

Chapter 3 Present Situation and Development Plans of Roads and Railways

3.1 Present situation of roads and railways

3.1.1 Road and railway network in the Red River Delta

(1) Highways and roads

From managerial point of view, the roads in Vietnam are classified into the following five classes:

- 1) National Highway (NH),
- 2) Provincial Road,
- 3) Urban Road,
- 4) District Road, and
- 5) Commune Road.

From technical point of view, roads are classified into six Grades, I to VI. Technical requirements such as number of lanes, width, minimum radius of curvature, maximum gradient and others are defined in the Vietnam Technical Standard, TCVN 5054-85, based on average daily traffic and design speed of vehicles.

The network of highways and roads in the Red River Delta is summarized in **Table 3.1.1** in comparison with railways and inland waterways by start and end places. They are illustrated in **Figure 3.1.1**.

Hanoi is the focal city in the area. Highways are developed radially from Hanoi, which constitute trunk roads:

- 1) South: NH1A (Hanoi-Ha Nam- Ninh Binh-further to the south);
mostly Grade III
- 2) East: NH 5 (Hanoi-Hai Dung-Hai Phong); Grade I
NH 18 (Hanoi-Bach Ninh-Ha Long-Cai Lan- Coastal cities in
Quang Ninh Province); Grade III and IV
- 3) North: NH 3 (Hanoi-Northern provinces); Grade III and IV
- 4) Northwest: NH 2 (Hanoi-Viet Tri- Northwest provinces) ;
Grade III and IV
Thang Long – Noi Bai Highway with Grade II
- 5) West: NH 32 (Hanoi-Son Tay-Lao Chau Province) ;
Grade III and IV
- 6) Southwest: NH 6 (Hanoi-Ha Tay-Hoa Binh-Southwest provinces) ;

Grade I, III and IV

There are some other important highways which connect local nodal cities:

- 7) South-NE: HW 10 (Ninh Binh-Hai Binh-Hai Phong) ; Grade III and V
- 8) SE-NW: HW 21 (Nam Dinh-Ha Nam-Son Tay) ; Grade III and V

Table 3.1.1 Existing Highways in Comparison with Railways and Waterways

Cities	Road			Railway			Inland Waterway				
	Name	Start	End	Distance	Start	End	Distance	Main River cross	Start	End	Distance
Ha noi - Hai phong	HN5	Cau chui	Chua ve Port	106 km	Yen vien	Hai phong Station	102 km	Duong river Luoc river Day mounth	Ha noi Port	Chua ve Port	150 km 210 km 337 km
Ha noi - Quang ninh	(1A+18)	Cau chui	Cai lan Port	130 km	Yen vien	Cai lan	175 km	Duong river	Ha noi Port	Cai lan Port	212 km
	(1A+18)	Cau chui	Cam pha	160 km				Luoc river	Ha noi Port	Cai lan Port	272 km
	(5+10+18)	Cau chui	Cai lan Port	192 km				Day mounth	Ha noi Port	Cai lan Port	363 km
	(5+183+18)	Cau chui	Cam pha					Duong river	Ha noi Port	Cam pha Port	249 km
	(5+183+18)	Cau chui	Cai lan Port					Luoc river	Ha noi Port	Cam pha Port	309 km
	(5+10+18)	Cau chui	Cam pha	222 km				Day mounth	Ha noi Port	Cam pha Port	368 km
Ha noi - Viet tri	2	Phu lo	Viet tri	84 km	Ha noi Station	Viet tri Station	73 km	Red river	Ha noi Port	Viet tri Port	75 km
Hai phong - Quang ninh	(10+18)	Chua ve Port	Cai lan Port	86 km	Hai phong Station	Cai lan	277 km	Sea	Chua ve Port	Cai lan Port	62 km
	(10+18)	Chua ve Port	Cam pha	116 km				Sea	Chua ve Port	Cam pha Port	99 km
Ha noi - Ninh binh	1A	Ha noi Station	Ninh binh Town	94 km	Ha noi Station	Ninh binh Town	114 km	Red river	Ha noi Port	Ninh binh Port	161 km
Ninh binh - Hai phong	10	Ninh binh Town	Chua ve Port	117 km	Ninh binh Town	Hai phong Station	216 km	Luoc river	Ninh binh Port	Chua ve Port	219 km
	(1+5)	Ninh binh Town	Chua ve Port	205 km				Day mouth	Ninh binh Port	Chua ve Port	235 km
Ninh binh - Quang ninh	(10+18)	Ninh binh Town	Cam pha	233 km				Luoc river	Ninh binh Port	Cai lan Port	281 km
	(10+18)	Ninh binh Town	Cai lan Port	203 km	Ninh binh Town	Cai lan	289 km	Day mouth	Ninh binh Port	Cai lan Port	261 km
	(1A+5+10+18)	Ninh binh Town	Cai lan Port	286 km				Luoc river	Ninh binh Port	Cam pha Port	318 km
	(1A+18)	Ninh binh Town	Cai lan Port	224 km				Day mouth	Ninh binh Port	Cam pha Port	266 km
	(1A+5+10+18)	Ninh binh Town	Cam pha	316 km							
	(1A+18)	Ninh binh Town	Cam pha	254 km							
Ninh binh - Viet tri	(1A+2)	Ninh binh Town	Viet tri	178 km	Ninh binh Town	Viet tri	187 km	Red river	Ninh binh Port	Viet tri Port	236 km
Viet tri - Quang ninh	(2+18)	Viet tri	Cai lan Port	214 km	Viet tri	Cai lan	226 km	Duong river Luoc river Day mounth	Viet tri Port	Cai lan Port	267 km 327 km 438 km
	(2+18)	Viet tri	Cam pha	244 km				Duong river Luoc river Day mounth	Viet tri Port	Cam pha Port	304 km 364 km 443 km
Viet tri - Hai phong	(2+5)	Viet tri	Chua ve Port	190 km	Viet tri	Hai phong Station	164 km	Duong river Luoc river Day mounth	Viet tri Port	Chua ve Port	205 km 265 km 412 km
Cam pha - Cai lan	18	Cam pha	Cai lan Port	30 km				Sea	Cam pha Port	Cai lan Port	37 km

(Source) Study Team

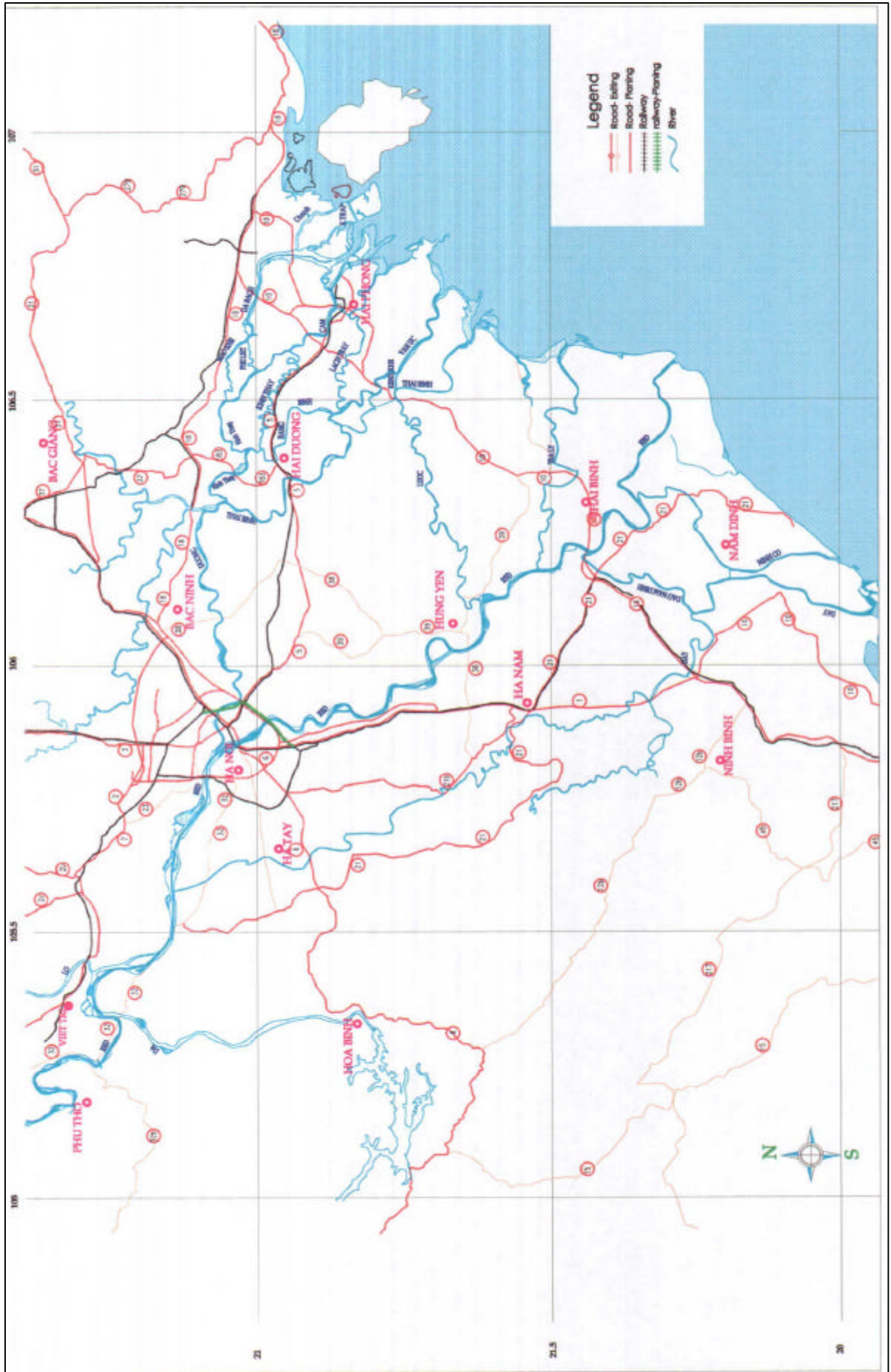


Figure 3.1.1 Highway, Railway and Inland Waterway Network in Red River Delta

Source) Study Team

The most important highways in view of the economic centers in the Delta area are HW1A and HW5. HW1A has mostly two lanes with Grade III level, and is under improvement at several focal points and bottlenecks into Grade I. HW5 was renovated from 1994 to 1999, and is now the only Grade I road in the Delta with four vehicle lanes plus sidewalks.

Thang Long – Noi Bai Highway, which opened in March 1994 and has Grade II, is the indispensable highway connecting Hanoi City at Thang Long Bridge and the only international airport of the capital city, i.e. Noi Bai Airport. The highway is also an important access to NH2. It has a length of 14.65km.

In addition to the above highways, the nets of local roads cover the Red River Delta.

(2) Railways

The Railway system in Vietnam has old history of development. Railways from Hanoi to the major cities in the Delta and on the Chinese border, such as Hai Phong, Ha Long, Dong Dang and Lao Cai, started construction in early 1900's. The cross-country railway, connecting Hanoi and Saigon, completed in 1936.

Railways in the Red River Delta, similar to highways, are developed radially from Hanoi. Hanoi Station and Yen Vien station, which is located 10.9km to the north of Hanoi Station (through the Long Bien Bridge), is the focal and nodal station in the area.

There are two gauges employed in Vietnam, i.e. 1,000mm for most of the lines, 1,435mm for Luu Xa-Kep-Chi Linh-Ha Long line running coal mine areas in the northeast region, and mixed gauges for Yen Vien- Luu Xa line and Yen Vien-Dong Da line.

The network of railway lines are, as shown in **Figure 3.1.1**:

- 1) South: Cross-country Line (Hanoi-Giap Bat-Van Dien-Ha Nam-further to the south); Gauge 1,000, Distance 1,726.2km
- 2) East: Hai Phong Line (Hanoi-Long Bien-Gia Lam-Hai Dung-Hai Phong); Gauge 1,000mm, Distance 101.8km
Ha Long Line (Hanoi-Yen Vien-Kep-Chi Linh- Ha Long); Gauge 1,435 and mixed, Distance 175.2km
- 3) North: Dong Dang Line (Hanoi-Yen Vien- Kep-MaiPha-Dong Dang); Gauge 1,000 and mixed, Distance 162.5
Quang Trieu Line(Hanoi-Yen Vien- Luu Xa-Quan Trieu); Gauge 1,000 and mixed, Distance 162.5
- 4) Northwest: Lao Cai Line (Hanoi-Yen Bien-Viet Tri-Yen Bai-Lao Cai) ;

- 5) South-NW: Gauge 1,000 and mixed, Distance 293.5
 Detour line (Hanoi -Van Dien-Ha Dong-(Thang Long Bridge-
 Bac Hong);
 Gauge 1,000, Distance 52.9km

3.1.2 Roads and railways in Hanoi city

(1) Roads in Hanoi

The road network in Hanoi is shown in **Figure 3.1.2**, including railways routes.

NH1A, the number of which is denoted by circled number in the Figure, runs across Hanoi city through Chuong Duong Bridge. HW2, 3 and 5 start at Phu Lo, the Duong Bridge, the Chui Bridge in Hanoi, respectively. The highway to the west, NH 6 and 32, have the starting points at Nga Tu So and Cau Giay, respectively. Thang Long-Noi Bai Highway with four lanes and sidewalks passes the Thang Tong Bridge and connect the City and Noi Bai Airport.

One of the important local roads is the Dike Road on the right-hand side Red River Dike, passing the commercial ports in Hanoi such as Hanoi Port, Khuyen Luong Port, Van Kiep Port, and Thuong Cat Port. It has two lanes for vehicles (width is 6m in the eastern portion and 9m in the western portion, separated at a place west of the exit of Khuyen Luong Port) with sidestep.

In Hanoi City, traffic jam has been a serious problem. It is prohibited for cars and trucks to enter Hanoi City during the following time:

Heavier than 2.5 tons:	From 5am to 10 pm,
Between 1.5 and 2.5 tons:	From 7am to 7pm, and
Less than 1.5 tons:	from 7am to 9am, and 4pm to 6pm.

(2) Railways in Hanoi

The railway in Hanoi forms a circle line as seen in **Figure 3.1.2**. It passes over the Red River by the Chuong Duong Bridge and the Thang Long Bridge.

The Cross-country Line runs across the city center beside NH1A.



Figure 3.1.2 Hanoi Transport Map

Source) Study Team

3.1.3 Modal Split

In Vietnam transport modes comprise four sub-sectors, i.e. road, railway, inland waterway, and maritime (coastal shipping). The share is shown in **Figure 3.1.3 (1)**. Road transport occupies more than 60%, inland waterway has a little more than 20%, coastal shipping shares about 10%, and railways is about 5%.

In the Red River Delta the road transport dominates inland waterways as shown **Figure 3.1.3 (2)** except Hai Phong and Nam Dinh where inland waterway handled larger volume of cargoes than that by road transport.

Modal share with regard to specific O-D, for example, between Hanoi and Hai Phong depends on not only trip distance, type of cargo, and commodity, but also local conditions of the road, inland waterways, etc.

In Vietnam the share versus trip distance has a rather special feature as shown in **Figure 3.1.4**. This share was calculated by distance of the shortest route between provinces. The share of road transport decreases up to a distance of 400km; instead the share of inland waterways increases until about 65% within this distance. This is mainly due to the well-developed inland waterway network in south Vietnam.

In the north Vietnam, however, modal share mostly depends on commodity, although the distance is limited within 400km at the most as shown in **Table 3.1.1**. The commodity hauled by inland waterways is dry bulk cargoes, including coal, sand and stones, fertilizer, etc. It reflects the conditions of inland waterways such as shallow depth.

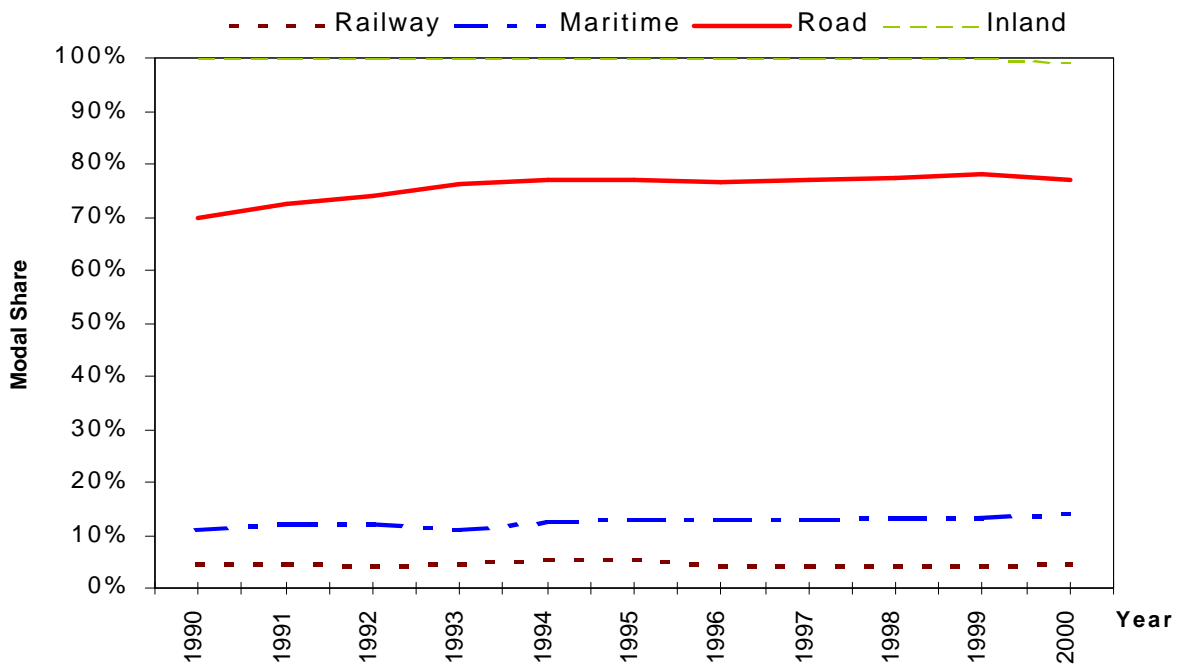


Figure 3.1.3 (1) Transport Volume in Vietnam (1990-2000)

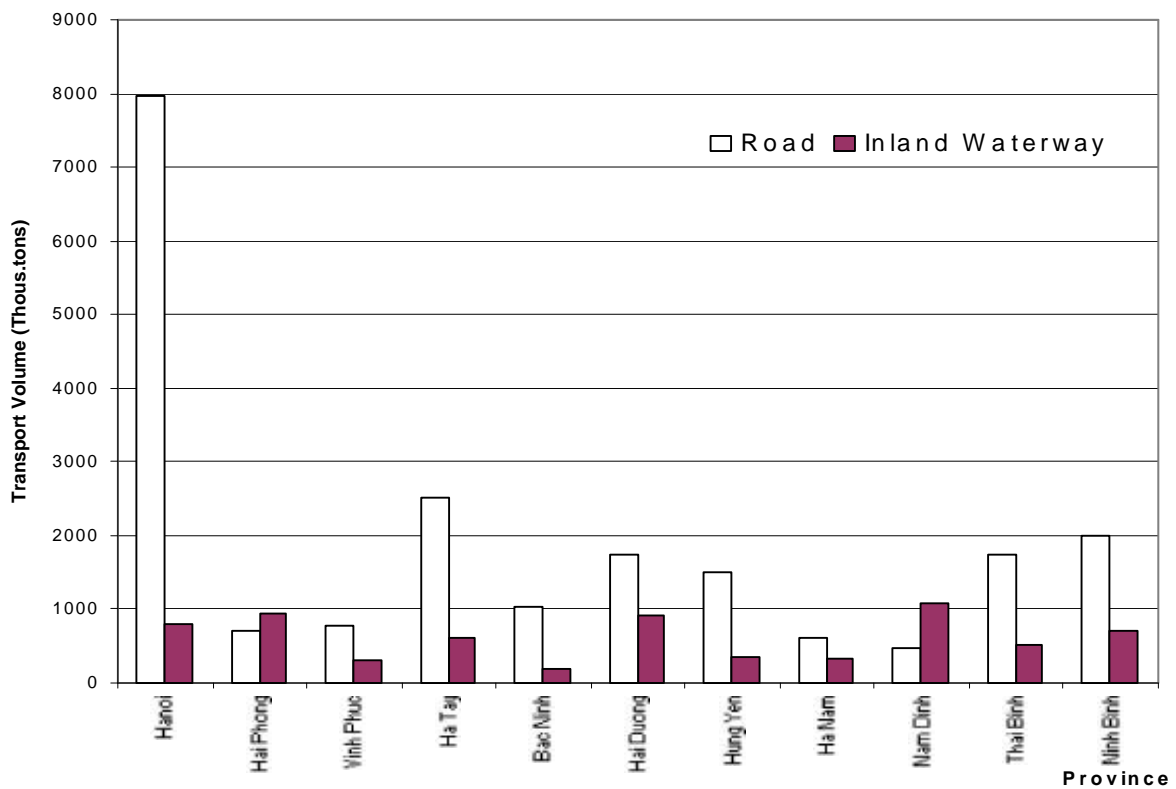


Figure 3.1.3 (2) Transport Volume by Road and Railway in the Red River Delta by Province (1999)

Source) Statistical Yearbook 2000

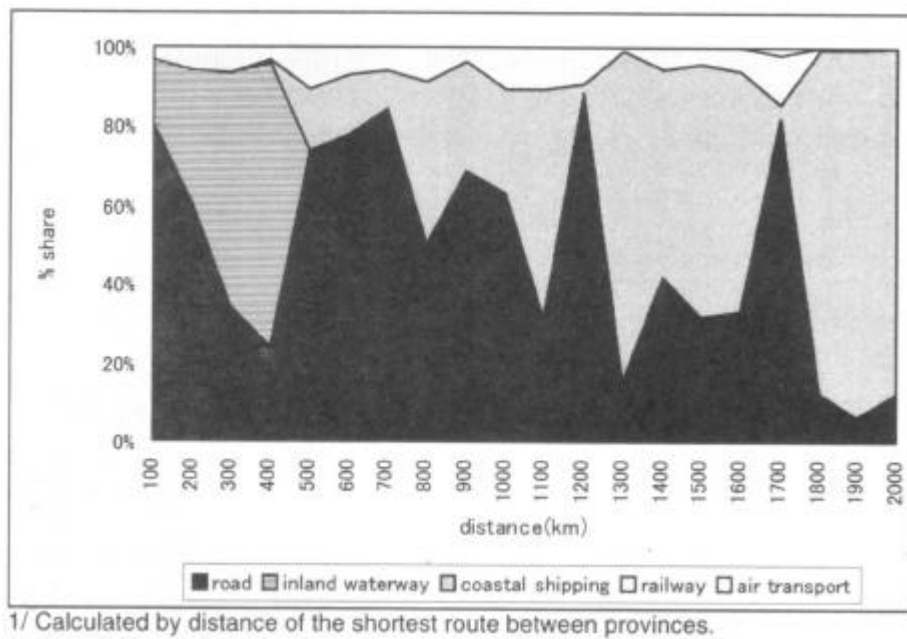


Figure 3.1.4 Modal Share by Trip Distance in Total Cargo Volume

Source) VITRANSS Report, 2000

3.2 Development plans of roads and railways

3.2.1 Road development plans

(1) Road development plans in the Red River Delta

The road development plan identified in the Master Plan of the government up to 2020 is summarized in **Table 3.2.1** for the National Highways in the Red River Delta. The most of the National Highways are planned to upgrade to higher classes, including Grade I.

(2) Road and bridge development plans in Hanoi city

The planned routes are already shown in **Figure 3.1.2**. Some important routes to be developed are as follows:

1) New HW1 and Ring Road 3

A ring road surrounding central Hanoi, from Cau Giay to the north, parallels to the existing NH1. It runs through the Than Tri Bridge, which is to be newly constructed, and Phu Dong Bridge, which has just completed. It connects HW No.1 and No. 5. The general layout of the Road and the Bridge is shown in **Figure 3.2.1**.

The construction of the Thanh Tri Bridge is the Package 1 in “ the Red River Bridge (Thanh Tri Bridge) Construction Project” funded by JBIC. The total length of the road in the Project is 12,831 m, including the bridge portion of 3,084 m, which has the grade of Expressway (Limit of speed: 100km/hr). The traffic lane arrangement is four at present and six in the future. The Bridge is made principally of concrete box girders. It has a clearance for ship navigation of 10 m from SDL +12.5m and a width of 80 m each at the two central spans.

The bridge portion (Phase I) entered the construction stage in September 2002. The construction period is 48 months, or the Bridge is expected to complete in 2006.

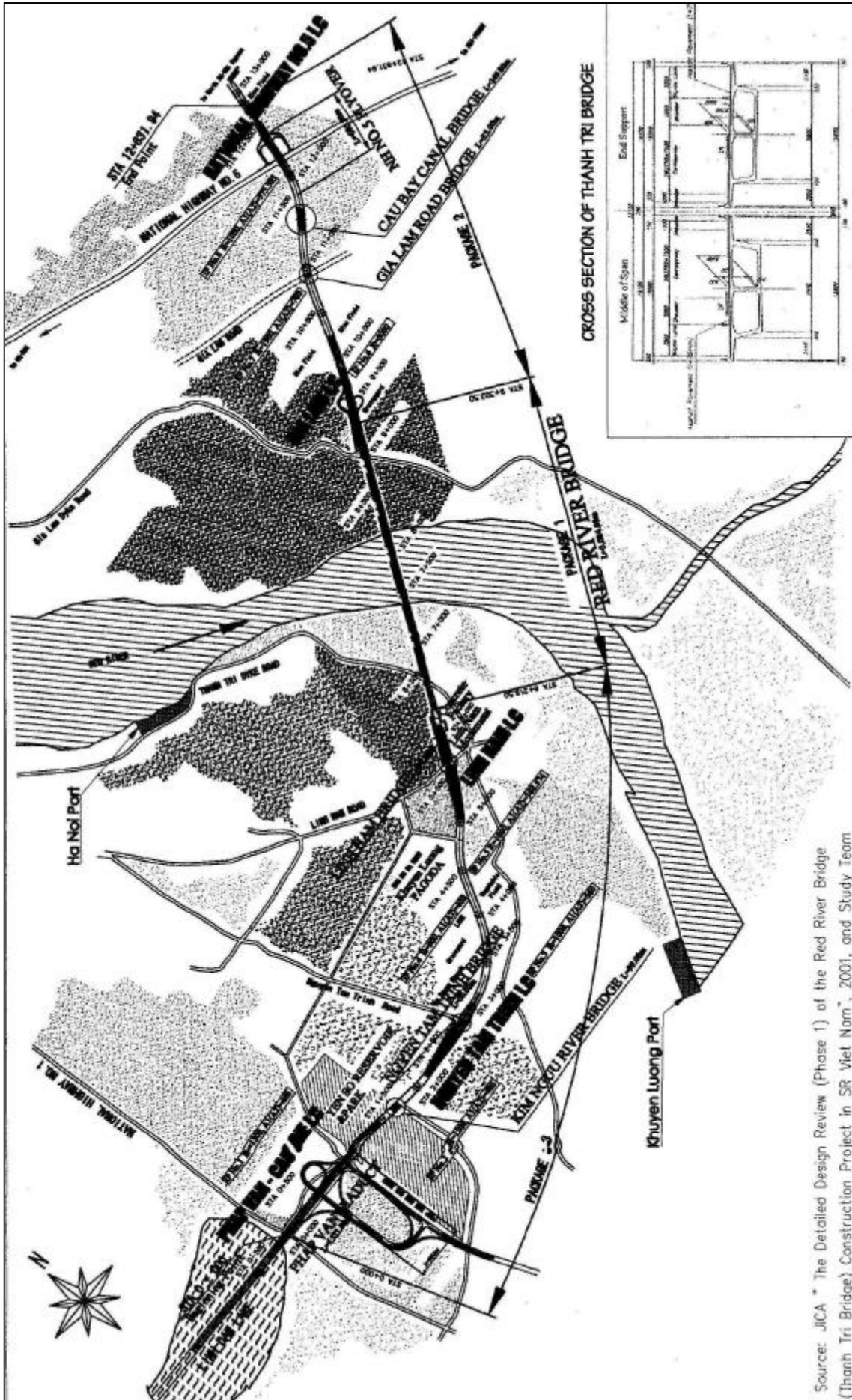
2) Ring Road 2

The Ring Road 2 is the inner ring road planned by the HPC. It is accompanied by construction of a new bridge, i.e. the Nhat Tan Bridge. and the Tu Lien Bridge in between the existing the Thang Long Bridge and the Long Bien Bridge.

Table 3.2.1 Master Plan of Road Development in The Red River Delta up to 2020

No.	Name	Distance (km)	Location		Provinces in Red river Delta through	Road class				Note	
			Starting point	Ending point		2000	2005	2010	2020		
I	Cross nation										
1	1A	2297	Huu nghi Frontier pass	Nam can	5 Provinces and City	III	I, III	I, III	I, III	I, III	
2	North-South Highway	180	Hoa lac (Ha tay)	Chon thanh	5 Provinces and City	III, IV	III, IV	III	III	III	Today, some segment are not used
II	Pan-shaped road system										
3	2	317	Phu lo	Thanh thuy Frontier pass	Hanoi – Vinh phuc	III, IV	I, III, IV	I, III, IV	I, III, IV	I, III, IV	In 2005 Segment road from Phu lo to Phuc yen: 1 class, 4 lanes
4	3	343	Duong Bridge	Ta lung Frontier pass	Hanoi	III, IV	I, III, IV	I, III, IV	I, III, IV	I, III, IV	In 2005 Segment road from Duong bridge to Phu lo: 1 class, 4 lanes
5	5	106	Chui Bridge	Chua ve Port	Hanoi, Hung yen, Hai duong, Hai phong	I	I	I	I	I	
6	6	500	Nga tu so	Lai chau	Hanoi, Ha tay	I, III, IV	I, III, IV	I, III, IV	I, III, IV	I, III, IV	
7	18	309	Bac ninh	Bac luan	Bac ninh, Hai duong	IV	III, IV	III, IV	I, III	I, III	
8	Hanoi – Ha long Highway	144	Noi bai	Ha long	Hanoi, Bac ninh, Hai duong		80-120/4	80-120/4	80-120/4	80-120/6	
9	32	397	Cau giay	Binh lu	Hanoi, Ha tay	III, IV	III, IV	I, III, IV	I, III, IV	I, III, IV	
10	37	465	Chi linh	Xom lom	Hai duong	IV, V	IV, V	IV	IV	IV	
11	10	230	Bi cho	Tao xuyen	Hai phong, Thai binh, Nam dinh, Ninh binh	III, IV	III, IV	III, IV	III, IV	I, IV	
12	21	209	Son tay	Hai thinh Port	Ha tay, Ha nam, Nam dinh	III, IV	III, IV	III, IV	III, IV	I, III	Segment road from Hoa lac to Song bai oincisive North-South Highway
13	39	109	Pho noi	Diem dien Port	Hung yen-Thai binh	IV, V	IV, V	IV, V	IV, V	IV, V	

Source) Present Conditions and Development Plan of Roads to 2000, MOT



Source: JICA "The Detailed Design Review (Phase 1) of the Red River Bridge (Thanh Tri Bridge) Construction Project in SR Viet Nam", 2001, and Study Team

Figure 3.2.1 Plan of Ring Road 3 and Thanh Tri Bridge

3) New Industrial Road (Extension of HW5)

The planned New Industrial Road to the north of and parallel to the Red River connects the north Thang Long Industrial Zone directly to NH5.

(3) Development plans of road connection to the related ports

1) Dike Road

The Dike Road runs behind Hanoi Port, Khuyen Luong Port, Chem Berths, Thanh Tri berths, etc. on the right bank of the Red River. The road is essential as the only access to the hinterland for these ports.

The HNPC has a development plan of the Dike Road for the portion in the Ring Road 2. According to the plan, the road width will be expanded from the present two lanes to six lanes.

2) Interchanges at Thang Long Bridge and Thanh Tri Bridge

Relating to connection with the existing ports in Hanoi, construction of interchanges between the Dike Road and the Thang Long-Noi Bai Highway as well as the 3rd Ring Way is essential subjects. The former interchange is planned by HNPC at the south of the Thang Long Bridge. The latter is included in the Thanh Tri Bridge Project as the Linh Nam Interchange on the right of the River and the Gia Lam Dyke Interchange at the left Dike Road as already shown in **Figure 3.2.1**.

The Linh Nam Interchange is a diamond-type, and located 5.0 km from the entrance of Hanoi Port via the Dike Road and 6.2 km from Khuyen Luong Port via the Dike Road. The Gia Lam Dyke Interchange has a half-clover shape and located just behind the left dike, allowing direct access to/from the Dike Road.

These interchanges will contribute to secure smooth traffic to/from the existing ports and HW 1 and 5.

3.2.2 Railway development plans

(1) Railway development plans in the Red River Delta

The Master Plan of Railway Development up to 2020 includes:

- 1) Upgrading of the existing routes to reach approved technical standards,
- 2) Building some sections, routes and branch routes to combine with ports, industrial zones, important economic zones,
- 3) Giving priority to increase capacity and mobilize North-South Axis, East-West Axis, and electrifying Hanoi-Hai Phong Line to have a base to develop electric force later, and
- 4) Others.

(2) Railway development plans in Hanoi city

Presently a feasibility study is underway on rehabilitation of Long Bien Bridge under a technical cooperation of the French government. It is considered to be an urgent project, and planned to implement by 2005. Development of elevated railway in the city is also being discussed in the study.

In relation to inland waterway in the Duong River, Duong Bridge flies over the River. The re-development plan of Duong Bridge has not been clear yet.

On the other hand, as shown in **Figure 3.1.2**, a new line is planned to pass the Red River on a new railway bridge to be newly constructed at Thanh Tri parallel to Thanh Tri Bridge.

3.3 Traffic of related road and railway

3.3.1 Road traffic volume at the existing ports in Hanoi

A traffic survey was carried out in this Study for three days in January 2002 at the gates of the existing ports in Hanoi, i.e. Hanoi Port, Khuyen Luong Port, and Chem Construction Material Port.

An example of the results is introduced in **Figure 3.3.1** for the case of Hanoi Port. The definitions of kind of vehicles (conversion factor to PCU) are as follows, depending on the weight of vehicles:

- Heavy truck: Heavier than or equal to 10 tons (2.50),
- Medium truck: Between 2.5 to 10 tons (2.00),
- Light Truck: Lighter than or equal to 2.5 tons (1.00), and
- Car: Sedan and wagon cars (1.00).

The peak traffic occurs in the morning, and reached to a maximum traffic of 370 vehicles/hour.

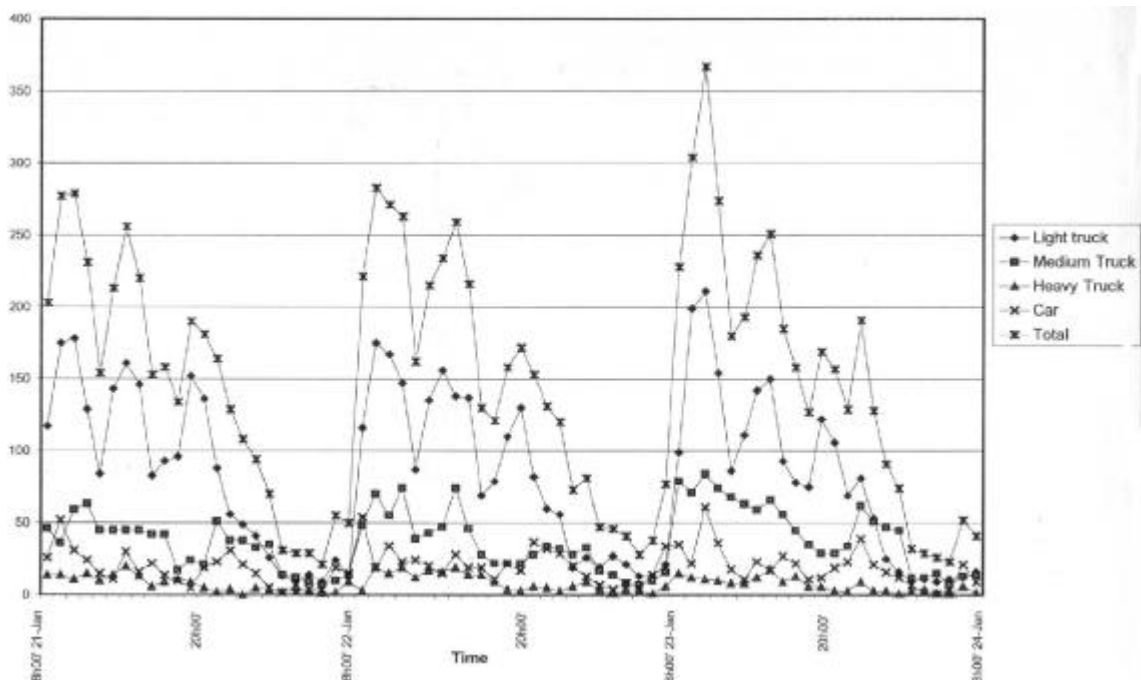


Figure 3.3.1 Vehicle Traffic into/out of Hanoi Port (January 2002)

Source) Study Team

3.3.2 Road and railway traffic volume at Duong Bridge

The Duong Bridge is located 5.7 km northeast of the Long Bien Bridge or 1.7 km southwest of Yen Vien Railway Station, and constitutes an important pass of the railway and HW 1A to the northern area from Hanoi. It is one of the serious bottlenecks of Duong River waterway transport due to lack of enough clearance during the flood season.

In order to discuss a possibility of the improvement of the clearance of the Bridge by modifying it into the movable bridge, and to grasp the actual traffic volume at the Duong Bridge, a road and railway traffic survey was carried out by the Study Team for 48 hours from August 25 (Sunday) to 27 (Wednesday) in 2002. The traffic of river vessels was about 100 ships on the Sunday and 220 on the Monday as shown in **Appendix A.3.3.1**.

(1) Road traffic volume

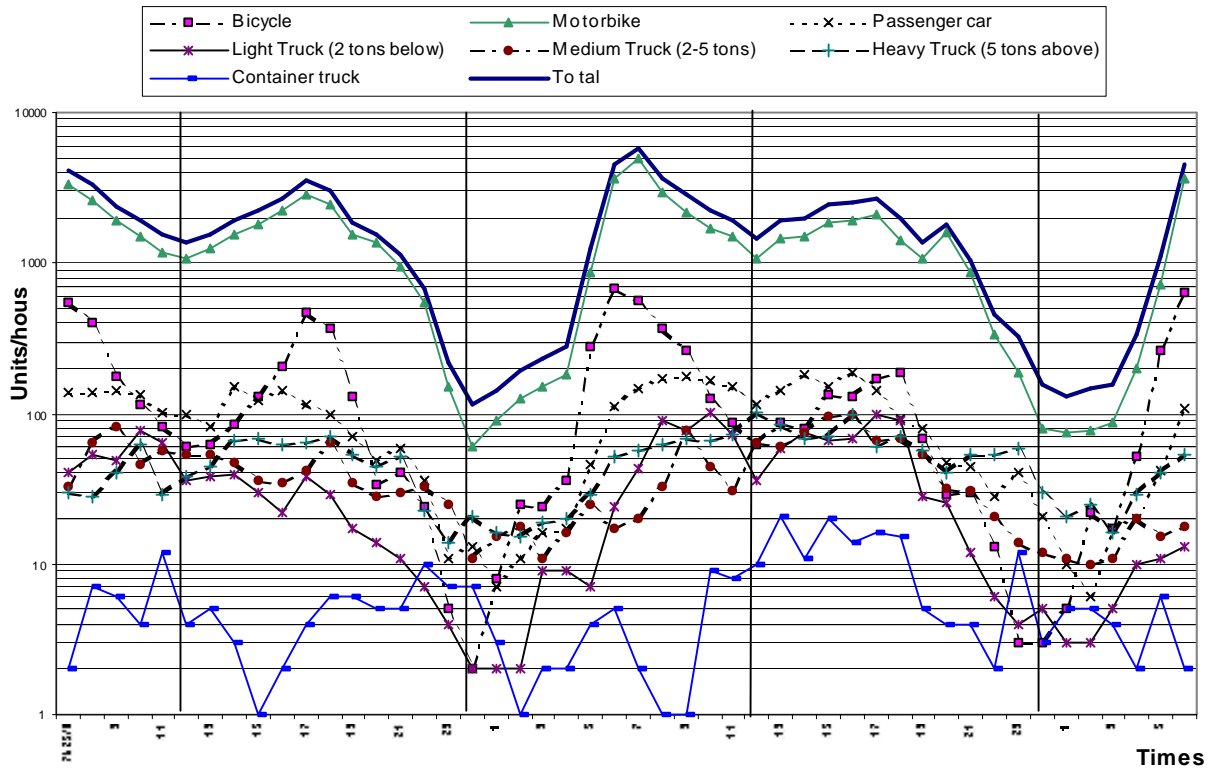
The result of road traffic survey is illustrated in **Figure 3.3.2** for the traffic directions both to and from Hanoi.

The traffic is very heavy due to large number of motorbikes, except nighttime from 10 pm to 5 am. The peak traffic occurs in the morning for the direction to Hanoi, and reach to almost a maximum traffic of 3,000 PCU (6,000 vehicles/hour) at 7 - 8 am. For the direction from Hanoi, the peak traffic is about 1,900 PCU (3,700 vehicles/hour) at 5 - 6 pm.

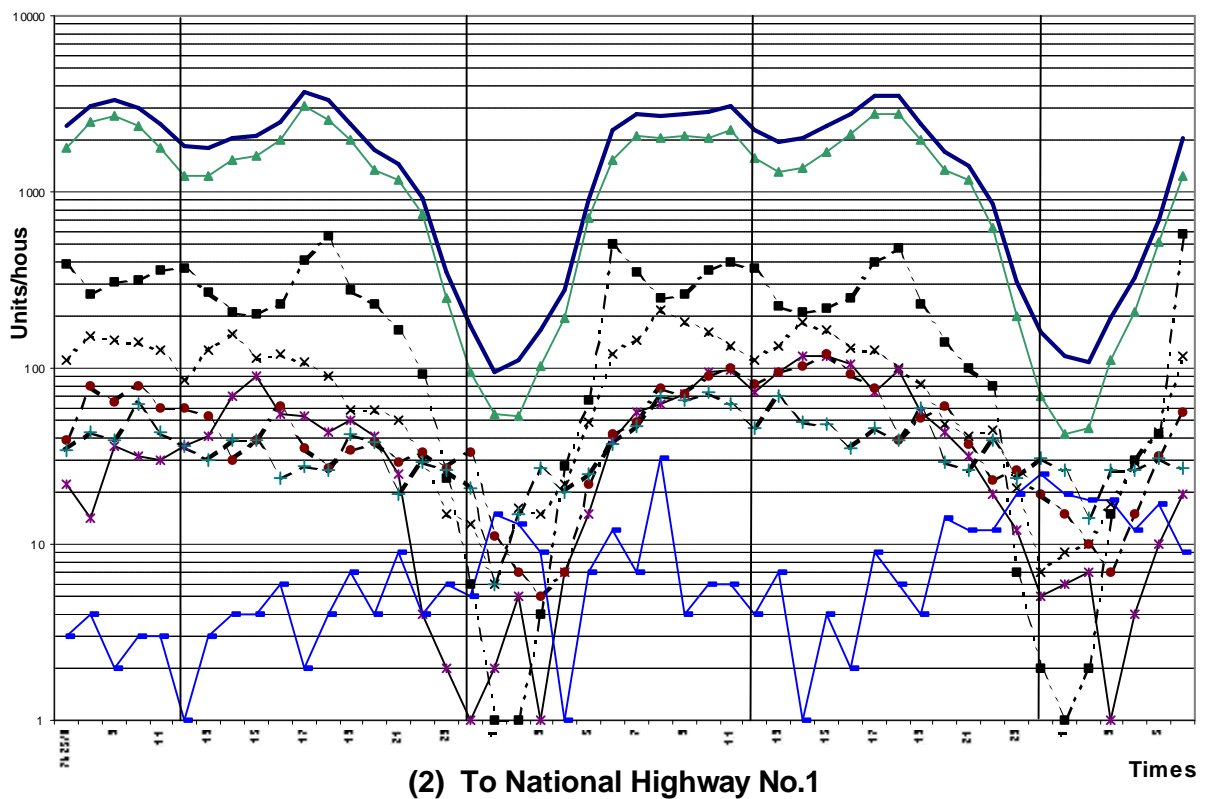
(2) Railway traffic volume

There are three kinds of trains which use the Bridge, i.e. passenger trains, cargo trains and locomotives only. The result of the railway traffic survey during the same period of time is summarized in **Table 3.3.1**. There were no trains used the Bridge other than the list in the Table.

There were 36 trains passed on the Monday. They passed the bridge almost evenly for the whole day. The overall average traffic is 1.65 trains/hour for the two days. The average traffic of nighttime from 10 pm to 5 am is 1.64 trains/hour. The busiest time is from 9 am to 12 am. There were no trains used the Bridge from 2 am to 3 am as far as the survey period concerns.



(1) To Hanoi Central Area



(2) To National Highway No.1

Figure 3.3.2 Surveeyed Road Traffic on the Duong Bridge
(From 7h 00 25/8 to 7h 00 27/8/2002)

Source) Study Team

**Table 3.3.1 Surveyed Railway Traffic on the Duong Bridge
(From 7h 00 25/8 to 7h 00 27/8/2002)**

Time	To Ha Noi Central Area				To Dirction of Norther Vietnam Area				Total
	Passenger Train	Cargo Train	Locomotive only	Total	Passenger Train	Cargo Train	Locomotive only	Total	
7:00 - 8:00		1		1	1			1	2
8:00 - 9:00					1			1	1
9:00 - 10:00	1	1	1	3					3
10:00 - 11:00			1	1			1	1	2
11:00 - 12:00	2			2					2
12:00 - 13:00			1	1					1
13:00 - 14:00					1			1	1
14:00 - 15:00		1		1	2	1		3	4
15:00 - 16:00		1		1		2		2	3
16:00 - 17:00	1			1					1
17:00 - 18:00						1		1	1
18:00 - 19:00						1		1	1
19:00 - 20:00	1			1			1	1	2
20:00 - 21:00	1			1		1		1	2
21:00 - 22:00					1			1	1
22:00 - 23:00		1		1	1			1	2
23:00 - 0:00						1	1	2	2
Total	6	5	3	14	7	7	3	17	31
0:00 - 1:00		1		1		2		2	3
1:00 - 2:00		1		1					1
2:00 - 3:00									
3:00 - 4:00	1			1					1
4:00 - 5:00						1		1	1
5:00 - 6:00	1		1	2					2
6:00 - 7:00		1		1	2			2	3
7:00 - 8:00					1			1	1
8:00 - 9:00									
9:00 - 10:00	1			1			1	1	2
10:00 - 11:00						1	1	2	2
11:00 - 12:00	2	1	2	5					5
12:00 - 13:00									
13:00 - 14:00					1			1	1
14:00 - 15:00					2			2	2
15:00 - 16:00									
16:00 - 17:00	1			1					1
17:00 - 18:00		1		1					1
18:00 - 19:00						1		1	1
19:00 - 20:00	2			2		1		1	3
20:00 - 21:00									
21:00 - 22:00					1	1		2	2
22:00 - 23:00		1		1	1	1		2	3
23:00 - 0:00		1		1					1
Total	8	7	3	18	8	8	2	18	36
0:00 - 1:00		1		1		1		1	2
1:00 - 2:00		1		1		1		1	2
2:00 - 3:00									
3:00 - 4:00	1	1		2					2
4:00 - 5:00	1	1		2		1		1	3
5:00 - 6:00			1	1					1
6:00 - 7:00					2			2	2
Total	2	4	1	7	2	3	0	5	12

Note) Number of other railway traffic is nothing.

Source) Study Team

Chapter 4 National Basic Policy for the IWT System

4.1 Master Plan on Vietnamese Waterway Transport Development up to 2020

The Master Plan on Vietnamese Waterway Transport Development up to 2020 was approved in 2000 by the Prime Minister (Decision No:16/2000/QD-TTg as of 03/Feb./2000).

Planning objectives of the master plan are as follows:

- To be the basis for investment, construction and development of IWT system in a proper and consistent manner in the whole country.
 - + forming nodal points connecting IWT infrastructure and services and facilitating to make use of the existing potentials and to enhance the capability of IWT sector.
- To gradually promote IWT sector to construct IWT system consisting of channels, ports, transport means and handling equipment in the synchronous and modern way.
 - + in order to meet the transport demand with higher quality service, reasonable cost, higher speed and safety.
- To satisfy the needs for industrialization and modernization of IWT sector.
- To concentrate on investment by using all funding sources.
 - + aiming at sustainable development, enhancement of management capability, to expand service supply activities, to ensure traffic safety, to make full use of the technical and economic advantages as well as to improve the capability of the IWT sector.

Major contents of the master plan relating to the Red River Delta are as follows:

- a) IWT contribution to the transport sector
 - Ton & Ton-km: 25-30%
 - Passenger & passenger-km: 10-15%
- b) Development of vessel fleets
 - Vessel type: Self-propelled vessels, container ships, passenger ships, etc.
 - Transport speed: 10-12 km/h (pushing & towing barge trains)
20 km/h (self-propelled vessels)
- c) Construction of regional major ports and port groups and gradual provision of modern handling equipment
 - Capacity of major ports and port groups is shown as follows:

No.	Ports	Unit	Estimated Capacity		Type of Ports
			2010	2020	
1	Hanoi - Khuyen Luong port group	10 ³ ton	1,900	2,500	General port
2	Ninh Binh - Ninh Phuc port group	10 ³ ton	1,900	2,500	General port
4	Viet Tri port	10 ³ ton	735	1,230	General port
6	Da Phuc port	10 ³ ton	200	200	General port
11	Hanoi port	10 ³ pax	320	550	Passenger port

- d) Construction of a port/berth with handling equipment in every province
- e) Upgrading and improving main channels
Class 1: Cua Day - Ninh Binh, Lach Giang - Hanoi
Class 2: from Viet Tri, Hanoi, Ninh Binh to Hai Phong, Quang Ninh through Duong and Luoc rivers
- f) Modernization of navigation aid system
- g) Investment in activities relating to IWT
Infrastructure construction, new river vessel building, river vessel repair, pilot, port authority, waterway recovery and rescue activities

The demand of investment capital for priority projects up to 2005 is estimated in the master plan to be VND 2,239 billion, of which domestic capital is VND830 billion and foreign capital is VND 1,409 billion. The details are shown as follows:

No.	Investment by phase	Billion VND
I	Urgent stage (1999-2000)	57
1	Signal supplement	34.5
2	Installing buoy, signal and equipment for new routes to be managed by the central government	22.5
II	Stage of 2000-2005	2,182
3	Duong river routes (Hai Phong - Hanoi)	25
4	Cua Day - Ninh Binh Route and Ninh Binh port	15
5	Lach Giang - Hanoi route	55
7	Hanoi passenger port	5
9	Obstacle removing/clearance	48
11	Red River embankment	740
12	Quang Ninh - Pha Lai route	16
13	Investigation of local management and construction of ports in some key provinces	150

The responsibilities of MOT and VIWA in terms of management and organization of implementation are made clear in this Decision.

4.2 Draft law on inland waterway transport

MOT has worked out the draft law on inland waterway transport and expects that the National Assembly will approve it by the year 2003.

Until now, there hasn't been a comprehensive law in the inland waterway transport sector. Administration on inland waterway transport has been done by decisions and decrees according to needs. Some inconsistencies among such decisions and decrees can thus occasionally be found. On the other hand, there are comprehensive laws in other sectors such as aviation and sea transport. Consequently, the drafting of a new law covering the inland waterway transport sector is expected.

The new law is basically made by compiling present decrees and decisions, but some new content is added. The aim of this law is as follows.

- To define sharing of responsibility and increase the efficiency of administration on the inland waterway transport.
- To enhance competitiveness of the inland waterway transport sector by reducing transportation costs.
- To promote the involvement of private companies by defining the responsibility between state and private sector.
- To contribute to environmental protection

As for ports, land, infrastructure and superstructure belong to the government at present. After the new law is approved, however, only land and infrastructure will belong to the government. A private company will lease the land and infrastructure and install its own superstructure.

As for inland waterways, although they have been classified simply according to their dimensions such as depth, width and bend radius until now, a new classification according to their importance and cargo volume will be introduced in the new law. For example, inland waterways connecting economic centers will be authorized as a 'central inland waterway', the most important one, and necessary measures will be taken to secure sufficient depth, etc.

Major contents of the draft law are as follows:

(1) Scope of Application

This law provides regulations on matters arising from activities related to the construction, management and operation of the inland waterway transport.

(2) Objects of Application

This law is applicable to Vietnamese and foreign organizations and individuals specializing in the following activities:

- A) Construction, management, protection and operation of inland waterway transport facilities;
- B) Traffic on inland waterways;
- C) Inland waterway transport (transport activities of defense sector are conducted under specific regulation);

Other activities in inland waterways which are not regulated in this law shall be subject to other laws of Vietnam on a case by case basis.

If the International Treaties in inland waterways that Vietnam has joined or signed have provisions conflicting with those provided in this law, the International Treaties shall prevail.

(3) Content of State Management

- Drawing up strategies, master plans, plans and policies on development of the inland waterway transport; drawing up and providing guidance of implementation of national plans on transport safety and measures to ensure smooth and safe transport in inland waterways.
- Issuance and implementation of legal documents on inland waterways transport.
- Propagation, popularization and education of legal regulations on the inland waterway transport.
- Management, maintenance and protection of inland waterways facilities.
- Providing registration of vessel and grant and revocation of number plates of vessel and certificates of technical safety and environment protection.
- Training and management of personnel and providing supplementary

training to technical workers in the inland waterway transport sector; Grant, change and revocation of professional certificates and licenses of ship's crew.

- Study and application of science and technology in inland waterways transport.
- Inspection and settlement of complaint and accusation; imposition of necessary punishment on violations of inland waterways transport.
- International cooperation in inland waterways transport.

(4) Responsibility of State Management

- The Government is responsible for general state management of inland waterways transport.
- The MOT is responsible to the Government for the implementation of state management of inland waterways transport.
- The Ministry of Police is responsible for cooperation with the MOT in taking measures to ensure order and safety of inland waterways transport; providing data of inland waterways transport accidents and making statement of punishment to violations of inland waterways transport.
- Ministries, ministerial-level agencies, agencies under the Government are responsible for cooperation with the MOT in implementing state management of inland waterways transport.
- People's committees at all levels are responsible for implementing state management of inland waterway transport and carrying out measures to ensure order and safety of inland waterway transport and protection of inland waterway transport infrastructure in the localities under their management.

(5) Inland Waterway System

Inland waterways are divided as follows:

- a. Central inland waterways

- b. Local inland waterways
- c. Specialized inland waterways

Central inland waterways are under control and management of the MOT. Local inland waterways are under control and management of the provincial People's Committee. The adjustment of Central, Local and Specialized inland waterways shall be decided by the Minister of Transport.

Navigation channels are classified according to technical classification. The MOT provides technical standards for the classification of inland waterways. (According to hearing, new classification will be almost same as present one.)

(6) Environment Protection

People and vessels taking part in transport, constructors of works, transporters and people in other services of the inland waterway transport shall fully implement regulations on environment protection of Vietnam law and of International Treaties that Vietnam has joined or signed.

Chapter 5 Existing Development Plans of the IWT System in the Red River Delta

5.1 Previous studies and recommendations

Previous studies on the IWT System in the Red River Delta are as follows:

- Previous studies and recommendations
- National Transportation Sector Review (1992, UNDP)
- M/P Study on Transport Development in the Northern Part of Vietnam (June 1994, JICA)
- Red River Delta M/P (June 1995, UNDP)
- M/P Study on Coastal Shipping Rehabilitation and Development Project (March 1997, JICA)
- Red River Waterways Project (January 1998, ADB)
- Transport Sector Report 1998 (January 1999, WB)
- Study on the National Transport Development Strategy (July 2000, JICA)

5.1.1 National Transportation Sector Review (1992, UNDP)

(1) Recommendations

- Development strategy:
 - 1) Modernizing the IWT fleet
 - 2) Improving waterways
 - 3) Enhancing efficiency of loading/unloading operations
 - 4) Combining inland transport with sea transport
 - 5) Opening new areas for waterway transport
- Needed studies relating to the Red River Delta:
 - 1) F/S of the development scheme of the Duong River
 - 2) Optimization study of navigation in the Red River and Thai Binh River Systems
 - 3) Study on the development of the navigation in mountainous areas, particularly on the Red River up to the Chinese province of Yunnan
 - 4) Development of navigation on the Hoa Binh reservoir
 - 5) F/S of sea-cum-river transport in North Vietnam
 - 6) Master plan for navigation aids system
 - 7) Study of river port development in Vietnam
 - 8) Study of ship design and river transport operation
- Others:
 - 1) Fuel taxes should be imposed to recover waterway infrastructure costs.

(2) Development Programs

- Investment Program 1991-1995
 - 1) Upgrading existing infrastructure and facilities (Viet Tri, Khuyen Luong: VND 10 billion)
 - 2) Improving the most dense traffic channels (VND 50 billion)
 - 3) Rehabilitating and gradually modernizing the navigation aids for sea-going vessels (VND 14 billion)
 - 4) Investing in transport facilities and equipment (barges, pushers: VND 285 billion)
- Investment Requirements until the year 2000
 - 1) Investment for transport and dredging fleet
 - 2) Investment for waterways, including hydrographic surveys to assess present conditions; simulation studies to determine where capital dredging is justified; hydrographic studies to locate and size training works.
- Investment Requirements beyond the year 2000
 - 1) Upgrading the network including reducing operating costs by means of increasing the LAD, cutting sharp bends, renewing IWT fleet, etc.
 - 2) Integrating inland waterway transport and coastal shipping including dredging inland channels and bar channels to increase the size of sea-cum-river vessels which can approach inland sites, and expanding and upgrading ports to accommodate larger vessels

5.1.2 M/P Study on Transport Development in the Northern Part of Vietnam (June 1994, JICA)

(1) Recommendations

- Specialization of river ports in handling bulk cargo (coal and construction materials)
- Modernization of river port facilities and IWT fleet
- Development of construction material-related industries in the vicinity of river ports
- Rehabilitation of dredging and navigation aids
- Priority routes for rehabilitation: Quang Ninh - Pha Lai and Quang Ninh - Ninh Binh
- Priority ports for rehabilitation: Hanoi, Ninh Binh and Viet Tri

(2) Development programs

Table 5.1.1 List of Projects (US\$ million)

No.	Project Item	by 2000	2001 -2005	2006 -2010	Total
1	Ninh Binh Port Rehabilitation and Extension	17.6	8.5	8.5	34.6
2	Hanoi and Viet Tri Port Improvement	30	10	10	50
3	The main Waterway Dredging and Rearrangement	7.6	1.5	1.5	10.6
4	Groyne Test Construction and Hydrologic Survey	0.18	0.46	0.46	1.1
5	Navigation Aids System Rearrangement	0.77			0.77
	Total	56.15	20.46	20.46	97.07

(3) Others

Table 5.1.2 IWT Cargo Forecasts in Northern Vietnam

Commodity	2000	2010
Coal & Peat	5	8 - 10
Construction Materials	3.5	5 - 7
Cement	4	5 - 7
Others	1	4
Total	13.5	22 - 28

5.1.3 Red River Delta M/P (June 1995, UNDP)

(1) Recommendations

- Increase of the least available depth of main waterways to 1.8m (90% of the time)
- Improvement of bends until the radius of curves is greater than 600 m
- Increase of clearances under bridges across Duong River and Thuong Ly and Dao channels in Hai Phong
- Investigation regarding the feasibility of installing retro-reflecting material on beacons and sealed narrow beam searchlights on vessels to extend navigation time
- Improvement of river ports by improving road and railway access, mooring and transit facilities and handling equipment
- IWT fleet upgrading by replacing old and smaller barges with barges of 1.5 m laden draft and replacement of old tugs with new, shallow draft pushers
- Development of the north-south coastal shipping using modern, shallow

- draft coasters of more than 1,000 DWT
- Development of tourist services in rivers, coastal water and upstream reservoirs (for example, Hoa Binh)
- Development of a management information system for optimum multimode planning of cargo flows
- Conducting related feasibility studies

(2) Development programs

- Short-term plans (the period up to 2005, US\$ 95million)
 - (1) Improvement of waterways
 - 1) Improvement of waterways: Quang Ninh - Hai Phong - Pha Lai - Hanoi - Viet Tri route, Hai Phong - Nam Dinh - Ninh Binh route, Ninh Binh - the mouth of Day river route
 - 2) Improvement of river port facilities: Ninh Binh, Hanoi and Viet Tri port
- Medium-term plans (the period from 2005 up to 2025)
 - 1) Improvement of waterways
 - 2) Implementation of river training works to assist in maintaining the required least available depth (LAD) while minimizing dredging requirements, based on detailed studies.
 - 3) Raising of bridges studied in the short term.
 - 4) Improvement of river port facilities
- Long-term plans (the period beyond 2025): Continuous maintenance and upgrading of the waterways, provision of suitable navigation aids, and encouraging the upgrading of port facilities

5.1.4 M/P Study on Coastal Shipping Rehabilitation and Development Project (March 1997, JICA)

(1) Recommendations

- Improvement of ports, waterways, navigation aids facilities, etc.
- Priority inland waterway ports as key general coastal shipping ports (excluding the main sea ports of Hai Phong, Cai Lan): Hanoi, Viet Tri, Ninh Binh
- Priority inland waterway routes as key sea-cum-river routes (excluding the main sea channels of Cua Nam Trieu - Hai Phong: Lach Giang - Hanoi, Hanoi-Viet Tri, Cua Day - Ninh Binh, Quan Lieu Canal route
- Improvement in pricing of waterways to encourage efficiency and adequate cost recovery

- Resolution of overlapping responsibilities between VINAMARINE and VIWA

(2) Development Programs (Short-term Priority Projects)

- Improvement of inland waterway ports: Hanoi
- Improvement of inland waterway routes: Lach Giang - Hanoi
- Deployment of visual ATN and maritime safety fleet

5.1.5 Red River Waterways Project (January 1998, ADB)

(1) Recommendations

- Improvement of navigation conditions by constructing river training works in combination with capital dredging
- Increase of fleet in the short term and fleet modernization in the medium and long term
- Establishment of an environmental monitoring program to monitor sediment quality in waterways and ports during and after construction activities (dredging, river groins, slope protection, bridges, etc.)
- Installation of shipwaste-receiving facilities at ports
- Implementation of a pilot project to restructure river management of VIWA
- Enhancement of private sector involvement

(2) Development programs

- Navigation channel improvement
 - 1) Quang Ninh - Haiphong - Hanoi - Viet Tri route
 - 2) Cua Day/Lach Giang - Hanoi - Viet Tri route
 - 3) Quang Ninh - Haiphong - Nam Dinh - Ninh Binh route
 - + Dredging to 2m (3.5m for Hanoi - sea) LAD and 55m bottom width (in the short term)
 - + Bend correction (dredging) in seven locations
 - + Improvement of existing navigation aid system
- Port improvement: Ninh Binh, Hanoi and Viet Tri ports
- Bridge construction
 - 1) Rehabilitation of the Duong bridge
 - 2) Construction of a bridge spanning the Day - Ninh Co canal
- Canal and bank protection
 - 1) Bank protection for a total of 15km of waterway
 - 2) Construction of a canal linking the Day and Ninh Co rivers

5.1.6 Transport Sector Report 1998 (January 1999, WB)

(1) Recommendation

- Access and affordability: The basic inter urban transport networks, in particular roads and inland waterways, must be completed and linked with the feeder networks, as well as with national and international distribution centers, including ports, airports, and local distribution centers.

5.1.7 Study on the National Transport Development Strategy (July 2000, JICA)

(1) Recommendations

- Classification of waterways from more strategic and functional viewpoints
 - + Class A: Routes for international transportation network
 - + Class B1: Trunk routes for inter-provincial transportation network
 - + Class B2: Other routes for inter-provincial transportation network
 - + Class C: Other routes
- Classification of river ports from functional viewpoints
 - + Class A: National hub ports serving international trade
 - + Class B1: Regional hub ports serving inter-regional/provincial trade and those serving goods transport for key establishments of national importance
 - + Class B2: Regional ports serving other inter-provincial trade
 - + Class C: Local ports serving intra-provincial trade and local life support
- Prioritization of investment based on proposed classification
- ATN improvement and safety enhancement
- Education
- IWT Fleet development
- Organization/institution

(2) Development programs

- Prioritized waterways for improvement (potential projects)
 - Class B1: 1) Quang Ninh - Ninh Binh (via Luoc River)
 - 2) Quang Ninh - Pha Lai (via Chanh, Da Bach, Kinh Thay Rivers)
 - 3) Hai Phong - Hanoi (via Duong River)
 - 4) Hanoi - Viet Tri

- 5) Cua Day - Ninh Binh
- 6) Lach Giang - Hanoi (via Ninh Co, Red Rivers)
- US\$ 6.0 million for 1)
- US\$ 13.9 million for 2) and 3)
- US\$ 74.0 million for 4) and Viet Tri - Lao Cai
- US\$ 19.9 million for 5) and 6)
- Prioritized ports for improvement (potential projects)
 - Class B1: 1) Hanoi/Khuyen Luong Ports (US\$ 18.5 million)
 - 2) Ninh Binh/Ninh Phuc Ports (US\$ 23.8 million)
 - 3) Viet Tri Port (US\$ 11.6 million)

5.2 Master Plan on Vietnamese Waterway Transport Development up to 2020

The Master Plan on Vietnamese Waterway Transport Development up to 2020 was approved in 2000 by the Prime Minister (Decision No:16/2000/QD-TTg as of 03/Feb./2000). Planning objectives and major contents of the master plan are summarized in section 4.1 of Chapter 4.

After approval of the Master Plan, MOT takes the responsibility to manage and organize implementation of the Master Plan, and VIWA to manage and operate infrastructure facilities and waterway operation services.

In this connection, VIWA and TDSI are now drafting revised (adjusted and supplemented) master plan. Main report and appendix 1 (Plan for main ports in the Northern region) of revised master plan have already been drafted at the end of 2000 and remaining appendixes will be drafted in due order.

5.2.1 Plan for main ports in the Northern region (Appendix 1)

(1) Recommendations

- To develop major river ports in a synchronous manner with the development of main navigation channels in order to enhance transport and handling capacities by shortening vessel turnaround time.
- To gradually modernize handling technology by investing in modern handling equipment.
- To mechanize all the process of handling cargo from ships to trucks.
- To realize close cooperation between ports and cargo owners and transport companies so that direct transport rate (from ship to truck or train) can be improved.
- To reach the following targets up to 2020
 - + Handling capacity of berth: 2,000 t/m/year for cargo in bag
 - + Direct transport rate: 80-90% for cargo in bag, 70% for bulk cargo
 - + Mechanization rate: 100% (excluding hooking process)
- To invest into IWT sector in a consistent manner.
- To make two port groups including Hanoi and Ninh Phuc ports participate in container handling in two main navigation channels
 - + Quang Ninh - Ninh Binh
 - + Hai Phong - Hanoi

(2) Development programs

- Port improvement: Hanoi, Khuyen Luong, Viet Tri, Hoa Binh, Ninh Phuc, Ninh Binh, Da Phuc

Table 5.2.1 Development Program of Major River Ports

Port	Item	Unit	Year	
			2010	2020
Hanoi	Cargo Throughput	million Tons	1.2	1.3
	Largest Vessel Size	DWT	1,000	1,000
	Number of Berths	berth	8	8
	Total Berth Length	m	445	445
	Land Use	ha	9	9
	Total Investment	billion VND	14.0	29.0
	Upgrading Berths		5.0	10.0
	Warehouse, Yards, etc.		4.0	4.0
	Handling Equipment		5.0	15.0
Khuyen Luong	Cargo Throughput	million Tons	0.71	1.255
	Largest Vessel Size	DWT	1,000	1,000
	Number of Berths	berth	3	5
	Total Berth Length	m	196	366
	Land Use	ha	9.2	15.2
	Total Investment	billion VND	17.0	25.0
	Berths Construction (1000DWT)		9.0	15.0
	Warehouse, Yards, etc.		4.0	4.0
	Handling Equipment		4.0	6.0
Viet Tri	Cargo Throughput	million Tons	0.735	1.25
	Largest Vessel Size	DWT	400	400
	Number of Berths	berth	7	9
	Total Berth Length	m	228	268
	Land Use	ha	17.55	17.55
	Total Investment	billion VND	21.5	68.5
	Berths Construction (400DWT)		7.5	8.5
	Warehouse, Yards, etc.		5.0	6.0
	Handling Equipment		9.0	14.0
	Railway			40.0
Ninh Phuc	Cargo Throughput	million Tons	1.445	1.805
	Largest Vessel Size	DWT	1,000	1,000
	Number of Berths	berth	5	6
	Total Berth Length	m	357	431
	Land Use	ha	10	12.5
	Total Investment	billion VND	76.5	25.5
	Berths Construction (400DWT)		40.5	9.5
	Warehouse, Yards, etc.		13	6
	Handling Equipment		23	10
Ninh Binh	Cargo Throughput	million Tons	0.145	0.145
	Largest Vessel Size	DWT	400	400
	Number of Berths	berth	1	1
	Total Berth Length	m	10	10
	Land Use	ha	12	12
	Total Investment	billion VND	33	
	Berths Construction (400DWT)		14.5	
	Warehouse, Yards, etc.		14	
	Handling Equipment		4.5	

5.3 Pre-F/S on Red River - Hanoi Section Rehabilitation Project

(1) Necessity of the project

The Red River - Hanoi section of approximately 40 km long has had a critical geographical and economic position throughout the history of establishment, construction, protection and development of the country.

This section plays a significant part in various activities ranging from economics, tourism, culture, sports, social safety and order etc., which can be seen through its characteristics involving:

- Acting as the gateway to the IWT system and a crucial link to the rail-road system for northern provinces
- Providing water for irrigation, serving agricultural needs of rural provinces as well as their neighboring areas; being given priority for protection to improve the capacity of dewatering during flood period.
- Flowing between Hanoi urban area and its outskirts; acting as a link to many of the country's historical and cultural heritage namely "Thang Long of one thousand year culture", "God of Turtle of Co Loa Citadel", "Two thousand years of history", etc.

It has, therefore, led to urgency that a comprehensive, large-scale project with enough investments designed to meet the fundamental demand of such industries as transportation, water resources as well as for the purpose of scenery embellishment, planning of city development should be formed and implemented, particularly when Hanoi is preparing for "Thang long one thousand year Anniversary".

(2) Selection of a river alignment

This rehabilitation project of Red River - Hanoi section is primarily designed to select an appropriate river alignment and stabilize the river section by training works so as to meet the above fundamental demand. The proposed solutions in the project mainly aims at:

- Keeping the river in stable conditions, improving shipping facilities in the river section; selecting a suitable location for the development of berth and port system and appropriate position for river crossing works construction

- Reinforcing river banks to prevent erosion, which may endanger existing dykes, social order and safety; land planning aiming at flood dewatering improvement in the river section
- Building and embellishing scenery alongside the river banks to make Red River - Hanoi section a true "Corridor for the cultural activities of the Capital"

(3) Proposed river position

From the results of the analysis and study of the river section developments with reference to the available findings of the Ministries of Transport, Water Resources and the computed modeling of current velocity in typical circumstances, the proposed river position for training is:

- The training alignment is planned against the background of river position A (A1-A2-A3) with bends at Thuong Cat (upstream of Lien Mac sluice), Tam Xa (upstream of Cua Duong), Hanoi Port and Bat Trang (Xuan Quan sluice). On the transitional straight between the two bend crests of opposite direction lies the end cross-sections of the river position including those at Thang Long, Long Bien and Chuong Duong bridges and the former Khuyen Luong ferry (in the upstream of present Khuyen Luong Port). The analysis of statistic data collected in many years show that this river form has been prevailing for over one hundred years. This river alignment appears to be most favorable for the economic industries related to the current comprehensive utilization of this section namely transport, irrigation, tourism and the city's development.
- The basic configuration of the aligned river section is selected based on the calculations extracted from experienced and semi-experienced formula with reference to the available related study results by local authors. The training configuration of this river section is specifically shown as follows:

Table 5.3.1 Summary Sheet of the training position configuration

Item	Dong Lai - Cua Duong Section	Cua Duong - Thanh Tri Section	Thanh Tri - Van Phuc Section
1. Training breadth			
Flood bed	0.80km	0.74km	0.74km
Dry bed	0.70km	0.63km	0.63km
2. Training depth			
Flood bed	10.7m	10.2m	10.2m
Dry bed	9.8m	9.1m	9.1m
3. Bend radius	3.5-4.2km	3.0-4.8km	2.4-3.0km
4. Flood discharge corridor	2.40km	2.22km	2.22km

(4) Work structure

According to the alternatives, a groyne should be constructed to stabilize and regulate the aligned river section together with bank revetments, channel dredging and reclamation. The proposed works can be divided into:

- The groyne system to adjust the river streambed and create shoreline as the training route
- Dredging and reclamation to partially regulate the aligned section during construction of training works
- Revetments for bank formation and protection

(5) Investment capital for the construction of training works

Dong Lai - Cua Duong section: VND 1,418 billion
 Cua Duong - Thanh Tri section: VND 1,544 billion
 Thanh Tri - Van Phuc section: VND 114 billion
 Total investment capital: VND 3,076 billion

(6) Port and berth system

The various ports and berths along the river section are divided into five types with respective locations as follows:

- Integrated ports: Ha Noi and Khuyen Luong ports
- Construction materials handling ports: Linh Nam (upstream of Khuyen

- Luong port), Thuong Cat port (on the right side upstream of planned Thuong Cat Bridge), and Mai Lam port;
- Port for coal handling: Thuong Cat and Mai Lam ports
 - Specialised ports: Duc Giang and Lung Lo ports
 - Passenger and tourism ports: estimated inter-provincial passenger port at Van Kiep with additional ship calls at Long Bien reach. Estimated tourist ship berths include Chu Dong Tu (Thanh Tri); Bat Trang; Bo De; Cua Duong (Gia Lam); Hai Boi (Don* Anh); Nhat Tan (Tay Ho) and Ben Chem (Tu Liem).

The overall figures of port and berth system along the river are as follows:

Table 5.3.2 Port and Berth System

Port/Berth	Capacity	Land Use	Investment (bil. VND)
I Cargo Port	6.19 mil. tons		564
1. Hanoi	1.30 mil. tons	25 ha	165
2. Khuyen Luong	1.66 mil. tons	17 ha	224
3. Linh Nam	1.00 mil. tons	6 ha	80
4. Thuong Cat	1.26 mil. tons	8 ha	95
II Passenger & Tourism Berth			191
1. Tourism Berths (10 berths)		5 ha	50
2. Passenger Ports	0.50 mil. PAX	3 ha	141
Total		64 ha	755

(7) Navigation aid system

Total investment: VND 50 billion

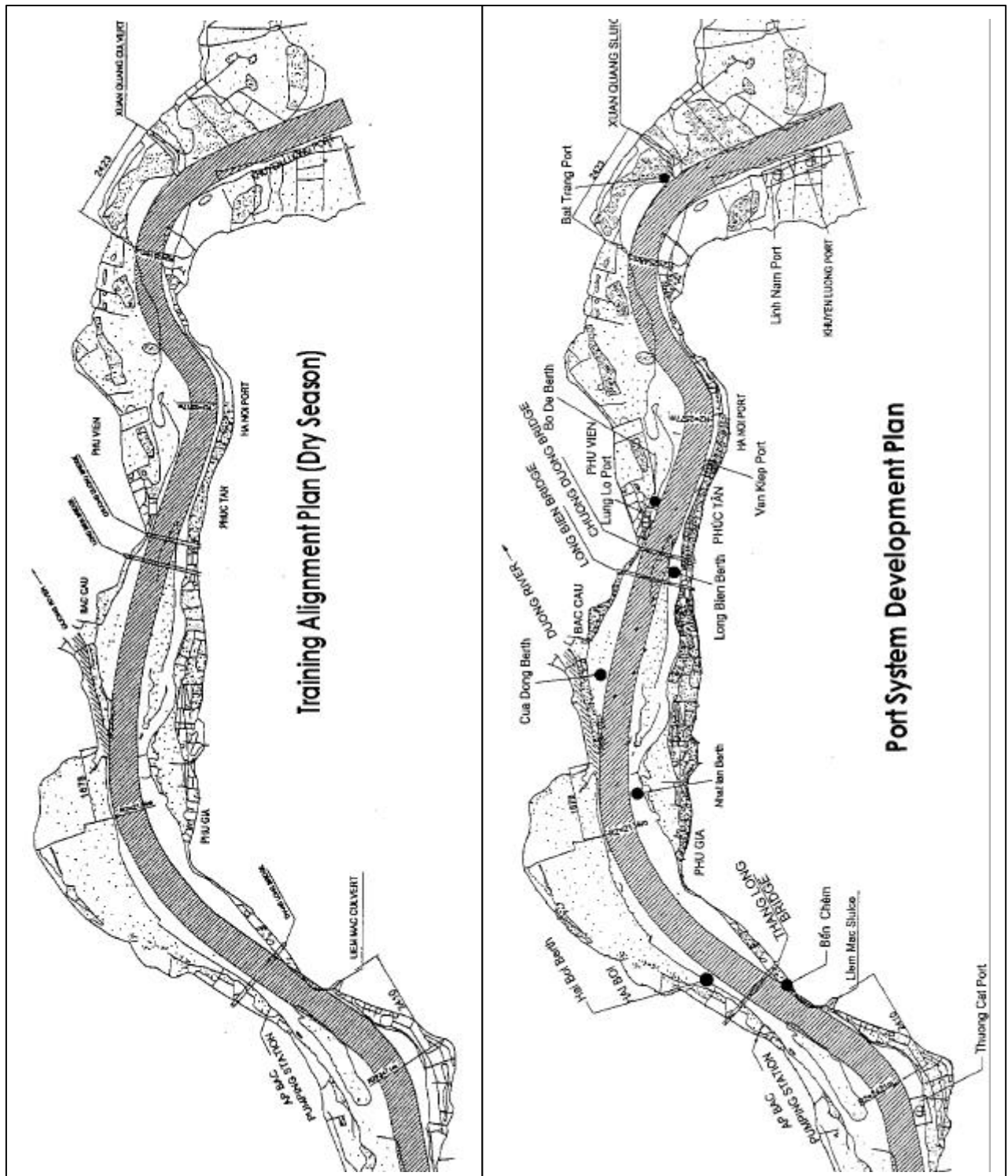
(8) Total investment capital

Total investment capital for the rehabilitation of the river section includes rehabilitation and stabilization of the river current & streambed, port/berth system and navigation aid system is VND 3,881 billion. With the said investment capital, the project will bring the following benefits:

- Direct benefit of the project is to create a stable river alignment convenient for the navigation of transport vessels including sea-river going vessels with the capacity of 1000 DWT as well as sport and tourist vessels.
- Long-term arrangement and stabilization of river port works of cargo and

- passenger transport services as well as cultural and tourism services in an overall reasonable and well organized planning.
- Stabilization of the water intake works serving for irrigation as well as other demands of industry and society of the city.
 - Ensuring the stabilization of big bridge's foundation and other river crossing works along nearly 40 km of the river section passing through Hanoi.
 - Ensuring the flood discharge corridor for the river section, excluding riverbank erosion and maintaining the safety for capital residences during flood season.
 - Protecting the grounds nearby the river which are effectively utilized and creating new grounds to increase land availability for the city.
 - On the basis of stable river shoreline, plans for the construction and development of the area near dikes can be implemented. This will lay the foundation and create favorable conditions for the protection of environment, city scenery in the coming years.

The efficiency of investment capital for the construction of training and rehabilitation works of the ports: Basing on the stabilization of the river alignment and riverbank which will be the foundation for the construction investment of the riverbank infrastructure on both riversides to the existing dikes, price of land will be increased and EIRR will be determined to be 17%.



Source) Pre-F/S on Red River - Hanoi Section Rehabilitation Project

Figure 5.3.1 Plans of Training Alignment and Port System Development