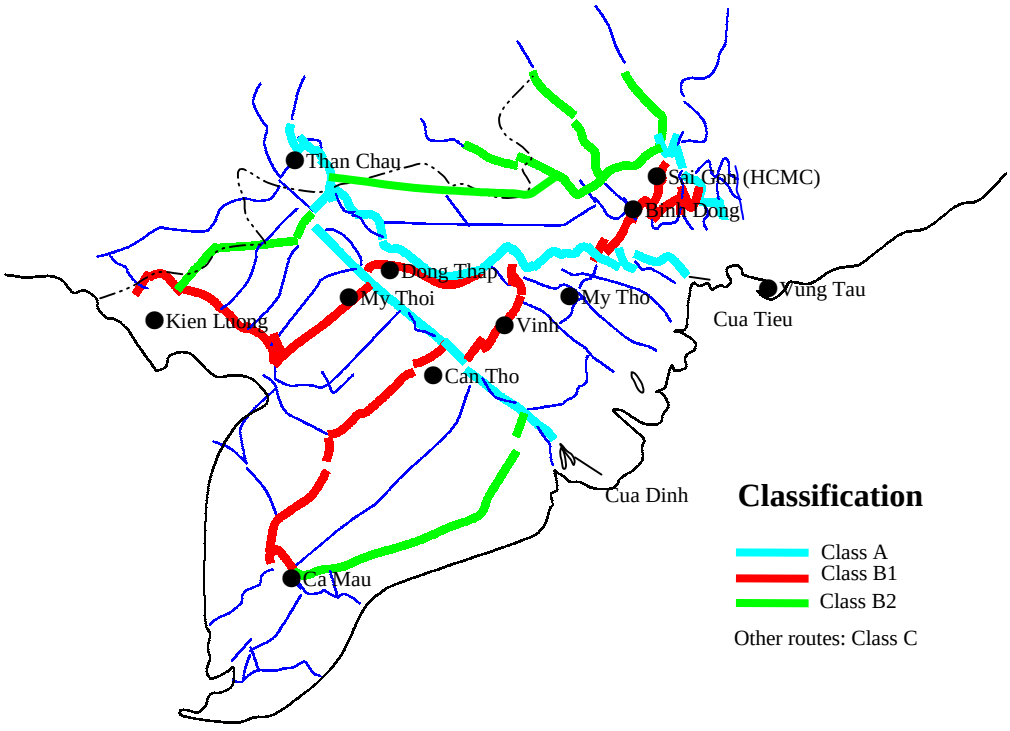


Table 4.1.3
Proposed Classification of Inland Waterways (managed by central government)

No.	Name of river or channel	Managed section	Length (Km)				
			Total	Class A	Class B1	Class B2	Class C
I. PROVINCES IN THE NORTH PART							
1	Bach Dang River	From the confluence of Chan River (Bach Dang) to Dinh Vu confluence	12		12		
2	Bang Giang River	From Cao Bang town to Thuy Khau	56				56
3	Ba Nom channel	From Den Cua Xoai to Hon Vung Dai	15	15			
4	Bai Tu Long channel	From Hon Dua to Hon Mot	13.5	13.5			
5	Ba Tho channel	From Nui Bai Tho to Hon Dau Moi	7				7
6	Cau River	From Lac confluence to Ha Chau	104			104	
7	Cong River	From the confluence of Cau River to Cai Dan	19			5	14
8	Cam River	From Nong confluence to the upstream of Vat Cach port, 200m	9		9		
9	Chanh River	From the confluence of Chanh River (Bach Dang) to Den Qua Xoai	20.5		20.5		
10	Cau Xe River	From the confluence of Cau Xe River (Thai Binh) to Au Cau Xe	6				6
11	Da River	From Hoa Binh hydro-power dam to Hong Da confluence	58			58	
12	Day River	From Van Dinh to buoy No.0 Cua Day	163		72		91
13	Duong River	From Cua Dau confluence to My Loc confluence	68		68		
14	Da Bach River	From Ben Dun confluence to the confluence of Chanh River (Bach Dang)	23		23		
15	Dao Ha Ly River	From Ha Ly confluence (Lach Tray) to Xi Mang confluence	3		3		
16	Gua River	From Mui Guom confluence to Cua Dua	4				4
17	Gam River	From Lo Gam confluence to Chiem Hoa	36				36
18	Han River	From Trai Son confluence to Nong confluence	8.5		8.5		
19	Red River	From Nam Thi confluence to buoy No.0 Ba Lat	541		198	286	57
20	Hoa River	From Ninh Giang confluence to Ba Giai river mouth	36.5				36.5
21	Hon Gai channel	From Hon Tom to Hon Dua	16				16
22	Hoang Long River	From Nho Quan to Cau Gian confluence	29				29
23	Hoa Binh lake	From Hoa Binh hydro-power dam to Ta Bu	203			203	
24	Kinh Thay River	From Lau Khe confluence to Trai Son confluence	44.5		44.5		
25	Kinh Mon River	From Keo confluence to Nong confluence	45				45
26	Kenh Khe River	From Kenh Khe confluence (Van Uc) to Kenh Khe confluence (Thai Binh)	3		3		
27	Lai Vu River	From Vu Xa confluence to Cua Dua confluence	26				26
28	Lach Ngan channel	From Ghenh Dau Phuon to Hon Mot	16				16
29	Lach Ngan channel to Cat Ba						
	Dau Xuoi channel	From Hon Muoi Nam to Hon Sai Coc	9				9
	Cua Van creek	From Hon Sai Coc to Tung Gau river mouth	4.5				4.5
	Tung Gau channel to Cua Dong	From Tung Gau River mouth to Cua Dong	8				8
	Bai Beo creek	From Hon Ngang Cua Dong to Hon Vay Rong	7				7
	Cat Ba bay	From Cat Ba port to Hon Vay Rong	2				2
	Giai creek	From Hon Sai Coc to Hon Mot	6				6
30	Lach Sau creek	From Hon Vung Dai to Hon Mot	11.5	11.5			
31	Lach Buom channel	From Hon Dua to Hon Buom	11	11			
32	Lach Tray River	From Kenh Dong confluence to Lach Tray river mouth	49		31		18
33	Lo River	From Lo Gam confluence to Viet Tri confluence	115			105	10
34	Luoc River	From Cua Luoc confluence to Quy Cao	72		72		
35	Luc Nam River	From Chu to Nhan confluence	56				56
36	Mao Khe River	From Ben Trieu confluence to Ben Dun confluence	18				18
37	Mong Cai-Cua Lo channel	From Cua Mo to Van Tam (Vinh Thuc island)	59	59			
38	Mong Cai River	From Mong Cai borough to Van Tam	17	17			
39	Mia River	From Mia confluence (Thai Binh) to Mia confluence (Van Uc)	3				3
40	Nam Dinh River	From Hung Long confluence to Doc Bo confluence	33.5		33.5		
41	Ninh Co River	From Mom Ro confluence to buoy No.0 Lach Giang	61		61		
42	Phi Liet River	From Ben Dun confluence to Trai Son confluence	8		8		
43	Rout Lon River	From East-Vang Chau confluence to West-Vang Chau confluence	7				7
44	Thac Ba lake	From Huong Ly port to Thac Ba dam	8				8
		From Cam Nhan to Huong Ly port	42				42
45	Thai Binh River	From Lac confluence to the confluence of Mia river (Thai Binh)	64				64
		From Guy Cao to Thai Binh river mouth	36				36
46	Tra Ly River	From Pham Lo confluence to Tra Ly river mouth	70				70
47	Tien Yen River	From Tien Yen borough to Cua Mo	31				31
48	Cai Bau-Cua Mo channel	From Hon Buom to Cua Mo	42	42			
49	Thuong River	From Bo Ha to Lac confluence	62			62	
50	Uong Bi River	From Uong Bi bridge to Dien Cong confluence	14				14
51	Van Uc River	From Cua Dua confluence to buoy No. 0 at Van Uc river mouth	57		19		38
52	Vac River	From Yen bridge to Kim Dai confluence	28.5				28.5
53	Ha Long bay channel	From Hon Vung Dai to Hon Gai passenger terminal	9.5				9.5
54	Van Don to Co To channel	From Cai Rong port to Co To port	55				55
55	Yen Mo River	From Duc Hau confluence to Chinh Dai confluence	14				14
		Subtotal (in the North part)	**2,676**	**169.0**	**686.0**	**823.0**	**998.0**

Table 4.1.3 continued

No.	Name of river or channel	Managed section	Length (Km)				
			Total	Class A	Class B1	Class B2	Class C
II PROVINCES IN THE CENTRAL PART:							
1	Nga Son channel	From Che Thon confluence to Dien Ho	27				27
2	Len River	From Bong confluence to Yen Luong confluence	31				31
3	De channel	Yen Luong confluence to Truong Xa confluence	6.5				6.5
4	Truong River	From Truong Xa confluence to Hoang Ha confluence	6.5				6.5
5	Choan channel	From Hoang Ha confluence to Hoang Phu	15				15
6	Ma River	From Vinh Ninh confluence to Upstream of Le Mon port: 200m	42				42
7	Buoi River	From Yen Tan to Vinh Ninh confluence	25.5				25.5
8	Lam River	From Do Luong to upstream of Ben Thuy port: 200m	96.5				96.5
9	La River	From Linh Cam confluence to Nui Thanh confluence	13				13
10	Nghen River	From Nghen bridge to Sot river mouth	38.5				38.5
11	Rao Cai and Nhuong Rivers	From Cam Xuyen borough to Son confluence	37				37
12	Gianh River	From Cho Cat to upstream of Gianh port: 200m	45				45
13	Truoc River	From Phong Nha to Van Phu confluence	31				31
14	Nhat Le River	From Long Dai bridge to upstream of Nhat Le port: 200m	19				19
15	Hieu River	From Ben Duoi to upstream of Cua Viet port: 200m	27				27
16	Thanh Han River	From Ba Long to Gia Do confluence	46				46
17	Perfume River	From Tuan confluence to Thuan An	34				34
18	Pha Tam Giang - Cam Thuy Tu channel	From Van Trinh to Tu Hien river mouth	67				67
19	Truong Giang River	From An Lac confluence to Ky Ha port	67				67
20	Thu Bon River	From Nong Son ferry to Cua Dai	65				65
		Subtotal (in the Central part)	**739.5**	**0**	**0**	**0**	**739.5**
III. PROVINCES IN THE SOUTH PART:							
1	Ba Hon channel	From Rach Gia channel (Ha Tien) to Ba Hon River mouth	7		3		4
2	Bac Lieu - Co Co channel	From Rach Ba confluence via Dua Tho to the confluence of Bac Lieu- Vam Leo channel	18			19	
3	Bac Lieu - Vam Leo River	From the confluence of Co Co river to the confluence of Bac Lieu - Ca Mau channel	18				18
4	Bay Hap - Ghenh Hao channel	From the confluence of Ghenh Hao river to Bay Hap river	9				9
5	Bay Hap River	From the confluence of Bay Hap - Ghenh Hao channel to the	25				25
6	Ba Xuyen - Dua Tho creek	From the confluence of Co Co River to the confluence of Thanh Loi creek	20			20	
7	Bac Lieu - Ca Mau channel	From Giong Me confluence to Ca Mau	67			67	
8	4 Bis channel	From Kenh Dong confluence to the confluence of Nguyen Van Tiep channel	16.5				16.5
9	Ba The channel	From the confluence of Hau river to the confluence of Rach Gia - Ha Tien channel	57				57
10	Ben Tre River	From the confluence of Ben Tre Ham Luong River to the confluence of Chet Say channel	7.5				7.5
11	Co Chien River	From Co Chien confluence (Tien river) to Co Chien river mouth	109		11		98
12	Cay Kho channel	From Te channel to the confluence of Ong Lon creek	3.5		3.5		
13	Can Giuoc River	From the confluence of Ong Lon creek to the confluence of Soai Rap River	35		25.7		9.3
14	Cho Lach channel	From Cho Lach confluence (Tien River) to Cho Lach-Co Chien confluence	7.5		7.5		
15	Chet Say channel	From the confluence of Tien River (Vam Gia Hoa) to the confluence of Ben Tre river	9				9
16	Cho Gao channel	From the Rach La confluence to Vam Ky Mon confluence	11.5		11.5		
17	Can Tho creek	From the confluence of Hau River to the confluence of Xa No channel	16		16		
18	Cai Nhut creek	From the confluence of Xa No channel to the confluence of Cai Tu creek	3		3		
19	Cai Tu creek	From the confluence of Cai Nhut creek to the confluence of Cai Lon River	12.5		12.5		
20	Cai Be River	From the confluence of Giong Gieng - Ben Nhut channel to Cai Be river mouth	24				24
21	Cho Dom - Ben Luc River	From the confluence of Doi channel to the confluence of Vam Co Dong River	20			20	
22	Cai Con creek	From the confluence of Hau River to Phung Hiep	16.5				16.5
23	Cai Lon River	From Tat Cay Tram confluence to the confluence of Tan Bang-Can Giuo channel	38				38
24	Cai Nhap channel (Lon Bay Hap river mouth)	From the confluence of Bay Hap River to the confluence of Cua Lon River	11				11
25	Chau Doc River	From the confluence of Hau River to the confluence of Vinh Te channel	1.5				1.5
26	Dong Nai River	From the confluence of Be River to upstream of Vitaco port: 300m	85				85
27	Doi channel	From the confluence of Te channel to the confluence of Cho Dem - Ben Luc channel	8.5			8.5	
28	Doi Ngai channel	From the confluence of Hau River to the confluence of Phu Huu- Bai Xau channel	4.5			4.5	
29	Ganh Hao river	From the confluence of Tat Thu river to buoy No.0 Ganh Hao	62.5		5.6		56.9

Table 4.1.3 continued

No.	Name of river or channel	Managed section	Length (Km)				
			Total	Class A	Class B1	Class B2	Class C
30	Giong Rieng - Ben Nhut channel	From the confluence of Thi Doi - O Mon channel to the confluence of Cai Be river	15.5				15.5
31	Ho Phong - Ganh Hao channel	From Ho Phong to the confluence of Ganh Hao River	18				18
32	Ham Luong River	From the confluence of Tien River to Ham Luong river mouth	74				74
33	Hau River	From the confluence of Tan Chau channel to upstream of Can Tho port: 300m	111	111			
		Cu Lao - Ong Ho branch	7.5				7.5
		Cu Lao May branch	21.5				21.5
		Nang Gu - Thi Hoa branch	16				16
34	Vam Ky Hon	From the confluence of Cho Gao channel to Ky Hon confluence (Tien River)	7		7		
35	La creek	From the confluence of Vam Co river to the confluence of Cho Gao channel	10		10		
36	Lap Vo - Sa Dec creek	From the confluence of Hau River to the confluence of Tien River	50		50		
37	Mang Thit River	From Mang Thit - Co Chien confluence to the confluence of Tra On creek	42		42		
38	Mac Can Dung	From the confluence of Ba The channel to the confluence of Tam Ngan channel	12.5				12.5
39	Mo Cay creek and channel	From the confluence of Ham Luong river to the confluence of Co Chien River	18				18
40	Nga Ba Dinh creek	From the confluence of Cai Tau creek to the confluence of Song Trem channel	11.5		11.5		
41	Salt watwer channel	From the cofluence of Can Giuoc salt water channel to the confluence of Vam Co salt water channel	2		2		
42	Ong Doc River	From the confluence of Trem Trem River to Ong Doc river mouth	49.5		4.9		44.6
43	Ong Lon creek	From the confluence of Cay Kho channel to the confluence of Can Giuoc River	5		5		
44	Ong Chuong creek	From the confluence of Tien River (Cho Moi) to the confluence of Hau river	23				23
45	Ong Hien - Ta Nien channel	From the confluence of Cai Be River to the confluence of Rach Gia - Long Xuyen channel	12.5		7.8		4.7
46	Quan Lo - Phung Hiep channel	From Phung Hiep to Ca Mau	105				105
47	Phu Huu - Bai Xau channel	From the confluence of Dai Ngai creek to the confluence of Thanh Loi creek	15.5			15.5	
48	Rach Soi - Hau Giang channel	From the confluence of Hau River to the confluence of Ong Hien - Ta Nien channel	59		59		
49	Rach Gia - Ha Tien channel	From the confluence of Rach Gia - Long Xuyen channel to Ha Tien town	81.5		61.3		20.2
50	Rach Gia - Long Xuyen channel	From the confluence of Hau River to Rach Gia river mouth	63.5				63.5
51	Soai Rap River	From confluence of Long Tao river to the confluence of Vam Co River	31				31
52	Sai Gon River	From Dau Tieng dam to Sai Gon bridge	126.5			102	24.5
53	Tat Rang channel	From the confluence of Ong Hien - Ta Nien channel to the confluence of Rach Soi channel	4				4
54	Tat-Cu Lao May channel	From Hau River (in Tra On) to Hau River (in small Cai River)	3.5				3.5
55	Tan Chau channel	From the confluence of Tien River to the confluence of Hau River	9.5				9.5
56	Tra On creek	From the confluence of Mang Thit river to the confluence of Hau River	5		5		
57	Tat-Cay Tram channel	From the confluence of Cai Lon River to the confluence of Cai Tau creek	5		5		
58	Thanh Loi creek	From the confluence of Phu Huu - Bai Xau to the confluence of Ba Xuyen - Dua Tho channel	1.5				1.5
59	Tat Thu River	From the confluence of Ong Doc river to the confluence of Ganh Hao river	4.5		4.5		
60	Tan Bang - Can Gao channel	From the confluence of Trem Trem river to the confluence of Cai Lon river	40				40
61	Tat Cau channel	From the confluence of Cai Lon River to the confluence of Cai Nho river	1.5				1.5
62	Te channel	From the confluence of Sai Gon river to the confluence of Doi channel	4.5		4.5		
63	Tam Ngan channel	From the confluence of Mac Can Dung channel to confluence of Rach Gia - Ha Tien channel	36				36
64	Thu Thua channel	From the confluence of Vam Co Dong river to the confluence of Vam Co Tay river	10.5			10.5	
65	Tra Vinh channel	From the confluence of Co Chien River to the Tra Vinh bridge	4.5				4.5
66	Trem River-Canh Den channel (Chac Bang)	From the confluence of Nga Ba Dinh creek to the confluence of Trem Trem river (Thoi Binh)	33.5		33.5		
67	Trem Trem River	From the confluence of Ong Doc river to the confluence of Tan Bang-Can Gao channel	40		12.5		27.5
68	Thap Muoi channel No.1 (Dong Tien - Lagrang)	From the confluence of Tien River to the confluence of Vam Co Tay River	90.5			90.5	
69	Thap Muoi channel No.2 (Nguyen Van Thiep - Tat Thap 10 - Tong Doc Lc - Chanh creek	From the confluence of Tien River to the confluence of Vam Co Tay River	93.5				93.5

Table 4.1.3 continued

No.	Name of river or channel	Managed section	Length (Km)				
			Total	Class A	Class B1	Class B2	Class C
70	Tri Ton - Hau Giang channel	From the confluence of Rach Gia - Ha Tien channel to the confluence of Hau river	57.5			57.5	
71	Tat Nam Can channel	From the confluence of Bay Hap river to Nam Can	11.5				11.5
72	Tien River	From Cambodia border to upstream of My Tho port: 200m	179	179			
		Cu Lao Rong branch	13				13
		Cu Lao Binh Thanh branch	4				4
		Cu Lao Tay, Cu Lao Ma branches	27				27
		Cu Lao Long Khanh branch	8				8
73	Tri An lake	From La Nga bridge to Tri An dam	40				40
74	Vam Co River	From the confluence of Vam Co Dong Tay river to the confluence of Soai Rap river	35.5		10		25.5
75	Vam Co Dong River	From Ben Keo to the confluence of Vam Co Dong Tay	131			110	21
76	Vam Co Tay River	From Moc Hoa to the confluence of Vam Co Dong Tay	128.5			80	48.5
77	Vam Nao River	From the confluence of Tien River to the confluence of Hau River	6.5	6.5			
78	Vinh Te channel	From the confluence of Chau Doc River to Ben Da	5				5
79	Xa No channel	From the confluence of Can Tho creek to the confluence of Cai Nhut creek	39.5		39.5		
80	Thi Doi - O Mon channel	From the confluence of Hau river to the confluence of Rong Giang-Ben Nhut channel	31.5				31.5
	Sub-total (In the South part)		**2,816**	**296.5**	**474.3**	**605.0**	**1,440.2**
	Total (I,II,III)		**6,231.5**	**465.5**	**1,160.3**	**1,428.0**	**3,177.7**

2) Port

There is no comprehensive master plan, nor classification by function or national importance for the inland waterway ports. Inland waterway ports could be classified into three classes according to function, namely: “Class A”, “Class B” and “Class C”. Class A ports play an important role as “national hub ports serving international trade”. Class B ports are “regional ports serving inter-regional/inter-provincial trade”. Class C ports are “local ports serving intra-provincial trade and local life support” Class B is divided into two subclasses: Class B1 as regional hub ports serving inter-regional/inter-provincial trade and those serving goods transport for key establishments of national importance and Class B2 as regional ports serving other inter-provincial trade (see Table 4.1.3).

To appraise each port, representative data that should be considered are shown in Table 4.1.4. Other data can be added, if necessary. The team listed the representative data by port as shown in Table 4.1.5.

Based on the above procedure, the Study Team classified inland waterway ports in the north and south as shown in Table 4.1.6. The classification indicates which port has importance in the national, regional and local level development strategies. If the situation and policy should greatly change in future, this classification would have to be revised.

3) Proposed Concept on the Classification of Inland Waterways and Ports

Figure 4.1.3 and 4.1.4 show the classification of ports and waterways for cargo transport in the lump, and Figure 4.1.5 shows the conceptual image on that classification. Table 4.1.7 lists the tentative proposal to achieve the minimum standard required for each class of waterway and port.

Table 4.1.4
Strategic Classification of Inland Waterway Ports according to Functions

Classification		Status	Expected role	Representative data as criteria for determining each class
Class A		National hub ports serving international trade	*National gateway for international trade* 1. Cargo Transportation - the base for collecting/distributing cargo from/to foreign countries - the base for connecting with coastal shipping trade - the base for loading/unloading necessary goods for national markets 2. Passenger/Tourism Transportation - the base for passenger/tourism transportation of international route (Class A is applied only to sea port)	*(basic data)* - Population - GRDP *(for cargo transportation)* - Cargo volume - Existence and future plan of key national industries, such as coal, cement plant, etc., which need the port and generate large quantities of cargo *(for passenger/tourism transportation)* - Passenger volume - Existence of major tourism area and potential area for future development of tourism
Class B	B1	Regional hub ports serving inter-regional/inter-provincial trade and those serving goods transport for key establishments of national importance	*Regional gateway for inter-regional/inter-provincial trade* 1. Cargo Transportation - the base for collecting/distributing cargo from/to other provinces - the base for connecting with coastal shipping trade - the base for loading/unloading necessary goods for regional markets 2. Passenger/Tourism Transportation - the base for passenger/tourism transportation on inter-provincial route	
	B2	Regional Ports serving other inter-provincial trade		
Class C		Local ports serving intra-provincial trade and local life support	*Local gateway for intra-provincial trade* 1. Cargo Transportation - the base for loading/unloading necessary goods for provincial/local markets - the base for supporting peoples' livelihood in less developed districts 2. Passenger/Tourism Transportation - the base for passenger/tourism transportation on provincial/local route	

Table 4.1.5
Representative Data for Appraising Inland Waterway Ports

Area	Name of Port	Cargo Volume					Existence/ future plan of the key national industries such as coal, cement plant, etc.	Provincial Data						
		Actual data		Forecasted data by TDSI				Name of Province	Population in 1997	GRDP in 1997 (current price)	Freight volume by water in 1996	Freight traffic volume by water in 1996	Gross output of paddy in 1997	Fertilizer
		Latest Data		2000	2010	2020								
		(1000Tons)	(Year)	(1000Tons)	(1000Tons)	(1000Tons)			(1000pers)	(Bill.dongs)	(1000Tons)	(Mill.Tons.Km)	(1000Tons)	(1000Tons)
North	Hanoi	650	1997	808	1.200	1.300		Ha Noi	2.306	20.071	751	281	188	182
	Khuyen Luong	482	1997	458	710	1.225								
	Chinh Pong	(-)	(-)	700	1.270	1.270	•	Hai Phong	1.693	7.470	750	240	425	(-)
	Cong Cau	(-)	(-)	250	350	460		Hai Duong	1.717	4.830	762	55	783	(-)
	Pha Lai	1.013	1995	1.400	2.250	2.250	•							
	Hoang Thach	212	1995	1.279	1.550	1.550	•							
	Thuy Loi	100	1997	150	200	200		Hung Yen	1.099	2.581	311	30	453	(-)
	Thai Binh	(-)	(-)	150	250	250		Thai Binh	1.853	4.883	491	79	930	(-)
	Nam Dinh	71	1997	200	280	350		Nam Dinh	1.934	4.347	874	120	904	(-)
	Ninh Binh	512	1997	1.080	1.800	2.500	•	Ninh Binh	906	1.676	615	34	375	40
	Ninh Phuc	100	1997											
	Son Tay	150	1997	200	350	400		Ha Tay	2.387	4.818	497	49	891	(-)
	Hong Van (Hong Chau)	55	1997	100	150	150								
	Dien Cong	400	1995	440	440	440	•	Quang Ninh	938	3.732	334	436	145	(-)
	Da Phuc	80	(-)	120	200	200		Tai Nguyen	966	2.342	24	9	226	(-)
	Dap Cau	250	1997	300	350	460	•	Bac Ninh	940	2.019	159	10	319	(-)
	A Lu	130	1997	200	250	250		Bac Giang	1.475	2.758	187	22	367	134
	Viet Tri	150	1997	370	735	1.250		Phu Tho	1.284	2.836	292	23	203	856
	Hoa Binh	70	1997	350	400	550		Hoa Binh	770	1.287	83	5	136	(-)
South	Thu Duc	200	1995	(-)	(-)	(-)	•	H.C.M.C.	5.050	54.744	1.539	251	241	236
	Dong Nai	207	1996	(-)	(-)	(-)		Dong Nai	1.964	9.539	178	23	234	11
	Cao Lanh (Dong Thap)	140	1996	509	692	1.150		Dong Thap	1.559	4.179	653	89	1749	(-)
	My Thoi	169	1997	635	843	1.400		An Giang	2.056	7.148	1.165	201	1981	(-)
	My Tho	349	1997	453	658	882		Tien Giang	1.726	5.450	791	111	1269	(-)
	Vinh Thai (Vinh Long)	120	1997	332	705	945		Vinh Long	1.110	3.300	811	104	863	(-)
	Hong Chong	4	1995	218	353	475	•	Kien Giang	1.447	5.590	691	108	1.892	(-)
	Kien Luong	310	1997	(-)	(-)	(-)	•							
	Can Tho	487	1998	1.374	2.858	(-)		Can Tho	1.905	6.548	984	159	1717	20
	Ca Mau	50	1997	305	390	472		Ca Mau	1.092	4.110	458	52	650	(-)

Note: (-) Data unavailable

Table 4.1.6
Proposed Classification of Inland Waterway Ports

Area	Classification		Name of Port	
			Cargo Transportation	Passenger/Tourism Transportation
North	Class A		[Hai Phong (sea port)] [Cai Lan (sea port)] (Class A is applied only to sea port)	[Hai Phong (sea port)] (Class A is applied only to sea port)
	Class B	B1	Central & Local Port Hanoi/Khuyen Luong Ninh Binh/Ninh Phuc Viet Tri Special Port Ports for national industries (Pha Lai, Hoang Thach, Chinh Pong, etc.)	Central & Local Port Hai Phong (river port) Hanoi
		B2	Central & Local Port Ha Bac (Dap Cau & A Lu) Nam Dinh Hoa Binh Other provincial main ports (Da Phuc, Son Tay, Bac Giang, etc.) Special Port Ports for regional industries	Central & Local Port Ninh Binh Viet Tri Nam Dinh Hoa Binh
	Class C		other ports	other ports
South	Class A		[Saigon (sea port)] [Vung Tau (sea port)] [Can Tho (sea port)] (Class A is applied only to sea port)	[Saigon (sea port)] [Vung Tau (sea port)] [Can Tho (sea port)] (Class A is applied only to sea port)
	Class B	B1	Central & Local Port Can Tho (river port) My Tho (river port) Vinh Thai (Vinh Long) Ca Mau Cao Lanh (Dong Thap) My Thoi (Long Xuyen) Special Port Ports for national industries (Kien Luong, Hon Chong, etc.)	Central & Local Port Saigon (river port) Can Tho (river port)
		B2	Central & Local Port Other provincial main ports (Ben Tre, Tra Vinh, Bac Lieu, etc.) Special Port Ports for regional industries	Central & Local Port My Tho (river port) Vinh Thai (Vinh Long) Ca Mau Cao Lanh (Dong Thap) My Thoi (Long Xuyen) Rach Gia Ha Tien
	Class C		other ports	other ports

Figure 4.1.3
Proposed Classification of IWT in Northern Vietnam

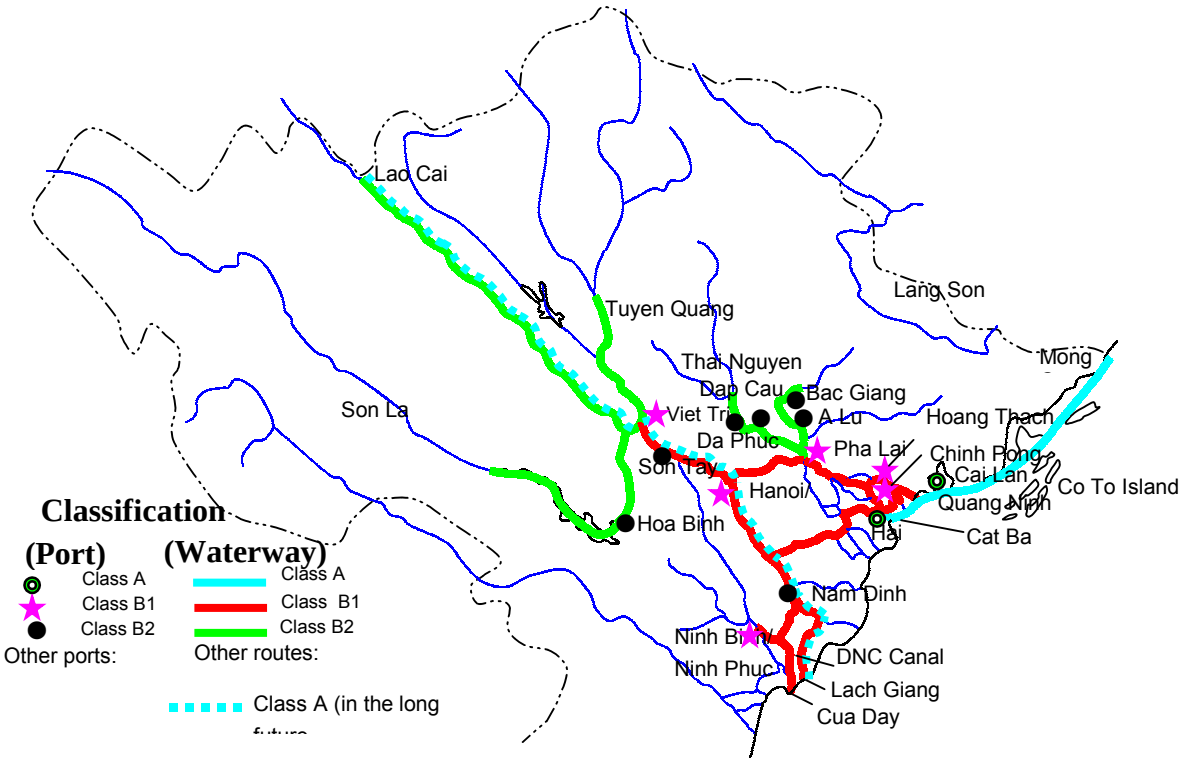


Figure 4.1.4
Proposed Classification of IWT in Southern Vietnam

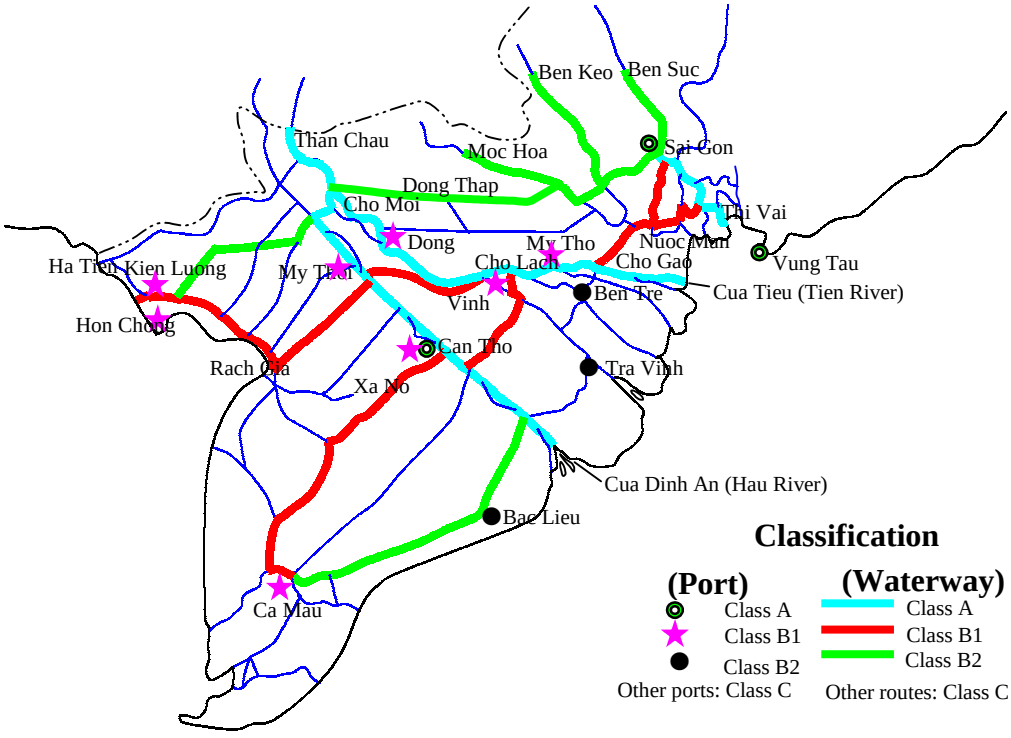


Figure 4.1.5
Conceptual Inland Waterway Network
(for cargo transportation)

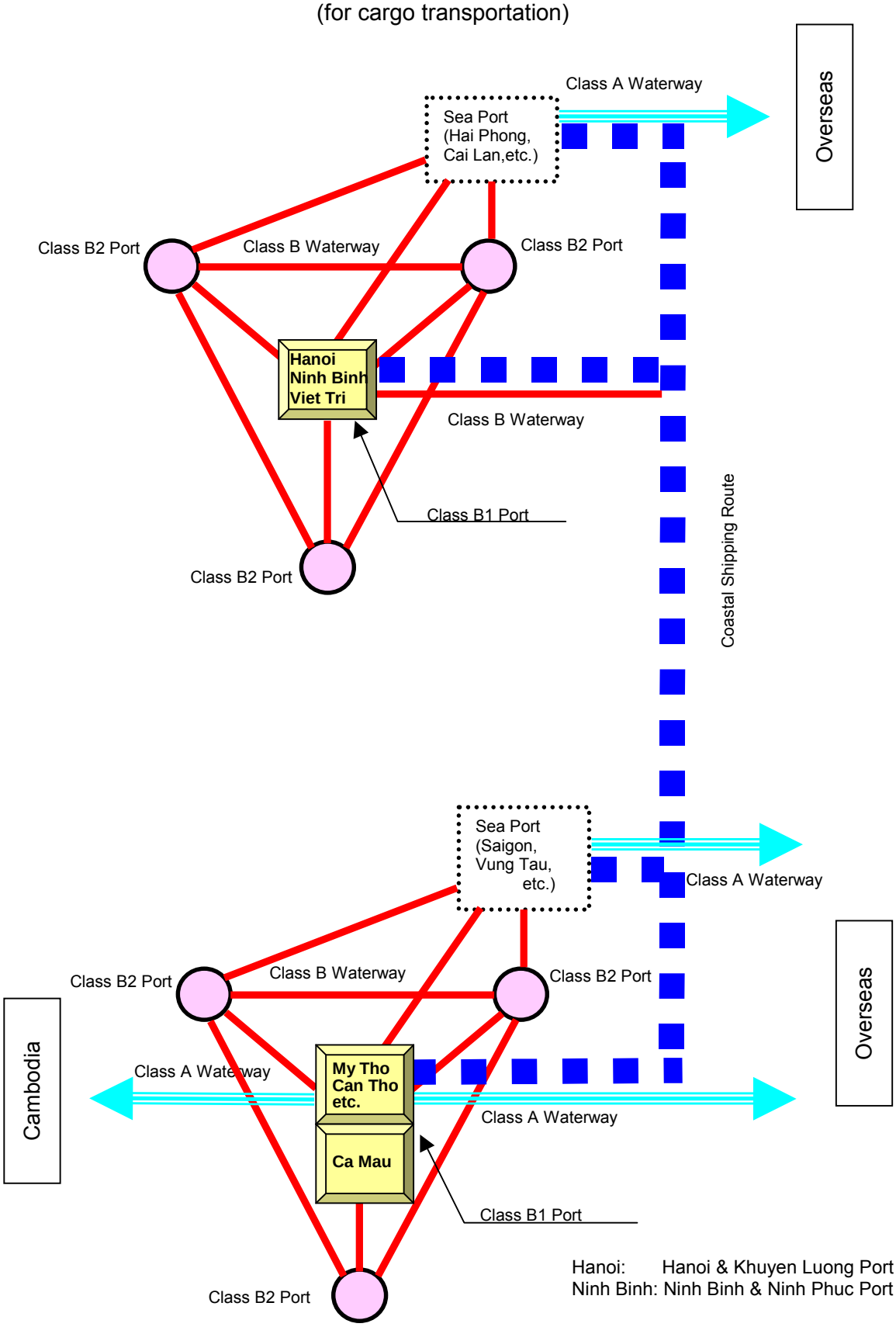


Table 4.1.7
Required Minimum Standard for Inland Waterway and Port

Item	Class A	Class B1	Class B2	Class C
1. Waterway				
Vessel Size	Sea-going Ship (≥2000DWT)	Barge Convoy, Sea-cum-River Ship	Barge, Small Ship	Small Boat
Waterway Width	≥200m	≥50m	≥30m	≥≧10m
Waterway Depth	>4.5m	>2.5m	>1.5m	>1.0m
Navigational Aids	Safe for Day and Night Navigation	Safe for Day and Night Navigation	Safe for only Daytime Navigation	Safe for only Daytime Navigation
2. Port				
Vessel Size (cargo berth)	Sea-going Ship (≥2000DWT) (applied for sea port)	Barge Convoy, Sea-cum-River Ship	Barge, Small Ship	Small Boat
Cargo Throughput	≥1,000,000 t/year	≥300,000 t/year	≥100,000 t/year	-
Vessel Size (passenger terminal)	International Cruise Ship (applied for sea port)	High-speed Boat for interprovincial travel	High-speed Boat for interprovincial travel	Small Boat
Passenger Volume	≥500,000 person/year	≥300,000 person/year	≥100,000 person/year	-

4.2 Prioritization of Investments

1) Waterway

Based on the "Draft Master Plan for Inland Waterway Transport of Vietnam toward the Year 2020", the TDSI and VIWA are preparing a number of development plans to improve waterway routes. However, under severe budget constraints, it is uncertain that all proposed plans will be implemented by 2020. In addition, without a detailed study, it is unknown whether the project cost of each proposed plan is accurate or not.

In order to optimize the investment, proposed projects should be ranked according to strategic importance (see Table 4.2.1.). However, it is first necessary to select the priority projects and their scope by evaluating their costs and benefits through a detailed study of each project.

Table 4.2.1
Long-term Development Plan for Inland Waterways by Priority

Area	Route	Length (km)	Strategic Classification	Dimensional Classification (at Present)	Plan	Estimated Investment Capital (bil. VND)	Priority
North	Quang Ninh-Ninh Binh (via Luoc River)	322.5	Class B1	Class I-IV	Upgrade to Class II	25	1-2
					Dredging		1
					Construction of river bank		2
					Widening bend		2
					Installation of navigational aids system		1
					Modernization of navigation aids system		3
					Maintenance of river channel (Class II)		2
					GENERAL		1
	Quang Ninh-Pha Lai (via Chanh, Da Bach, Kinh Thay rivers)	172	Class B1	Class II-III	Upgrade to Class II	20	1-2
					Dredging		1
					Widening bend		2
					Installation of navigational aids system		1
					Modernization of navigation aids system		3
					Maintenance of river channel (Class II)		2
					GENERAL		1
	Viet Tri-Tuyen Quang	106	Class B2	Class V-VI	Upgrade to Class III	25	3
					Dredging		3
					Stone breaking		3
					Construction of river bank		3
					Installation of navigational aids system		2
					Modernization of navigation aids system		3
					Maintenance of river channel (Class III)		3
					GENERAL		3
	Cua Day-Ninh Binh	72	Class B1	Class I-II	Upgrade to Class I	25	1
					Dredging		1
					GENERAL		1
	Lach Giang-Hanoi (via Ninh Co River, Red River)	187	Class B1 (Class A)	Class I-II	Upgrade to Class I	55	1
					Dredging		1
					Modernization of navigation aids system		3
					Maintenance of river channel (Class I)		2
					GENERAL		1
	International route Lach Giang-Hanoi-Lao Cai	446.5				1,000	
	*Lach Giang-Hanoi		Class B1 (Class A)	Class I-II	same as shown above		-
	*Hanoi-Viet Tri		Class B1 (Class A)	Class III	Maintenance of river channel (Class III)		2
					Modernization of navigation aids system		3
	*Viet Tri-Lao Cai		Class B2 (Class A)	Class IV-VI	Upgrade to Class III		2
					Dredging		2
					Stone breaking		2
					Installation of navigational aids system		2
					GENERAL		2
	Da River	269	Class B2	Class IV	Maintenance of river channel	25	3
					Modernization of navigation aids system		3
					150km extension of the route for Son La power plant		2
					GENERAL		2
	Routes for Co To and Cat Ba Island	91.5	Class C	Class I	Installation of navigational aids system	100	2
					GENERAL		2
	Other routes in the North					125	3

Note: Lach Giang-Hanoi route will be classified as Class A in the long future after the year 2020

Table 4.2.1 continued

Area	Route	Length (km)	Strategic Classification	Dimensional Classification (at Present)	Plan	Estimated Investment Capital (bil. VND)	Priority
South	Sai Gon-Kien Luong (via Cho Gao Canal, Tien River, Lap Vo Canal, Hau River and Rach Soi Canal)	320	Class B1	Class I-III	Upgrade to Class III		1
					Dredging		1
					Widening bend		1
					Bridge rebuilding		1
					Installation of navigational aids system		1
					Maintenance of river channel (Class III)		2
					GENERAL	984	1
	Sai Gon-Ca Mau (via Cho Gao Canal, Tien River, Mang Thit River, Hau River, Xa No River)	332	Class B1	Class I-IV	Upgrade to Class III		1
					Dredging		1
					Widening bend		1
					Bridge rebuilding		1
					Installation of navigational aids system		1
					Maintenance of river channel (Class III)		2
					GENERAL		1
	Sai Gon-Kien Luong (via Dong Thap Muoi)	288	Class B2	Class I-IV	Upgrade to Class III	75	2
					Dredging		2
					Bridge rebuilding		2
					Installation of navigational aids system		2
					Modernization of navigation aids system		3
					GENERAL		2
	Thi Vai-Nuoc Man Canal	70	Class B1	Class III-IV	Upgrade to Class III	45	2
					Dredging		2
					Installation of navigational aids system		2
					Modernization of navigation aids system		3
					GENERAL		2
	Sai Gon-Moc Hoa (from Binh Phuoc to Moc Hoa mainly on Vam Co River and Vam Co tay River)	129	Class B2	Class III-IV	Upgrade to Class III	15	3
					Dredging		3
					Installation of navigational aids system		3
					Modernization of navigation aids system		3
					GENERAL		3
	Sai Gon-Ben Keo (from Binh Phuoc to Go Dau, Ben Keo, mainly on Vam Co Dong River)	156	Class B2	Class III-IV	Upgrade to Class III	60	3
					Dredging		3
					Installation of navigational aids system		3
					Modernization of navigation aids system		3
					GENERAL		3
	Ho Chi Minh City-Ben Suc	101.5	Class B2	Class III	Upgrade to Class III	15	3
					Dredging		3
					Installation of navigational aids system		3
					Modernization of navigation aids system		3
					GENERAL		3
	Cua Dinh An-Tan Chau (Hau Giang River)	(-)	Class A	Class I	Maintenance of river (Class I)	300	1-3
	*Cua Dinh An-Can Tho						1
	*Can Tho-My Thoi						2
	*My Thoi-Tan Chau						3
					GENERAL		2
	Cua Tieu-Tan Chau (Tien Giang River)	227	Class A	Class I	Maintenance of river (Class I)	300	2
					GENERAL		2
	Other routes in the South					230	3
Central	Rivers of the provinces from Than Hoa to Quang Nam				Maintenance of river	255	3
					Installation of navigational aids system		3
					GENERAL		3
	TOTAL INVESTMENT CAPITAL by Priority (bil. VND)				**Priority 1**	**1,109**	
					Priority 2	**1,845**	
					Priority 3	**725**	
					TOTAL	**3,679**	

Note: (-) Data unavailable

2) Port

The TDSI and VIWA are currently listing development plans for port extension and construction of new passenger ports based on the "Draft Master Plan for Inland Waterway Transport of Vietnam toward the Year 2020". However, due to severe budget constraints, it is uncertain if these plans will be realized by 2020 or if project costs are accurate since there is no detailed study of each project.

In general, a port should be developed on the basis of reliable demand forecast and a regional development plan. In case the current level of demand is low, when and how to develop a port step by step is the most important point in port planning. In this regard, it is necessary to estimate an existing port's capacity and to aim to fully utilize it during the first stage then make a realistic and suitable development plan for it based on the demand forecast.

There are three basic steps in port development, as follows:

(1) Improving the productivity of existing port
- Renewal or purchase of cargo handling equipment,
- Improvement of operations, etc.

(2) Extending the port
- Extension of berth, yard, warehouse, etc.

(3) Developing new ports

The first method is more or less applicable to many existing ports, because cargo handling equipment are either lacking or aged as to hinder suitable operations. Under severe budget constraints, this method should be prioritized at the first development stage. Port extension plan should be carefully examined in more detail. In addition, it is necessary to conduct further study on a comprehensive master plan on river ports.

As with waterway, the Study Team believes that to optimize investment, proposed projects should be ranked according to strategic importance (see Table 4.2.2). However, it is necessary to select priority projects after conducting feasibility studies on each port.

Table 4.2.2
Long-term Development Plan of Inland Waterway Ports by Priority

Area	Name of Port	Strategic Classification for Cargo /Passenger Transportation	Cargo Berth			Passenger Terminal		
			Plan	Estimated Investment Capital (bil. VND)	Priority	Plan	Estimated Investment Capital (bil. VND)	Priority
North	Hanoi	Class B1/B1	Extension	85	1	Construction	15	2
	Khuyen Luong							
	Hai Phong	Class A/B1				Construction	15	2
	Ninh Binh	Class B1/B2	Extension	145	1			
	Ninh Phuc							
	Da Phuc	Class B2/C	Extension	42	2			
	Viet Tri	Class B1/B2	Extension	90	2			
	Nam Dinh	Class B2/B2				Construction	10	3
	Hoa Binh	Class B2/B2	Extension	45	3			
South	HCMC	Class A/B1				Construction	25	2
	Cao Lanh (Dong Thap)	Class B1/B2	Extension	75	2			
	Long Xuyen (My Thoi)	Class B1/B2	Extension	110	2	Construction	10	3
	My Tho	Class B1/B2	Extension	65	2			
	Vinh Thai (Vinh Long)	Class B1/B2	Extension	70	2			
	Can Tho	Class A/B1				Construction	12	2
	Ca Mau	Class B1/B2	Extension	65	2	Construction	15	3
TOTAL INVESTMENT CAPITAL by Priority (bil. VND)							Priority 1	230
							Priority 2	584
							Priority 3	80
							TOTAL	894

4.3 Fleet Development

Based on transportation demand and other indicators of fleet capacity, VIWA forecast fleet demand toward the year 2020 as shown in Table 4.3.1.

Table 4.3.1
Demand Forecast of Fleet

	1997	2010	2020
Cargo			
Pusher and Tugboat	90,500 CV	181,520 CV	363,045 CV
Barge	454,500 DWT	726,087 DWT	1,152,174 DWT
Self-propelled ship	439,300 DWT	650,000 DWT	1,247,826 DWT
Small boat	396,200 DWT	538,000 DWT	600,000 DWT
Oil tanker	-	15,000 DWT	20,000 DWT
Passenger			
Passenger Ship	210,000 seat	320,000 seat	480,000 seat
Total			
DWT	1,290,000	1,929,087	3,020,000
CV	1,275,300	2,313,520	3,650,050
Seat	210,000 seat	320,000 seat	480,000 seat

Present shipyards are only capable of building and repairing barges with a maximum capacity of 400 tons and tugboats with a capacity of 270 CV due to shortage of slip ways and backward equipment. Machinery and equipment for building new ships and important spare parts for repairing ship are currently imported. Only hull and some minor accessories, like anchor chain and pumps, are manufactured in the country. Shipyards are distributed unevenly in the country. There is no shipyard in the western of the south region.

In order to promote shipbuilding and repair industries and strengthen the network of shipyards, the following measures need to be attended:

- Upgrading the following factories: River Ship Overhaul Repair Factory No.1 (Quang Ninh), Hanoi Ship Yard (Hanoi), Ship Repair Factory No. 81 (Haiphong), Ship Repair Factory No.71 (Ninh Binh)
- Constructing new factories (Hoa Binh lake and Can Tho area)
- Encouraging joint venture investment in constructing a factory for assembling machines and producing spare parts

VIWA estimated the total investment capital (enterprise, private and state budget) as follows:

Building new ships: VND 5,072 billion
Building new shipyards: VND 380 billion

4.4 Inland Waterway Transport Safety

According to accident statistics on inland waterways under central jurisdiction, the number of inland waterway transport accidents and death is equal to 2% and 5%, respectively, of the whole subsector. There are various reasons for such accidents, but the main reason is the noncompliance with traffic rules. There is no separate data on accidents in inland waterways under local jurisdiction.

In order to reduce inland waterway transport accidents and standardize management and enforcement of inland waterway transport safety by central and local levels, the following measures are to be considered:

- Promulgating laws, decrees or ordinances on inland waterway transport safety.
- Disseminating information and traffic rules on inland waterway transport safety.
- Expanding State management functions.
- Improving inland waterway infrastructure (dredging, removing obstacles, installing navigation aids, etc.).
- Organizing a system for prompt information, efficient rescue and collection, processing and storage of data on inland waterway transport safety.

5 DRAFT MASTER PLAN

5.1 Priority Waterways and Ports for Improvement

1) Waterway

Table 5.1.1 shows the traffic volume forecast by TDSI, ADB and VITRANSS. (See main report about the data by VITRANSS.) The Study Team appraised the waterway improvement needs based on this table, and prioritized the waterways for improvement as shown in Table 5.1.2.

2) Port

Table 5.1.3 shows the cargo volume forecast by TDSI, ADB, WB and VITRANSS. (See main report about the data by VITRANSS.) The Study Team appraised the port improvement needs for cargo transportation based on this table, and prioritized the ports for improvement as shown in Table 5.1.4.

Table 5.1.1
Forecast Traffic Volume on Principal Sections of Waterway

Area	Route	Length (km)	River	Section	Traffic Volume on Principal Section of Waterway							
					Forecast Data by TDSI (1000Ton)				Forecast Data by ADB (1000Ton)		Forecast Data by VITRANSS (1000Ton)	
					1995	2000	2010	2020	2001	2016	2010	2020
North	Quang Ninh-Ninh Binh	322.5	Ven Bien	H.Gai-N3 S.Chanh	4,000	7,231	10,637	12,800	6,700	11,100		
	(via Luoc River)		Luoc	N3 Phuong Tra-Qui Cao	2,000	3,654	5,891	10,158	2,100	3,900		
			Hong	Phuong Tra-Pham Lo	1,200	3,324	4,884	6,544	2,900	4,900	(See main report)	
				Pham Lo-Hung Long	1,200	2,366	3,221	4,316	2,900	4,900		
			Nam Dinh	N3 Hung Long-N3 Doc Bo	2,000	2,216	3,013	4,200	2,500	4,100		
			Day	N3 Doc Bo-Cang Ninh Binh	1,200	2,270	3,093	(-)	2,200	3,800		
	Quang Ninh-Pha Lai	172	Ven Bien	H.Gai-N3 S.Chanh	4,000	7,231	10,637	12,800	6,700	11,100		
	(via Chanh, Da Bach, Kinh Thay rivers)		Da Bach	N3 S.Chanh-Pha Dun	2,000	5,042	6,845	7,500	3,600	6,000		
			Phi Liet	Phu Dun-N3 Trai Son	(-)	3,531	5,110	5,800	3,500	5,900		
			Kinh Thay	N3 Trai Son-N3 Trieu	2,500	4,300	6,211	7,763	4,400	7,200		
				N3 Trieu-N3 Lau Khe	(-)	5,390	7,040	8,500	4,700	7,700		
	Hai Phong-Hanoi	150.5	Cam	Hai Phong-Nga Ba Nong	400	1,164	1,945	3,350	800	1,500		
	(via Duong River)		Han	N3 Nong-N3 Trai Son	400	1,164	1,945	3,350	800	1,500		
			Kinh Thay	N3 Trai Son-N3 Trieu	2,500	4,300	6,211	7,763	4,400	7,200		
				N3 Trieu-N3 Lau Khe	(-)	5,390	7,040	8,500	4,700	7,700		
			Duong	Cua Dau-My Loc	1,200	3,654	5,230	8,500	2,900	5,600		
	Viet Tri-Tuyen Quang	105	Lo	Viet Tri-Bai Bang	1,500	2,832	4,320	6,000	2,200	3,500		
				Bai Bang-Tuyen Quang	(-)	672	840	1,400	(-)	(-)		
	Cua Day-Ninh Binh	72	Day	Cua Day	(-)	50	200	340	(-)	(-)		
					(-)	(-)	1,000	1,300	(-)	(-)		
				N3 Doc Bo-Cang Ninh Binh	1,200	2,270	3,093		2,200	3,800		
	Lach Giang-Hanoi	187	Hong	Hanoi-Hong Chau	400	3,050	4,424	5,900	2,300	4,400		
	(via Ninh Co River, Red River)			Hong Chau-Phuong Tra	400	1,548	2,928	3,920	900	1,600		
				Phuong Tra-Pham Lo	1,200	3,324	4,884	6,544	2,900	4,900		
				Pham Lo-Hung Long	1,200	2,366	3,221	4,316	2,900	4,900		
				Cua Lach Giang	(-)	200	610	660	(-)	(-)		
	International route Lach Giang-Hanoi-Lao Cai	446.5	Hong	Yen Bai-Viet Tri	150	192	252	435	(-)	(-)		
				Viet Tri-Hanoi	1,500	3,870	5,514	7,400	4,000	8,800		
				Hanoi-Hong Chau	400	3,050	4,424	5,900	2,300	4,400		
				Hong Chau-Phuong Tra	400	1,548	2,928	3,920	900	1,600		
				Phuong Tra-Pham Lo	1,200	3,324	4,884	6,544	2,900	4,900		
				Pham Lo-Hung Long	1,200	2,366	3,221	4,316	2,900	4,900		
				Cua Lach Giang	(-)	200	610	660	(-)	(-)		
	Da River	269	Da	N3 H.Ha-Cang H.Binh	450	602	632	850	400	600		
				Ho Hoa Binh	(-)	300	624	650	(-)	(-)		
	Other routes in the North				(-)	(-)	(-)	(-)	(-)	(-)		

Table 5.1.1 continued

Area	Route	Length (km)	River	Section	Traffic Volume on Principal Section Forecast Data by TDSI (1000Ton) 1995	2000	2010	2020	VI
South	Sai Gon-Kien Luong (via Cho Gao Canal, Tien River, Lap Vo Canal, Hau River and Rach Soi Canal)	320	Tien	Cay Kho-Cho Gao My Tho-N3 Sa Dec Kenh Sa Dec-Lap Vo Rach Soi-Hau Giang	9.270 7.350 6.150 1.820	11.205 9.702 8.200 3.435	16.750 11.041 12.136 6.600	19.500 14.360 16.262 8.000	
	Sai Gon-Ca Mau (via Cho Gao Canal, Tien River, Mang Thit River, Hau River, Xa No River)	332		Cay Kho-Cho Gao My Tho-(N3 Sa Dec) Mang Thit Xa No	9.270 7.350 3.530 1.160	11.205 9.702 4.685 2.550	16.750 11.041 6.685 3.300	19.500 14.360 8.890 4.000	
	Sai Gon-Kien Luong (via Dong Thap Muoi)	288		Dong Tien-Lagrange	(-)	1.200	1.600	2.150	
	Thi Vai-Nuoc Man Canal	70			(-)	(-)	(-)	(-)	
	Sai Gon-Moc Hoa (from Binh Phuoc to Moc Hoa mainly on Vam Co River and Vam Co tay River)	129			(-)	(-)	(-)	(-)	
	Sai Gon-Ben Keo (from Binh Phuoc to Go Dau, Ben Keo, mainly on Vam Co Dong River)	156			(-)	(-)	(-)	(-)	
	Ho Chi Minh City-Ben Suc	101,5			(-)	(-)	(-)	(-)	
	Cua Dinh An-Tan Chau (Hau River)	(-)	Hau	Cua Dinh An-Can Tho Can Tho-Long Xuyen	(-) (-)	1.500 1.200	3.000 1.800	3.720 2.560	
	Cua Tieu-Hong Ngu-Cambodia (Tien River)	227	Tien	Cua Tieu-My Tho My Tho-N3 Sa Dec N3 Sa Dec-Cao Lanh	(-) 7.350 (-)	1.800 9.702 2.200	2.100 11.041 3.000	2.820 14.360 4.000	
	Other routes in the South				(-)	(-)	(-)	(-)	

Note: (-) Data unavailable

Table 5.1.2
Prioritized Waterways for Improvement

Area	Classification	Name of the Waterway Route
North	Class B1	- Quang Ninh-Ninh Binh (via Luoc River) - Quang Ninh-Pha Lai (via Chanh, Da Bach, Kinh Thay rivers) - Hai Phong-Hanoi (via Duong River) - Hanoi-Viet Tri - Cua Day-Ninh Binh - Lach Giang-Hanoi (via Ninh Co River, Red River)
South	Class A	- Cua Dinh An-Tan Chau (Hau River) - Cua Tieu-Hong Ngu-Cambodia (Tien River)
	Class B1	- Saigon-Kien Luong (via Cho Gao Canal, Tien River, Lap Vo Canal, Hau River and Rach Soi Canal) - Saigon-Ca Mau (via Cho Gao Canal, Tien River, Mang Thit River, Hau River, Xa No River) - Thi Vai-Nuoc Man Canal
	Class B2	- Saigon-Kien Luong (via Dong Thap Muoi)

Table 5.1.3
Forecast Data on Cargo Volume

Area	Name of Port	Cargo Volume								
		Actual data		Forecasted data by TDSI			Forecasted data by ADB,WB			Existing design capacity (Source)
		Latest Data		2000	2010	2020	2001(North, by ADB) 2000(South, by WB)	2016(North, by ADB) 2015(South, by WB)	2010 (calculation by proportion)	
		(1000Tons)	(Year)	(1000Tons)	(1000Tons)	(1000Tons)	(1000Tons)	(1000Tons)	(1000Tons)	(1000Tons)
North	Hanoi	650	1997	909	1.200	1.300	1.655	2.228	1.999	1.300 (ADB)
	Khuyen Luong	492	1997	458	710	1.225	(-)	(-)	(-)	700 (ADB)
	Chinh Pong	(-)	(-)	700	1.270	1.270	(-)	(-)	(-)	(-)
	Cong Cau	(-)	(-)	250	350	460	(-)	(-)	(-)	(-)
	Pha Lai	1.013	1995	1.400	2.250	2.250	(-)	(-)	(-)	(-)
	Hoang Thach	212	1995	1.279	1.550	1.550	(-)	(-)	(-)	(-)
	Thuy Loi	100	1997	150	200	200	(-)	(-)	(-)	(-)
	Thai Binh	(-)	(-)	150	250	250	(-)	(-)	(-)	(-)
	Nam Dinh	71	1997	200	290	350	293	527	433	150 (ADB)
	Ninh Binh	512	1997	1.080	1.900	2.500	1.090	1.962	1.613	350 (ADB)
	Ninh Phuc	100	1997							
	Son Tay	150	1997	200	350	400	(-)	(-)	(-)	(-)
	Hong Van (Hong Chau)	55	1997	100	150	150	(-)	(-)	(-)	(-)
	Dien Cong	400	1995	440	440	440	(-)	(-)	(-)	(-)
	Da Phuc	90	(-)	120	200	200	(-)	(-)	(-)	(-)
	Dap Cau	250	1997	300	350	460	(-)	(-)	(-)	(-)
	A Lu	130	1997	200	250	250	(-)	(-)	(-)	(-)
	Viet Tri	150	1997	370	735	1.250	338	608	500	200 (ADB)
	Hoa Binh	70	1997	350	400	550	(-)	(-)	(-)	(-)
South	Thu Duc	200	1995	(-)	(-)	(-)	(-)	(-)	(-)	(-)
	Dong Nai	207	1996	(-)	(-)	(-)	(-)	(-)	(-)	(-)
	Cao Lanh (Dong Thap)	140	1996	509	692	1.150	519	803	708	255 (WB)
	My Thoi	169	1997	635	843	1.400	1.190	1.550	1.430	255 (WB)
	My Tho	349	1997	453	658	882	477	798	691	255 (WB)
	Vinh Thai (Vinh Long)	120	1997	332	705	945	290	1.032	785	91 (WB)
	Hon Chong	4	1995	218	353	475	(-)	(-)	(-)	(-)
	Kien Luong	310	1997	(-)	(-)	(-)	1.668	2.976	2.540	620 (WB)
	Can Tho	487	1998	1.374	2.656	(-)	1.795	2.730	2.418	620 (WB)
	Ca Mau	50	1997	305	390	472	730	1.478	1.229	255 (WB)

Note: (-) Data unavailable

Table 5.1.4
Prioritized Ports for Improvement

Area	Classification	Name of the Port
North	Class B1	- Hanoi/Khuyen Luong - Ninh Binh/Ninh Phuc - Viet Tri
South	Class B1	- Can Tho - My Tho - Vinh Thai (Vinh Long) - Ca Mau - Cao Lanh (Dong Thap) - My Thoi

Note: Above ports are selected as prioritized ports for cargo transportation.

5.2 Identified Master Plan Projects for Inland Waterways and Ports

1) Criteria of Selecting Projects

The proposed projects in the long-term development plan are currently under different study levels as follows:

(1) Ongoing Projects
(2) Projects whose feasibility study has already been conducted
(3) Projects whose feasibility study has not been conducted yet
(4) Projects whose coverage is unknown

Therefore, it is recommended that further detailed studies and feasibility studies of each selected project should be conducted before deciding the master plan. The Study Team selected projects from the prioritized waterways and ports mentioned in 5.1, from those mentioned in the master plan made by ADB and WB, and from those mentioned in the short-term plan made by VIWA. In addition, the Study Team selected projects according to the strategy on master plan as mentioned in the following section.

2) Waterway Improvement

Strategy on waterway improvement is as follows.

a) Class A waterways: Waterways of this class are international routes and play an important role to contribute to international trade and coastal shipping trade. For this role, these routes should be improved to facilitate access for coastal/sea-cum-river ship to inland river port and neighboring country. The target is to complete the improvement of these waterways by 2010.
b) Class B1 waterways: Waterways of this class are inter-provincial major routes and play an important role as a part of national transportation network. The target is to complete the improvement of these waterways by 2010.
c) Class B2 waterways: Waterways of this class are inter-provincial routes and also play an important roll for regional economy growth together with Class B1 waterways. The target is to complete the improvement of these waterways by 2020.
d) Class C waterways: Waterways of this class support transport for local trade, especially where road is not well-developed in the remote area. These waterways are necessary to maintain the function.

Improvement plan of waterway is shown in Table 5.2.1, Table 5.2.2 and Figure 5.2.1.

These improvements (a, b and c) result in increasing transport capacity because larger barge/ship can navigate, loading capabilities for barge/ship increase by LAD improvement. In addition, improvement of navigation condition by widening bend, wreck removal, etc. results in safe navigation.

3) Port Improvement

Strategy on port improvement is as follows.

<u>For cargo transport</u>

a) Class A ports: (See the technical report on sea port)
b) Class B1 ports: Ports of this class play an important roll as regional hub for inter-regional/inter-provincial trades in the national transportation network. The target is to complete the improvement by 2010 based on the cargo demand.
c) Class B2 ports: Ports of this class also play an important roll for inter-provincial trade. Excepting the provinces which have major river port, the Study Team propose that one port of Class B2, at least, shall be developed in each province along navigable waterways. The target is to complete the improvement by 2020 based on the cargo demand.
d) Class C ports: Ports of this class are indispensable for local economy and local life support. These ports are necessary to maintain the function.

These improvements (a, b and c) result in increasing cargo-handling capacity, reducing waiting times presently experienced in most river ports, and so on.

<u>For passenger transport</u>

a) Class A ports: (See the technical report on sea port)
b) Class B1 ports: Ports of this class play an important roll as the regional base for passenger/tourism transportation. The target is to complete the improvement by 2010 based on the passenger demand.
c) Class B2 ports: Ports of this class also play an important roll together with Class B1 ports. The target is to complete the improvement by 2020 based on the passenger demand.
d) Class C ports: Ports of this class support transport for local community, especially where road is not well-developed in the remote area. These ports are necessary to maintain the function.

Table 5.2.1
Waterway Improvement Plan

(Unit: km)

		year	2000	2005	2010	2020
Central	Class A	Not yet improved	465.5	296.5	0.0	0.0
		Improved	0.0	169.0	465.5	465.5
		Total	465.5	465.5	465.5	465.5
		Ratio of improved waterway	0%	36%	100%	100%
	Class B1	Not yet improved	1,065.4	343.0	0.0	0.0
		Improved	94.9	817.3	1,160.3	1,160.3
		Total	1,160.3	1,160.3	1,160.3	1,160.3
		Ratio of improved waterway	8%	70%	100%	100%
	Class B2	Not yet improved	1,362.5	1,241.0	1,098.0	0.0
		Improved	65.5	187.0	330.0	1,428.0
		Total	1,428.0	1,428.0	1,428.0	1,428.0
		Ratio of improved waterway	5%	13%	23%	100%
	Class C	Only Maintenance	3,177.7	3,798.2	4,186.2	4,446.2
	Total Length (Central)		6,231.5	6,852.0	7,240.0	7,500.0
Local	Class C	Only Maintenance	1,782.0	3,762.0	5,000.0	8,500.0
	Total Length (Local)		1,782.0	3,762.0	5,000.0	8,500.0
Grand Total Length (Central+Local)			8,013.5	10,614.0	12,240.0	16,000.0

Figure 5.2.1
Waterway Improvement Plan

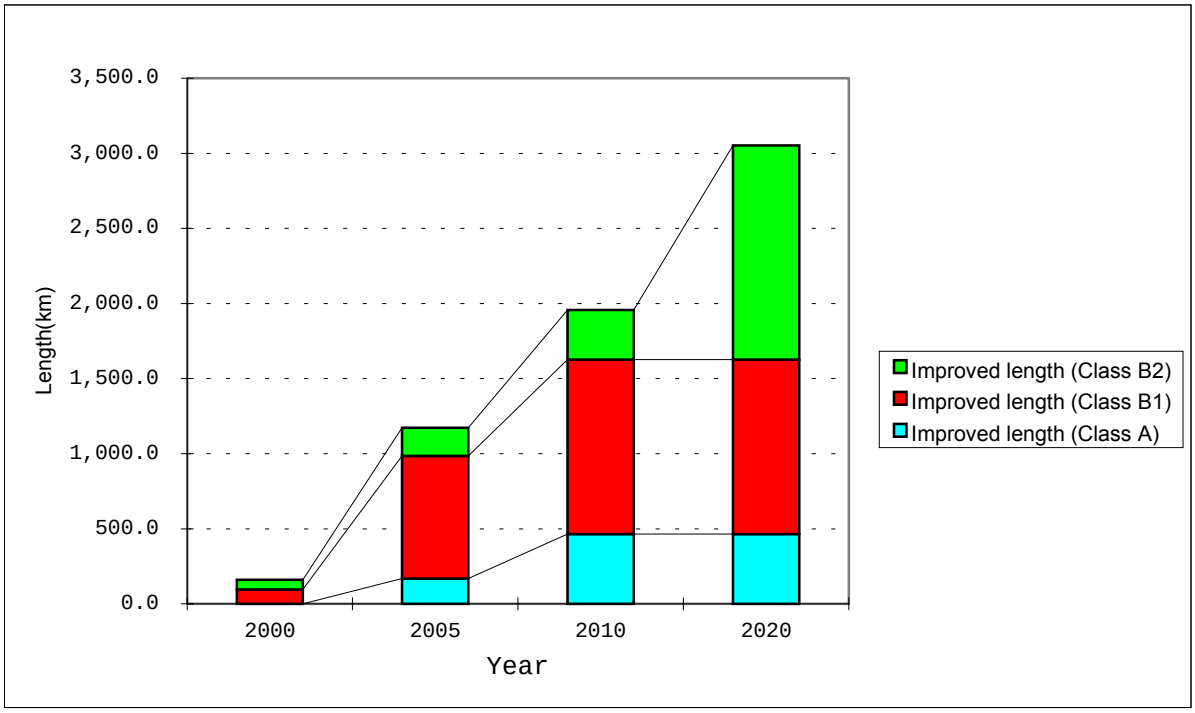


Table 5.2.2
Waterway Improvement Plan by River and Channel

No.	Name of river or channel	Length (Km)			Improved up to 2000 (Km)			Improved up to 2005 (Km)			Improved up to 2010 (Km)			Improved up to 2020 (Km)		
		Class A	Class B1	Class B2	Class A	Class B1	Class B2	Class A	Class B1	Class B2	Class A	Class B1	Class B2	Class A	Class B1	Class B2
I. PROVINCES IN THE NORTH PART																
1	Bach Dang River		12						6			12			12	
3	Ba Nom channel	15						15			15			15		
4	Bai Tu Long channel	13.5						13.5			13.5			13.5		
6	Cau River			104												104
7	Cong River			5												5
8	Cam River		9						4.5			9			9	
9	Chanh River		20.5						10.3			20.5			20.5	
11	Da River			68												68
12	Day River		72						36			72			72	
13	Duong River		68						34			68			68	
14	Da Bach River		23						11.5			23			23	
15	Dao Ha Ly River		3						1.5			3			3	
18	Han River		8.5						4.3			8.5			8.5	
19	Red River		198	286					99			198	143		198	286
23	Hoa Binh lake			203												203
24	Kinh Thay River		44.5						22.2			44.5			44.5	
26	Kenh Khe River		3						1.5			3			3	
30	Lach Sau creek	11.5						11.5			11.5			11.5		
31	Lach Buom channel	11						11			11			11		
32	Lach Tray River		31						15.5			31			31	
33	Lo River			105												105
34	Luoc River		72						36			72			72	
37	Mong Cai-Cua Lo channel	59						59			59			59		
38	Mong Cai River	17						17			17			17		
40	Nam Dinh River		33.5						16.7			33.5			33.5	
41	Ninh Co River		61						30.5			61			61	
42	Phi Liet River		8						4			8			8	
48	Cai Bau-Cua Mo channel	42						42			42			42		
49	Thuong River			62												62
51	Van Uc River		19						9.5			19			19	
	Sub-total (In the North part)	169.0	686.0	823.0	0	0	0	169.0	343.0	0	169.0	686.0	143.0	169.0	686.0	823.0

Table 5.2.2 continued

No.	Name of river or channel	Length (Km)			Improved up to 2000 (Km)			Improved up to 2005 (Km)			Improved
		Class A	Class B1	Class B2	Class A	Class B1	Class B2	Class A	Class B1	Class B2	Class A
II. PROVINCES IN THE SOUTH PART:											
1	Ba Hon channel		3			0.6			3		
2	Bac Lieu - Co Co channel			19							
6	Ba Xuyen - Dua Tho creek			20			7			20	
7	Bac Lieu - Ca Mau channel			67							
11	Co Chien River		11			2.2			11		
12	Cay Kho channel		3.5			0.7			3.5		
13	Can Giuoc River		25.7			5.1			25.7		
14	Cho Lach channel		7.5			1.5			7.5		
16	Cho Gao channel		11.6			2.3			11.6		
17	Can Tho creek		16			3.2			16		
18	Cai Nhut creek		3			0.6			3		
19	Cai Tu creek		12.5			2.5			12.5		
21	Cho Dom - Ben Luc River			20							
27	Doi channel			8.5			3			8.5	
28	Dai Ngai channel			4.5							
29	Ganh Hao river		5.6			1.1			5.6		
33	Hau River	111									111
34	Vam Ky Hon		7			1.4			7		
35	La creek		10			2			10		
36	Lap Vo - Sa Dec creek		50			10			50		
37	Mang Thit River		42			8.4			42		
40	Nga Ba Dinh creek		11.5			2.3			11.5		
41	Salt watwer channel		2			0.4			2		
42	Ong Doc River		4.9			1			4.9		
43	Ong Lon creek		5			1			5		
45	Ong Hien - Ta Niem channel		7.8			1.6			7.8		
47	Phu Huu - Bai Xau channel			15.5							
48	Rach Soi - Hau Giang channel		59			11.8			59		
49	Rach Gia - Ha Tien channel		61.3			12.3			61.3		
52	Sai Gon River			100							
56	Tra On creek		5			1			5		
57	Tat-Cay Tram channel		6			1			5		
59	Tat Thu River		4.5			0.9			4.5		
62	Te channel		4.6			0.9			4.6		
63	Tam Ngan channel										
64	Thu Thua channel			10.5			3.7			10.5	
66	Trem River-Canh Den channel (Chac Bang)		33.5			6.7			33.5		
67	Trem Trem River		12.6			2.5			12.6		
68	Thap Muoi channel No.1 (Dong Tien - Lagrang)			90.5			31.7			90.5	
70	Tri Ton - Hau Giang channel			57.5			20.1			57.5	
72	Tien River	179									179
74	Vam Co River		10			2			10		
75	Vam Co Dong River			110							
76	Vam Co Tay River			80							
77	Vam Nao River	6.5									6.5
78	Xa No channel		39.5			7.9			39.5		
	Sub-total (In the South part)	298.5	474.3	805.0	0	94.9	85.5	0	474.3	187.0	298.5
	Total (I,II)	465.5	1,160.3	1,428.0	0	94.9	85.5	169.0	817.3	187.0	465.5

4) Maintenance

According to the "Draft Master Plan for Inland Waterway Transport of Vietnam toward the Year 2020", VIWA forecast the managed length of waterway as shown in Table 5.2.3.

Table 5.2.3
Forecasted Data on Managed length of Waterways

	Actual Data (1997)	Forecasted Data (2010)	Forecasted Data (2020)
Under central control (km)	6,231	7,240	7,500
Under local control (km)	1,782	5,000	8,500
Total managed length (km)	8,013	12,240	16,000

At present, VIWA receives the maintenance fund of VND 10 million/km (US$ 714/km) on average from the state budget. It is considered short for maintenance of managed waterway even now. For instance, WB funded route in Mekong delta, the most modern waterway in near future, will require at least US$ 2000/km to maintain its original capacity. The Study Team suggests allocating fund for the maintenance cost as follows.

a) Waterways under central management: ≥US$ 1,500/km
b) Waterways under local management: ≥US$ 1,000/km

5) List of Potential Master Plan Projects

Project list proposed by the Study Team is shown in Table 5.2.4. Detail explanations of each proposed project are shown in the "Project Profile" sheets in the main report.

Table 5.2.4
Project List

No.	Project Name	Estimated Cost (million US$)	Note	Shedule		
				-2005	2005-2010	2010-2020
W1	Hanoi/Khuyen Luong Port Improvement	11.0		X	X	
-	Hanoi/Khuyen Luong Port Improvement (II)	7.5				X
W2	Ninh Binh/Ninh Phuc Port Improvement	14.4	Ongoing	X	X	
-	Ninh Binh/Ninh Phuc Port Improvement (II)	9.4				X
W3	Viet Tri Port Improvement	3.5		X	X	
-	Viet Tri Port Improvement (II)	8.1				X
-	Hoa Binh Port Improvement	4.0				X
W4	My Tho/Can Tho Port Improvement for IWT	6.1	Ongoing	X	X	
-	My Tho Port Improvement for IWT (II) (Can Tho Port improvement will be conducted as a sea port project)	3.2				X
W5	Vinh Thai (Vinh Long) Port Improvement	4.3		X	X	
-	Vinh Thai (Vinh Long) Port Improvement (II)	2.6				X
W6	Ca Mau Port Improvement	2.9		X	X	
-	Ca Mau Port Improvement (II)	1.5				X
W7	Cao Lanh (Dong Thap) Port Improvement	6.4		X	X	
-	Cao Lanh (Dong Thap) Port Improvement (II)	6.1				X
W8	My Thoi (Long Xuyen) Port Improvement	6.2		X	X	
-	My Thoi (Long Xuyen) Port Improvement (II)	7.6				X
W9	Passenger Terminal Development	2.2		X		
-	Passenger Terminal Development (II)	6.1				X
W10	Other Local Port Development	47.7		X	X	
-	Other Local Port Development (II)	42.0				X
W11	Quang Ninh-Hanoi/Pha Lai Waterway Improvement (Quang Ninh-Hai Phong-Hanoi, Quang Ninh-Pha Lai)	13.9		X	X	
W12	Cua Day/Lach Giang-Ninh Binh/Nam Dinh-Hanoi Waterway Improvement (Cua Day-Ninh Binh, Lach Giang-Hanoi, DNC Canal)	19.9		X	X	
W13	Quang Ninh-Nam Dinh/Ninh Binh Waterway Improvement	6.0		X	X	
W14	Hanoi-Viet Tri-Lao Cai Waterway Improvement (including Red River Embankment in Hanoi Area)	74.0		X	X	
-	Hanoi-Viet Tri-Lao Cai Waterway Improvement (II)	33.2				X
-	Viet Tri-Tuyen Quang Waterway Improvement	1.8				X
-	Viet Tri-Hoa Binh Waterway Improvement	1.8				X
-	Pha Lai-Thai Nguyen Waterway Improvement	1.8				X
-	Pha Lai-Bac Giang Waterway Improvement	1.8				X
W15	HCMC-Can Tho Waterway Improvement	23.2	Ongoing	X		
W16	Can Tho-Ca Mau Waterway Improvement (via Xa No)	17.6	Ongoing	X		
W17	Cho Lach-Kien Luong Waterway Improvement	25.5	Ongoing	X		
W18	HCMC-Kien Luong Waterway Improvement (via Dong Thap Mu	5.4	Ongoing	X		
W19	Thi Vai-Nuoc Man Canal Development	3.2		X		
-	HCMC-Moc Hoa Waterway Improvement	1.1				X
-	HCMC-Ben Keo Waterway Improvement	4.3				X
-	HCMC-Ben Suc Waterway Improvement	1.1				X
W20	Waterway Improvement in Hoa Binh Lake Area	2.1		X		
W21	Cuu Long-Cambodia Waterway Improvement	20.5		X	X	
W22	Island Service Improvement (Co To and Cat Ba Islands)	2.5		X		
-	Island Service Improvement (Other Islands)	4.6				X
W23	IWT Safety Enhancement	52.7		X	X	
-	IWT Safety Enhancement (II)	67.3				X
W24	IWT Education	14.1		X	X	
-	IWT Education (II)	14.1				X
W25	IWT Fleet Development	191.9		X	X	
-	IWT Fleet Development (II)	209.6				X
	TOTAL	1,017.8				
	(2001-2010)	577.2				
	(2011-2020)	440.6				
-	Maintenance Cost	142.2		X	X	
-	Maintenance Cost (II)	180.0				X
	GRAND TOTAL	1,340.0				
	(2001-2010)	719.4				
	(2011-2020)	620.6				

5.3 Operation

1) ATN Improvement and Safety Enhancement

At present, except some of major waterways, the facilities of ATN are insufficient, and safe navigation is not secured. Especially, nighttime navigation is impossible or very dangerous in many parts of waterways. In addition, the condition of many ATN is poor.

Strategy on ATN improvement is as follows.

a) Class A waterways: The target is to adapt the waterways of this class to night navigation by installing day and night ATN by 2010.
b) Class B1 waterways: The target is to adapt the waterways of this class to night navigation by installing day and night ATN by 2010.
c) Class B2 waterways: At the first stage, it is necessary for the waterways of this class to install day ATN by 2010. And at the second stage, day and night ATN should be installed by 2020.
d) Class C waterways: As the waterways of this class are also important for local transportation, day (and night) ATN should be installed step by step at the major section of these waterways.

These improvements result in not only improving navigation safety, but also increasing operational time, efficiency and business profitability, so that transportation cost will be reduced.

To enhance navigation safety, it is necessary to handle law-breaking cases strictly by patrol, and to supply equipment and facilities for inspection including vehicles, high speed vessels, communications equipment, and so on.

2) Education

In Vietnam, there are three major institutes in inland shipping education and training, i.e. Inland Waterways School No. 1, No.2 and No. 3. Inland Waterways School No. 1 in Hai Duong is the oldest and largest school for the operational jobs on inland vessels. Inland Waterways School No. 2 in HCMC is somewhat smaller and trains for the same profession. Inland Waterways School No. 3 in Haiphong is substantially smaller, and its curricula are focused on a limited number of inland shipping aspects, mainly on navigation marks and dredging operations. *(source: Netherlands report)*
Training demand has been continuously increasing, annual average regular students are estimated at more than 1,000 students by VIWA. Meanwhile, because of insufficient budget source for training activities, school/training equipment is short and in bad condition. Vessel operators and repairers are

not well trained due to the short and poor school/training equipment. It is necessary to train operational skills by using more modern training equipment, i.e. radar, electronic navigation aids, radio communication equipment, PC-based simulators, and so on. In terms of these training facilities/equipment, sufficient budget source is necessary to strengthen IWT training system. In addition, special and extensive training program should be designed to increase the education level of the trainee.

3) IWT Fleet Development

The total capacity of inland waterway fleet in Vietnam is estimated at about 1,290,000 DWT for cargo ship and 210,000 seat for passenger ship in 1997. Most of fleets are old, dating back to the 70's and 60's and even earlier, and renovated insufficiently. According to the ADB report, the fleet has shrunk continuously at a rate of between 3-5% due to its old age and an insufficient rate of renovation.

The improvements of IWT including ports, waterways, ATN, etc. can only be accomplished in connection with the development of the fleet. For the fleet development, it is not only the inland waterway fleet, but also the coastal/sea-cum-river fleet that needs to be taken into consideration, because some waterways will be improved so as to be made accessible for coastal transport.
The target of fleet development toward the year 2010 is estimated by VIWA, i.e. 1,929,087 DWT for cargo ship and 320,000 seat for passenger ship.

Strategy on fleet development is as follows.

a) Sufficiently to repair existing fleet
b) Newly to develop fleet and replace the old/existing fleet to keep up with the expected growth in IWT (based on demand)
c) To modernize fleet, such as higher powered tug which result in larger barge capacity (DWT), vessels with shallow draft specially designed for sea-cum-river navigation, container transportation, etc.

5.4 Organization/Institution

This aspect is discussed in detail in separate Technical Report No.4 Transport Sector Institution.

APPENDICES

APPENDIX A
CONTRIBUTION TO NATIONAL CONTAINER TRANSPORTATION

Nowadays, containerization in maritime transportation is a global trend, and it has prompted the modernization of international transportation. In Vietnam, container cargo volume loaded/unloaded at major seaports has increased in recent years, and the establishment of a container transportation network has become an urgent matter. Such a network in inland areas is not yet well developed with the exception of some routes, but it is sure to become vital to the economic development of these areas in future.

From this point of view, inland waterway transport can possibly be used in container transport particularly in the delta areas, such as Mekong Delta, for the following reasons:

1) Hindrance in road development
   - Construction cost of roads with many bridges over rivers and canals is high, therefore the development of a road network covering the whole inland area, including districts, would entail huge costs and a great deal of time.
   - It is necessary to improve existing bridges to accommodate heavy trailers. At present, these vehicles ply only major routes or short-distance routes.
2) Lack of container trailers as a means of transport
3) Lack of railway (not yet developed in Mekong Delta)

In using inland waterways to develop container transport, there are two alternative methods as follows (see Figure A.1):

Alternative 1 Entering inland area after transshipping at major seaport in Vietnam
Alternative 2 Entering inland area directly from foreign port

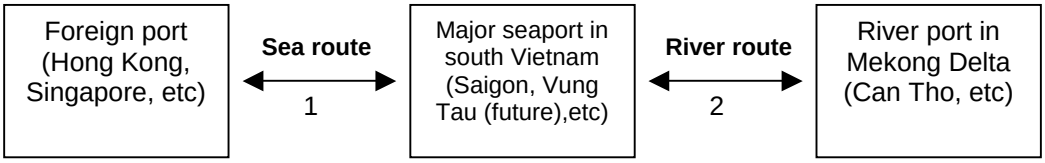
Necessary conditions for development and characteristics of each alternative are shown in Table A.1. In order to use inland waterway for container transportation, there are some issues that should be further examined in detail as follows:

1) Investigation of new river container ship or sea-cum-river container ship involving the examination and selection of the most suitable dimensions and carrying capacity of container, navigation speed stability, etc.
2) Examination and selection of the most suitable alternative through cost and benefit evaluation taking account of demand for river container transportation, characteristics of waterway route, etc.
3) Coordination with road development plan (schedule) and regional development conditions. Without access road from river port to regional development zone, river container transportation can not provide door-to-door service except for riverside customers.
4) Environmental conditions (shallow water depth and appearance of sandbars during dry season, fast water flow during rainy season, etc.)

These issues should be examined in detail under separate studies.

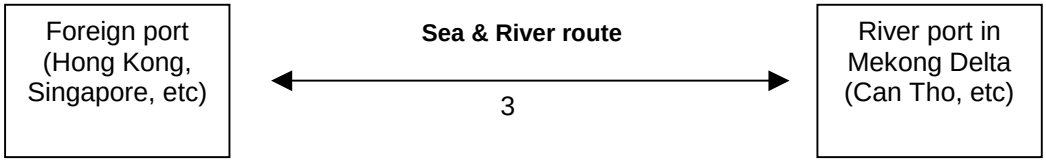
Figure A.1
Conceptual Image of River Container Transportation in Mekong Delta

(Alternative 1)



1 : Normal container ship
2 : Barge, or River container ship with shallow draft specially designed

(Alternative 2)



3 : Sea-cum-river container ship with shallow draft specially designed

Table A.1 Necessary Conditions for Development and Characteristics of Each Alternative Case

Case	Necessary Conditions for Development and Characteristics
Alternative 1	- Introduction of container handling equipment at river port - Improvement of existing barge, or development of river container ship with shallow draught specially designed for river navigation - Suitable for long-distance transport because the rate of transshipment cost to total cost is small - Suitable in the case that seaport has the capacity for ship-to-barge transshipment
Alternative 2	- Introduction of container handling equipment at river port - Development of sea-cum-river container ship with shallow draftt specially designed for sea-cum-river navigation - Suitable for short-distance transport because transshipment cost at seaport which is proportionally large to total cost is reduced - Suitable for seaport without capacity for ship-to-barge transshipment

APPENDIX B
REQUIRED SURVEYS AND STUDIES

Surveys are essential in the development of inland waterway transport. To date, however, there has been a lack of basic hydrographic surveys except on some major waterways. Further surveys are strongly required to understand the present condition of waterways and to confirm the methods for improving them. For example, siltation is probably the main obstacle to the development of inland waterway transport in Vietnam. In order to devise countermeasures for reducing siltation and establish an effective dredging method, it is important at least to understand its mechanism at the heavy and irregular sedimentation sites on the basis of a long-term engineering survey.

Before deciding the master plan on inland waterway transport system, further detailed surveys and studies should be properly conducted. Representative surveys and studies required are listed in Table B.1.

Table B.1
Representative Surveys and Studies Required

Survey/ Study	Objectives
Basic survey on hydrographic characteristics and measurement of waterways (based on up-to-date soundings, etc.)	-To measure dimensions of waterways and to identify the bottleneck in the waterway route, especially in dry season -To evaluate the volume of dredging required to improve waterway -To provide navigational charts periodically and to improve navigation safety
Study on countermeasures for reducing siltation and establishing an effective dredging method, especially in river estuary (based on the field survey, from the economic and technological viewpoints.)	-To determine quantitatively the principal factors of siltation -To work out possible improvement measures for reducing siltation (contributing to reduction of dredging backlog) -To work out effective dredging method (setting up optimum water depth for planning of waterway development, etc.)
Study on the development of an advanced water transport system, such as vessels with shallow draft specially designed for sea-cum-river navigation, container transportation, etc. (from the economic and technological viewpoints, considering future improvement plan on waterways.)	-To increase the capacity of waterway transportation -To reduce the initial and maintenance dredging volume at river estuary -To contribute to national container transportation network
Comprehensive master plan on river ports	-To identify the function of each river port -To estimate and set up the capacity of each port -To formulate a comprehensive master plan on river ports

APPENDIX C
POLICY FOR IMPROVING PORT STATISTICS SYSTEM

1. General

One of the most significant assignments of government is to compile and publish reliable statistics such as those on natural and socio-economic conditions and the status of national assets and activities. Without a firm base of statistics, accountable policies and plans of the country cannot be formed.

In formulating the port development strategy, such as the long-term development and improvement plan, port statistics are very important in projecting future demand of cargo and passenger, examining improvements on port facilities and equipment, etc. With the exception of major ports, statistical data at most river ports is not well prepared.

2. Basic Policy in Improving Port Statistics System

The basic policy to improve the port statistics system is as follows:

1) Port statistics should have a uniform format so that they can be easily accessed and understood by the entire nation and concerned parties.
2) Port statistics should comprehensively involve all ports, not just those managed at central and local levels but special ports as well.
3) Port statistics should at least clarify the trend of cargo volume of each kind of commodity, its origin/destination and cargo type, the number of calling vessels, number of passengers, and port characteristics such as water depth in front of wharf, area of stock yard and warehouse, etc.
4) If possible, port statistics should be integrated with the statistics system of land transportation, which is closely related to port activities, and be compatible with the international statistics system.

For a detailed improvement of the statistics system, a separate study should be conducted.

APPENDIX D
COST ESTIMATION OF PROPOSED PROJECTS

1. Calculation Method of Port Capacity Requirement

Parameter of Port Design	Data
(A) Design Cargo Throughput:	Forecasted cargo volume by each port
(B) Design Vessel:	4*200t barge convoy Barge (L*W)=36m*7m Barge convoy (L*W)=72m*14m
(C) Design Berth Length:	72m
(D) Number of Crane per Berth:	1
(E) Crane Capacity:	25t/hr
(F) Operating Hour:	8hr/shift
(G) Number of Shift:	2shift/day (Target in 2010)
(H) Working Day:	330days/year (including 10% down time and preventive maintenance)
(I) Dwell-times of Cargo Storage	2.5days
(J) Effectiveness of Warehouse Space Use	0.7
(K) Peak-factor	1.2
(L) Storage Capacity	2.0t/m^2

(1) Maximum Throughput Capacity per Berth = (D)*(E)*(F)*(G)*(H)
= 132,000t/year/berth

(2) Requirement of Berth Number = (A)/(1)

(3) Requirement of Berth Length = (C)*(2)

(4) Requirement of Crane Number = (D)*(2)

(5) Requirement of Forklift Number = (4)

(6) Requirement of Storage Area = $\frac{(A)*(I)*(K)}{(J)*(L)*(H)}$

2. Cost Estimation Method of Port Improvement

Calculation Method of quantity of each item

A. Civil Works

(1) Berth Length = Quantity based on the calculation of port capacity requirement

(2) Pavement = (1)*20m width

(3) Dredging = (1)*50m width*2m depth

(4) Refilling Port Area = (1)*50m width*4m height

(5) Access Road = Required quantity

B. Facilities & Equipment

(1) Warehouse = Quantity based on the calculation of port capacity requirement

(2) Mobil Crane = Quantity based on the calculation of port capacity requirement

(3) Forklift = Quantity based on the calculation of port capacity requirement