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JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

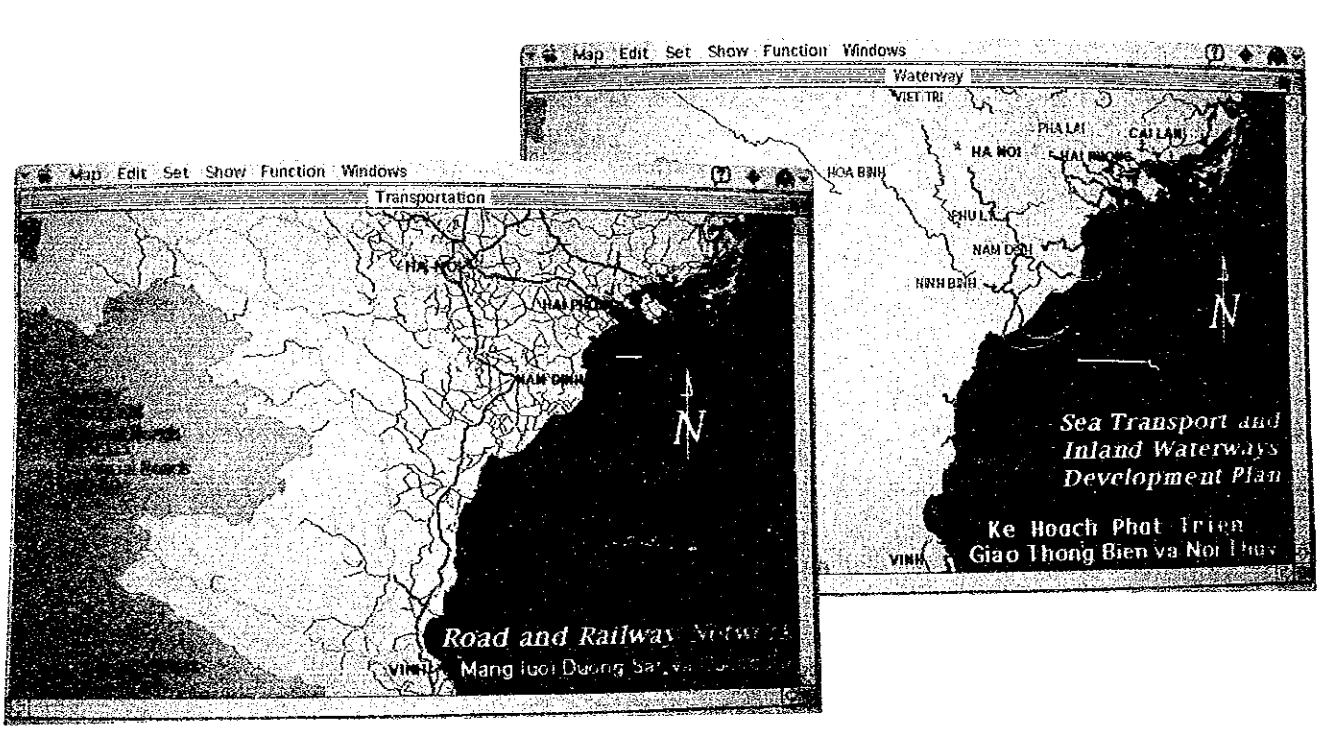
MINISTRY OF TRANSPORT AND COMMUNICATIONS
THE SOCIALIST REPUBLIC OF VIET NAM

NO. 52

THE MASTER PLAN STUDY ON THE TRANSPORT DEVELOPMENT IN THE NORTHERN PART IN THE SOCIALIST REPUBLIC OF VIET NAM

FINAL REPORT

VOLUME 4: ANALYSIS OF PRESENT CONDITIONS AND FUTURE FRAMEWORK



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IN THE NORTHERN PART
IN THE SOCIALIST REPUBLIC OF VIETNAM
FINAL REPORT - VOLUME 4

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List of Abbreviations

A. Authorities and Agencies

ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
CIS	Commonwealth of Independent States
COMECOM	Council for Mutual Economic Aid
DOTC	Department of Transport and Communications
FAO	Food and Agriculture Organization
G.D.R.	German Democratic Republic
IBRD	International Bank for Reconstruction and Development (World Bank)
IWB	Inland Waterway Bureau
JARTS	Japan Railway Technical Service
JICA	Japan International Cooperation Agency
JNR	Japanese National Railway
JR	Japan Railway
LAO PDR	*Lao People's Democratic Republic*
MOTC	Ministry of Transport and Communications
P.R. China	People's Republic of China
R.M.D.	Road Management Divisions
RRMU	Regional Road Management Unit
SCCI	State Committee for Co-operation and Investment
SPC	State Planning Committee
TEDI	Transport Engineering Design Inc.
TESI	Transport Economic Scientific Institute
UK	United Kingdom
UN	United Nations
UNDP	United Nations Development Programme
UNIDO	United Nation, Industrial Development Organization
U.S.A.	United States of America
USSR	Union of Soviet Socialist Republics
VINAMARINE, V.M.	Viet Nam National Maritime Bureau
VINASHIP	Viet Nam Shipping Company
VISERITRANS	Viet Nam Sea - River Transport Enterprise
VITRANSCHART	Viet Nam Sea Transport and Chartering Company
VNR	Viet Nam Railway
VOSCO	Viet Nam Ocean Shipping Company
VRAB	Viet Nam Road Administration Bureau

B. Other Abbreviations

AADT	Average Annual Daily Traffic Volume
AASHTO	American Association of State Highway and Transportation Officials
AC	Asphalt Concrete
As	Asphalt
BOT	Built, Operation and Transfer
CBR	California Bearing Ratio
CIF	Cost Insurance and Freight
DC	Diesel Rail Cars
DID	Densely Inhabited District
DWT	Dead Weight Tonnages (Tons)
EIA	Environmental Impact Assessment
EPZ	Export Processing Zone
FDC	Freight Distribution Center
FIRR	Financial Internal Rate of Return
F/P	Foreign Portion
GDP	Gross Domestic Products
GPP	Gross Provincial Products
GRP	Gross Regional Products
GRT	Gross Registered Tonnage
HCM	Highway Capacity Manual
HCM City	Ho Chi Minh City
HP	Horse Power
IEE	Initial Environmental Examination
L/P	Local Portion
LRT	Light Rail Transit
MG	Meter Gauge
MIS	Management Information System
MxG	Mixed Gauge
NFEA	Northern Focal Economic Area
N.P.	National Park
NTSR	National Transportation Sector Review
ODA	Official Development Assistance
O/D, O-D Survey	Origin-Destination Survey
OJT	On-The-Job- Training
PC	Prestressed Concrete
PCU	Passenger Car Unit
PD	Project Description
PSI	Present Serviceability Index
QC	Quality Control
R.O.W.	Right of Way
RUCM	Road User Cost Model

SD	Site Description
SFEA	Southern Focal Economic Area
StG	Standard Gauge
TEU	Twenty Feet Container Equivalent Units
TQC	Total Quality Control
TRANPLAN	Transportation Planning Modeling Software
TWV	Two-Wheeled Vehicles
V/C Ratio	Volume Capacity Ratio

Chapter 1 Introduction

CHAPTER 1 INTRODUCTION

This volume is intended to form the factual and analytical basis for the conclusions and recommendations proposed in Volumes I and II. It presents the study team's assessment of the present status of transport systems and services in the northern part of Vietnam, and their likely future development without intervention. The emphasis is on identifying both present and future opportunities as well as constraints, with the aim of prescribing solutions which will assist the Vietnamese transport authorities and national economic planners, to benefit from the opportunities and to relieve the constraints.

With these aims in mind, the three substantive chapters following this introduction, are organized first to examine concretely the status and prospects for the main modes of road, rail, sea and inland waterway transport which make up the backbone of Vietnam's transport supply system. Then, trends in economic and demographic factors and activities are evaluated from the particular point of view of their implications for development in demands for transport services. Finally, the mode-by-mode transport conditions are brought together with the expectations for growth and change in social and economic factors, to arrive at forecasts for transport demand in the years 2000 and 2010 in terms of movements of passengers and freight through interlinking road, rail and inland waterway networks. In each sector, encouraging strengths as well as obvious needs for improvement have been found.

However, even in those cases where there is sufficiency of service capacity for the present and near-term future, in every transport sector there is danger of the present infrastructure being overwhelmed by rapid expansion of passenger, freight and vehicle loads generated by the rapid economic development which northern Vietnam can now anticipate with confidence. Demographically, while the rate of natural population growth is relatively high, the expected pace of urbanization would be more important in impact within the time horizon of this study. Rising living standards may severely test the carrying capacities of transport systems, particularly if the presently very-lightly-traveled roadways become flooded with motorized vehicles. Both long-term foresight and immediate preparations are indispensable to cope with those challenges, to maintain unimpeded movement of the people and their goods through the whole of the northern part of Vietnam.

The very last chapter contains environmental aspects both in natural and social conditions. And the chapter is concluded with traffic safety measures.

Chapter 2 Present Transport Situation, Obstacles and Problems

CHAPTER 2 PRESENT TRANSPORT SITUATION, OBSTACLES AND PROBLEMS

2.1 OVERVIEW

In general, the transport network in the Northern part of Vietnam is not only poor, but also seriously degraded.

Most national roads are in a perilous condition. Insufficient performance in maintenance and rehabilitation activities resulted in the deterioration of already weak transport infrastructures. 61.4 % of national roads (except Route No. 1) are in poor and very poor condition, and only 2.1 % of national roads are in good condition (National Transport Sector Review, UNDP, Ha Noi 1992).

There is a high frequency of traffic accidents. About 6,000 to 7,000 accidents with 2,547 fatal casualties were reported in 1989. Safety measures, such as enactment and strict enforcement of traffic regulations, are required for both vehicles (including motorcycles and bicycles) and pedestrians.

The railway system consists of four major lines in the Northern part of Vietnam: two lines to the border with PR China (Ha Noi - Lao Cai Line, Ha Noi - Lang Son Line), one line to the coastline in the east (Ha Noi - Hai Phong Line) and one line to the south (Ha Noi - Ho Chi Minh City Line). The majority of bridges date back to the beginning of this century and many suffered damage during the wars. Repair works were undertaken on a temporary basis and substantial rehabilitation is now required.

With regard to the port sub-sector, Hai Phong Port, for instance, requires 9 million m^3 of dredging every year. The water depth in its entrance channel is currently only 4 to 4.5 m, as a consequence of strong siltation and insufficient dredging. In the light of growing foreign trade and a trend toward larger cargo vessels, the construction of a deep seaport would play a strategic role for economic development of the Northern part of Vietnam.

The inland waterway transport system is primarily developed along the Red and Thai Binh rivers, and transports mainly coal and construction materials. Its three major problems are siltation, fluctuations in water depth and shortage of equipment.

Budget constraints constitute the key bottleneck in coping with the poor condition of the transport infrastructure. Investment in transport infrastructure accounted for 18 % of the total state budget from 1976 to 1985, but only 11 % of the budget was allocated to this purpose from 1986 to 1990. Despite recent modifications of the state tax system, state revenue remains far short of that needed to develop the transport network to a satisfactory level. Maintenance work, alone, requires a fourfold budget increase. Foreign aid thus seems to be necessary to assist the government in its efforts to rehabilitate and expand the present transport network.

2.2 ROAD TRANSPORT

2.2.1 Road System in the Northern Part of Vietnam

(1) Nationwide Road Network

The total length of roads in Vietnam is 105,557 km as of January 1993. Roads are divided into 6 classes as shown below:

Road Type	Length (km)
• National Roads	11,353
• Provincial Roads	14,014
• District Roads	25,004
• Village Roads	46,910
• Urban Roads	2,825
• Special Roads	5,451
Total Length	105,557 km

The road networks in the Northern and Southern parts of Vietnam are developed in two radial pattern systems centralized in Ha Noi and Ho Chi Minh, respectively. National Road No. 1 connecting both cities along the coastline, serves as the backbone of the national road network which is shown in Figure 2.2.1. With a road density of 0.32 km/km^2, Vietnam's road network is already well developed in extension, compared to road densities of 0.2 km/km^2 in Thailand, 0.25 km/km^2 in Malaysia and 0.54 km/km^2 in the Philippines. The main present focus therefore needs to be on the upgrading of road quality, comprising the widening of road widths and the strengthening and rehabilitation of road structures.

(2) Roads in the Northern Part of Vietnam

Figure 2.2.2 shows the road network in the Northern part of Vietnam with a total length of 48,986 km as of January 1993. Roads are broken down as follows:

Road Type	Length (km)
• National Roads	5,461
• Provincial Roads	6,136
• District Roads	11,116
• Village Roads	25,445
• Urban Roads	393
• Special Roads	435
Total Length	48,986 km

The roads in the Northern part of Vietnam account for 46 % of the nationwide road length. Road density is 0.43 km/km^2 which is above the national average.

(3) Bridges in the Northern Part of Vietnam

Table 2.2.1 shows numbers and length of existing bridges on National Roads in the northern part of Viet Nam.

Table 2.2.1 Existing Bridges on the National Roads in the Northern Part of Vietnam

National Road No.	No. of Bridges	Total Length (m)	Width (m)	Loading Capacity
1	48	3,126	2.5 - 16	H8 - H30
1B	48	716	3.5 - 7	H8 - H10
2	90	2,439	2.6 - 7	H8 - H30
3	83	1,541	3.5 - 7	H8 - H13
4A	41	419	2.8 - 7	H8 - H13
4B	88	1,957	2.5 - 9	H8 - H18
4C	30	323	3.0 - 4.7	H8 - H10
4D	26	726	6 - 7	H10
5	20	1,031	4 - 11	H10 - H30
6	89	1,343	2.5 - 10.5	H8 - H30
10	45	1,323	2.5 - 10	H10 - H30
12	42	811	4 - 10	H8 - H20
15	2	30	5	H10
18	104	1,477	2.5 - 8	H8 - H13
21	51	1,018	2.6 - 12	H8 - H30
32	84	1,495	2.6 - 10	H10 - H13
183	5	67	3.5 - 7	H10 - H30
279	53	1,014	2.8 - 7	H10 - H30
379	69	1,549	2.8 - 7.3	H8 - H13

Source: Viet Nam Road Administration Bureau
Note: H30: 30 ton truck loading of VIETNAMESE BRIDGE DESIGN CODE

(4) River Crossing

There are 16 sites where ferries presently operate on national roads in the Northern part of Vietnam (Table 2.2.2). Most important are 8 sites located on Routes 10, 18 and 32. Several long-span bridges are under construction or have recently been completed. Construction of new bridges is currently not required at 5 ferry sites at Gia Phu, Xon Lom and Van Yen on Route 36, at Pac Uom on Route 279 and at Ta Khoa on Route 379 due to low traffic volume.

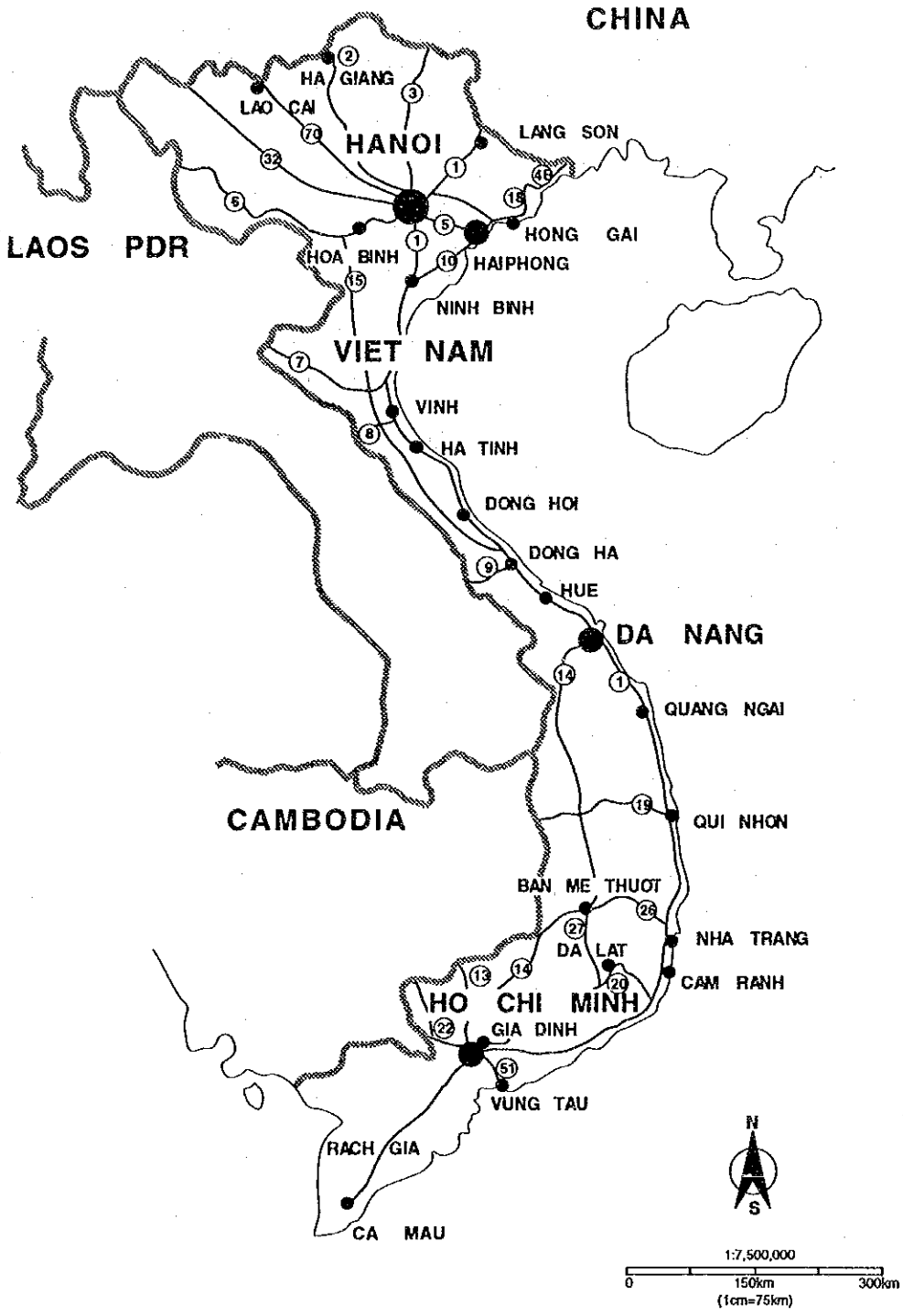


Figure 2.2.1 Nationwide Road Network in Vietnam

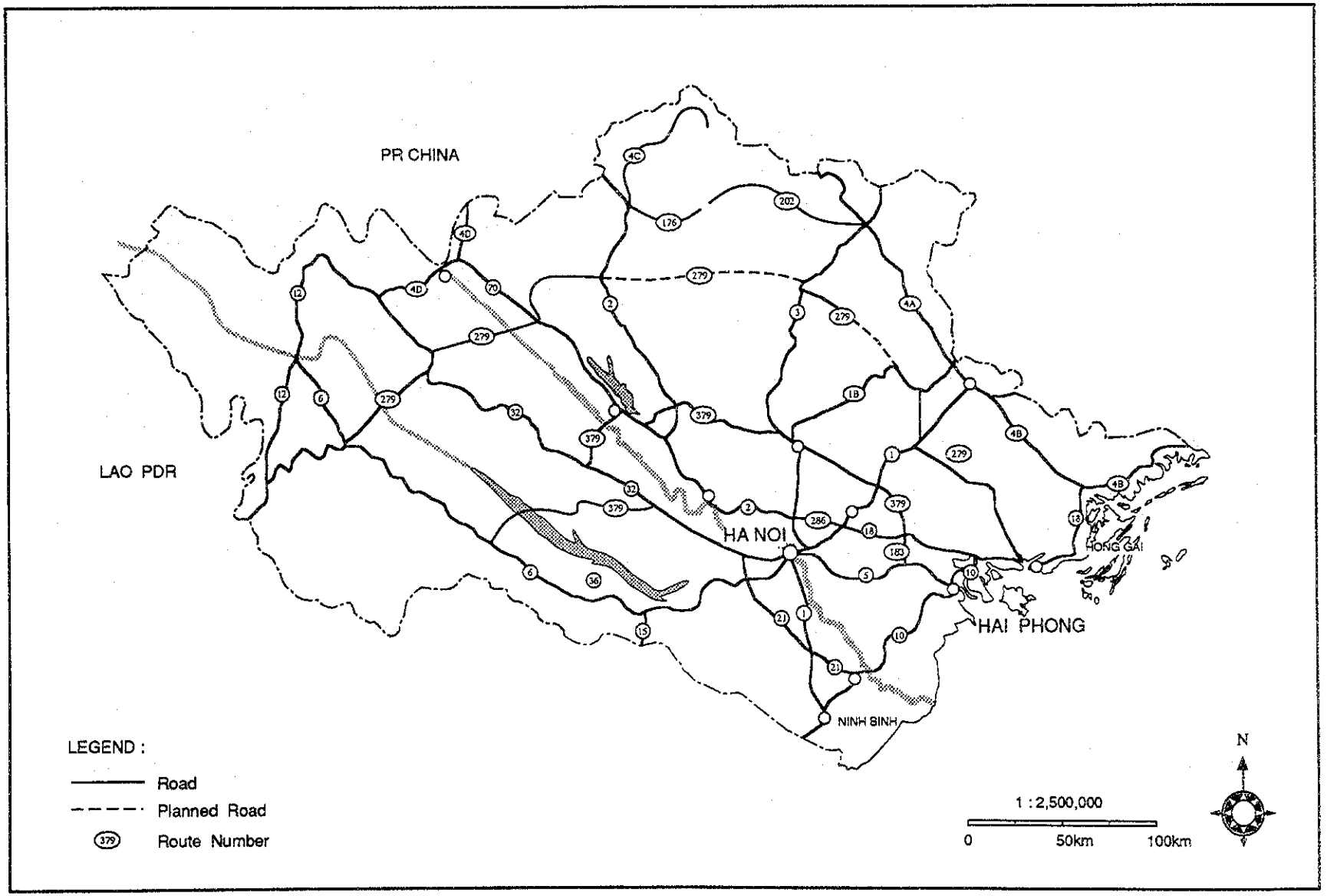


Figure 2.2.2 Road Network in the Nothen Part of Vietnam

Table 2.2.2 Ferries on National Roads in the Northern Part of Vietnam

National Road No.	No. of River Crossing	Location of River Crossing (River width)
10	5	Rung (1,200 m), Binh (480 m), Tien Cuu (250 m), Quy Cao (560 m), Tan De (500 m)
18	2	Pha Lai (350 m), Bai Chay (400)
32	1	Trung Ha (300 m)
36	3	Gia Phu (50 m), Xon Lom (50 m), Van Yen (250 m)
279	4	Chung (100 m), Bac Cuong (50 m), Tan An (250 m), Pac Uom (250)
379	1	Ta Khoa (300)
Total	16	

Source: MOTC

2.2.2 Modes of Road Transport

(1) Registered Vehicles

205,100 vehicles were registered in the whole of Vietnam as of 1991, and 68,324 vehicles were registered in the Northern part of Vietnam. Vehicle registration broken down by car, bus and truck is given in Table 2.2.3.

Table 2.2.3 Registered Vehicles in Vietnam by 1991 Survey

(Unit : vehicle)

Area	Car	Bus	Truck	Total
Study Area	21,192	6,633	40,499	68,324
Other Area	41,208	39,129	56,441	136,776
Entire Vietnam	62,400	45,762	96,940	205,100
Share of Vehicle Type	31 %	22 %	47 %	100 %

Source : Study Team Estimation

There are 3.08 registered vehicles per 1,000 persons in Vietnam which is a very low rate compared with 47.04 in Thailand. Some 68,000 vehicles were registered within the Study area during 1991 with 24,800 vehicles registered in Ha Noi. Other provinces with sizable ownership include Ha Tay (5,000 vehicles), Hai Phong and Quang Ninh (each with 4,100 vehicles) and Nam Ha (3,900 vehicles). The composite average ownership in the Northern part of Vietnam amounts to 2.8 vehicles per 1,000 persons. Ha Noi Province exhibited the highest rate (12 vehicles per 1,000 persons), Hai Hung Province the lowest rate (1.1 vehicles per 1,000 persons).

(2) Bus Transport

38,580 buses are used as public transport, of which half are mini-buses and tricycles. In addition, 7,180 buses are privately used. 45,760 buses are registered in Vietnam, including 6,633 in the Northern part of Vietnam. More than 80 % of bus companies are private as of 1993 due to the rapid progress of privatization reforms. About 45 % of the buses are more than ten years old.

The fare for bus transport is generally 70 to 100 Dong per km-person, but it is less than 70 Dong per km-person on very competitive bus routes. It is a problem that only a few bus operations cover remote areas.

(3) Truck Transport

96,940 trucks were registered in the country as of 1991, including 40,499 trucks registered in the Northern part of Vietnam. A review of 1991 TESI data yields the following findings:

- Only 16 % of trucks are privately owned, the remainder are owned by central government (35 %) and provincial government (39 %), but private ownership of trucks has certainly increased since 1991.

- A large majority of trucks were in the 5 to 7 ton class, and only 5 to 10 % had a load capacity of greater than 7 tons. This is consistent with findings of 1991 NTSR surveys which established average truck loads of 4.2 tons (empty trucks included) and 6.7 tons (empty trucks excluded).

The commodity flow consists of road transportation (46 %), inland waterway transportation (41 %) and railway transportation (13 %). Cargoes shipped via inland waterway and rail modes were heavily biased toward specific commodities : 61 % of inland waterway tons consisted of coal, while roughly 60 % of rail shipments consisted of coal, apatite and industrial/manufactured products. The road (truck) mode exhibited more diversity, with construction materials being the most-carried commodity (22 %).

Significant variation exists among the provinces not only in terms of total tons processed through the province, but also the ton share produced (exported from) or consumed (imported to) each province. Ha Noi Province was, in 1991, the most active zone with a total flow of 6.16 millions tons, 78 % of this being "imports". Quang Ninh Province, in contrast, processed 5.17 million tons, 90 % being "exports".

(4) Present Road Traffic

Current road traffic volume at major transit points on national roads is shown in Table 2.2.4, based on the JICA traffic surveys made in August 1993. Table 2.2.4 also indicates traffic volume in 1988 and 1991. The six locations

identified (on Routes 1, 2, 3 and 6) are sites experiencing pronounced traffic volumes. Historic volumes suggest that, while the relative growth rate can be high, absolute growth is still modest.

Route 1, South of Phu Xuyen for example, achieved a motor vehicle growth rate of 24.4 percent per annum from 1991 to 1993. However, this represents an absolute increase of only 638 vehicles per year - a small change in the total when viewed from a global perspective.

Table 2.2.4 Historic Traffic Volume Totals on Selected Links - 1988, 1991 and 1993

DAILY TRAFFIC VOLUME (1)						
		MOTOR VEHICLES			MOTOR CYCLES	
ROUTE	LOCATION	1988	1991	1993	1991	1993
1	South of Tien Son	1,392	1,724	2,661	5,324	7,899
1	South of Phu Xuyen	*	2,330	3,606	2,615	3,815
1	North of Bim Son	*	1,439	1,774	657	981
2	West of Phuc Yen	*	1,466	1,941	1,608	2,611
3	South of Pho Yen	*	1,285	1,343	2,137	2,335
6	East of Luong Son	581	952	906	1,126	1,408

AVERAGE ANNUAL CHANGE IN VOLUME					
		MOTOR VEHICLES			MOTOR CYCLES
ROUTE	LOCATION	88 - 91	88 - 93	91 - 93	91 - 93
1	South of Tien Son	111	254	469	1,288
1	South of Phu Xuyen	*	*	638	600
1	North of Bim Son	*	*	168	162
2	West of Phuc Yen	*	*	238	502
3	South of Pho Yen	*	*	29	99
6	East of Luong Son	124	65	-23	141

PERCENT CHANGE PER ANNUM, COMPOUNDED					
		MOTOR VEHICLES			MOTOR CYCLES
ROUTE	LOCATION	88 - 91	88 - 93	91 - 93	91 - 93
1	South of Tien Son	7.4	13.8	24.2	21.8
1	South of Phu Xuyen	*	*	24.4	20.8
1	North of Bim Son	*	*	11.0	22.2
2	West of Phuc Yen	*	*	15.1	27.4
3	South of Pho Yen	*	*	2.2	4.5
6	East of Luong Son	17.9	9.3	-2.4	11.8

(1) Daily traffic, total of both directions of travel
Data sources: 1993 - JICA traffic surveys; 1991 - "National Transportation Sector Review" traffic surveys; 1989 - TEDI.

2.2.3 Organization

Road administration remains within the jurisdiction of the Ministry of Transportation and Communication (MOTC). MOTC consists of 5 Vice Ministers, 7 Departments, 5 Bureaus and 4 Institutions, including the Vietnam Road Administration Bureau. Under the Decree No. 07 of the Vietnamese Government, the Vietnam Road Administration Bureau (VRAB) was formed on 30 January 1993 and started operation on 26 May 1993.

The VRAB has four levels of administrative groups as shown below:

- Management sections
- Road repair and construction companies
- Transporting companies
- Road management units

The management sections comprise the following 9 offices:

- Planning and Investment Section
- Traffic Section
- Financing and Accounting Section
- Infrastructure Construction Section
- Transport Section
- Science, Technology and Technique Section
- Personnel and Labor Management Section
- Inspection Section
- Administrative Office

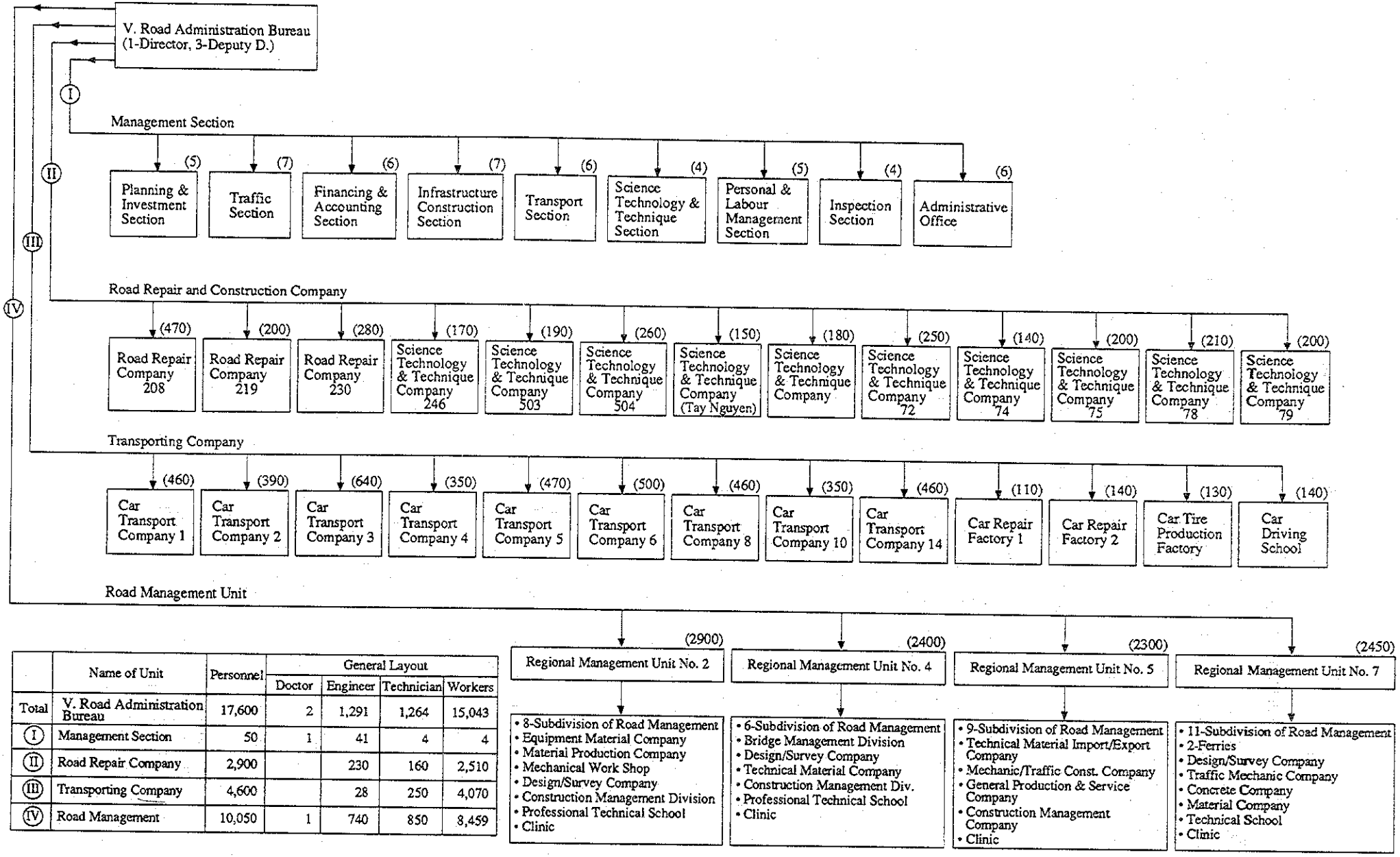
The comprehensive organization of the VRAB is shown in Figure 2.2.3 together with the number of employees for each group.

The road repair & construction companies and transporting companies have succeeded to the previously state-owned property and assets of MOTC, but salaries for the employees and operation costs of the companies have not been subsidized nor paid from the state budget any more since 1993.

2.2.4 Road Conditions

(1) Roads

Table 2.2.5 shows the road surface types and their length broken down by national, provincial, district, village, urban and special roads. The length of each category of road, further classified by road surface type in each province of the Northern part of Vietnam, is shown in Table 2.2.6. The pavement ratio of 42.6 % of national roads in the North Mountain and Midland Region is significantly lower than the comparative ratio of 88.7 % in the Red River Delta. The pavement ratio of provincial roads is 13.3 % in the North Mountain and Midland Region and 46 % in the Red River Delta. The pavement ratio of district roads is poor in both regions.



	Name of Unit	Personnel	General Layout			
			Doctor	Engineer	Technician	Workers
Total	V. Road Administration Bureau	17,600	2	1,291	1,264	15,043
(I)	Management Section	50	1	41	4	4
(II)	Road Repair Company	2,900		230	160	2,510
(III)	Transporting Company	4,600		28	250	4,070
(IV)	Road Management	10,050	1	740	850	8,459

Figure 2.2.3 Organization Chart of Vietnam Road Administration Bureau (VRAB)

Table 2.2.7 presents the present road surface conditions of national roads within the Study area. The evaluation method to classify surface conditions of national roads based on NTSR criteria is given in Table 2.2.8.

Table 2.2.5 Road Surface Types and Length in the Northern Part of Vietnam

Classi-fication	Asphalt, Concrete		Macadam Penetration		Gravel		Earth/ Gravel		Earth		Total	
	km	%	km	%	km	%	km	%	km	%	km	%
National Road	256.4	4.7	2,629.2	48.1	1,147.3	21.0	1,044.1	19.1	383.9	7.0	5,460.9	100.0
Provincial Road	0.0	0.0	1,422.9	23.2	1,143.4	18.6	1,688.1	27.5	1,881.7	30.7	6,136.1	100.0
District Road	0.0	0.0	138.3	1.2	2,144.8	19.3	1,004.8	9.0	7,828.1	70.4	11,116.0	100.0
Village Road	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25,444.5	100.0	25,444.5	100.0
Urban Road	0.0	0.0	284.4	72.3	109.2	27.7	0.0	0.0	0.0	0.0	393.6	100.0
Special Road	0.0	0.0	0.0	0.0	130.0	29.9	0.0	0.0	305.2	70.7	435.2	100.0
Total	256.4	0.5	4,474.8	9.1	4,674.7	9.6	3,737.0	7.6	35,843.4	73.2	48,986.3	100.0

Source: Vietnam Road Administration Bureau, and JICA Study Team's Survey

(2) Bridges

1) General

The existing bridges in the study area are divided into the following 6 major groups.

Reinforced concrete structures
Prestressed concrete structures
Steel plate-girder structures
Steel truss structures
Other steel structures
Substructures

2) Reinforced Concrete Structures

Because of the lack of maintenance for long periods and the increase of axial loads, many reinforced concrete handrails have been broken, expansion joints have been damaged, and pavement condition on carriageway slab is poor in general.

Narrow reinforced concrete bridges with carriageway widths of 2.5 m to 2.8 m are still used in remote areas. Most of the reinforced concrete handrails of bridges of this type have been completely broken and lost, and their 0.7 m wide cantilever slabs for pedestrians have sometimes been broken. Bottom concrete of beams has come off and exposed reinforcements have corroded. The loading capacity is generally only 8 t.

Gie bridge located on 213 km + 234 m of National Road No. 1 is one of the old cantilever bridges. The carriageway slab, cantilever slab, stringer and pier of the bridge have been damaged due to bombing. The main beams have been supported by 2 temporary columns. This is far from a stable condition.

Precast small-sized slabs are generally in poor condition. Exposed reinforcements have corroded.

Precast T beam without any cross beams, constructed after 1964, are not stable for horizontal forces and the quality of their construction is rather poor except for some bridges on National Road No. 6.

Cast-insitu T beams with cross beams are generally in good condition as Bung bridge located in 89 km + 129 m of National Road No. 6 shows.

3) Prestressed Concrete Structures

In northern Vietnam, prestressed concrete beams up to 33 m long are fabricated by the Union of Enterprises Thang Long. No cross beams are generally utilized for prestressed concrete structures. For easy fabrication and construction, the function of cross beams is neglected completely. The quality of insitu reinforced concrete slabs used to fill the spaces between main beams is generally poor.

In the case of that required distances between piers are more than 33 m, previously-constructed bridges utilize a Gerber-type structure, a combination of cantilever prestressed concrete box girders on piers, together with simple prestressed concrete beams with Gerber hinges.

Niem bridge located in 36 km of National Road No. 10 was constructed on 25 th December 1981 using the above-mentioned bridge type. However, as of September 1993, the bridge was open only for pedestrians and bicyclists because of repair works on the bridge. The cantilever portions of prestressed concrete box girders on the piers have been damaged because of lack of concrete strength and poor quality of construction. The deck slab concrete has been removed and is being replaced by new concrete, and additional PC cables are being placed using the Freyssinet system.

Phu Luong bridge located in 54 km + 210 m of National Road No. 5 has been designed using the VSL system of Switzerland for pestressing, and was under construction as of September 1993.

4) Steel Plate Girders

Steel girders with precast reinforced concrete slabs and composite girders are observed in the Project area. However, most of the steel girders are old ones being re-used.

In those structures, one girder lies on top of another, and the two girders are fasten by partial welding or riveting of two flange plates. Location of the splice is sometimes different in the upper and lower portions of the web plate. The girders are bent down because there was no consideration of camber when they were fabricated. Lower lateral bracings are welded directly to lower flanges of girders. Nghin bridge located in 75 km + 227 m of National Road No. 10 is one of these cases.

Van Dien bridge located in 183 km + 200 m of National Road No. 1 is under construction in September 1993 for widening. The bridge type is a composite girder of 29.5 m span length. Rivets are used for fastening lower flange and cover plates, and for field joints of girders. No prime coat is used. Main girders are already rusted before erection. For plat cutting, no automatic gas cutting machine is used. Cut edges area not finished because no grinder is available. No anchor bolt is used for shoes. There is no allowance made for the fatigue of steel and the effect of horizontal forces.

Nguyen bridge located in 89 km + 500 m of National Road No. 10 is made of multi-spans of I beams with reinforced concrete deck slabs. The center of the bridge is a lift span with wooden deck, which is lifted manually for small vessels. All steel members are rusted.

5) Steel Truss

Military beams intended for temporary structure, such as Bailey and YUKM bridges, have been used together with precast RC slabs as semi-permanent structures. Not only ordinary bolts and drift pins, but also the members themselves have been rusted and eroded because of lack of maintenance.

Truss bridges with a railway/road single track are used in several places in the Project area. The carriage way is made of precast RC slabs. Because of troubles in the joints between stringers and slabs, slabs crack and collapse. Bac Giang bridge and Dap Cau bridge located in 121 km + 800 m and 136 km + 600 m of National Road No. 1, respectively, are through trusses, and Phu Luong bridge located in 54 km + 210 m of National Road No. 5 is a pony truss, and Viet Tri

bridge located in 52 km + 890 m of National Road No. 2 is a deck truss. All steel members are rusted. Traffic jams frequently occur at the approaches to the above mentioned bridges.

Duong bridges located in 160 km + 700 m of National Road No. 1 is a through truss for both railway and road. The railway track is located inside of the truss, and carriage ways are located outside the truss, supported by cantilever beams and stringers. No serious damages are observed. Truss members are rusted in general.

The new Viet Tri bridge located in 52 km + 890 m of National Road No. 2, of a design similar to Duong bridge, is under construction in September 1993. However, precast RC carriageway slabs are overhanging the outer stringers. Stability of the carriageway is doubtful.

6) Other Steel Structures

Suspension bridges are observed in remote areas. Nam Muc bridge located in 150 km of National Road No. 12 is a suspension bridge 80 m long. There are no hand rails on the wooden deck. There is no protection of cables, hangers, anchorage or floor beam against corrosion.

A suspension bridge in Lai Chau town is in rather good condition. Hangers, floor beams, handrails, wooden deck are maintained well. However, cables are not painted. The loading capacity is only 8 tons.

Suspension bridges on district and village roads are generally poor. Joints between hangers and cables, and between hangers and floor beams are not stable. The bridges are used for pedestrians, bicycles and motorcycles only.

7) Substructures

Many reinforced concrete-pile bent type abutments and piers are used in the Project area. However, judging from the size and number of piles, it is clear that no horizontal forces due to earthquake are considered for these structures, even though the seismic intensity indicated by the Modified Mercalli Scale is 6 through 8 in northern Vietnam.

The approaches to bridges are generally sunken, because no approach slabs has been installed behind the abutments. The slopes of the embankments of approaches to bridges are sometimes collapsed, because suitable wing walls have not been constructed.

Table 2.2.6 Each Road Type's Length Sorted by Road Surface Type in Each Province of the Northern Part of Vietnam

Province	National Roads						Provincial Roads						District Roads						Grand Total
	Total Length	Asphalt Concrete	Macadum Penetration	Gravel	Earth Gravel	Earth/ Gravel	Total Length	Asphalt, Concrete	Macadum Penetration	Gravel	Earth Gravel	Earth/ Gravel	Total Length	Asphalt, Concrete	Macadum Penetration	Gravel	Earth Gravel	Earth/ Gravel	
Lai Chau	550.5	0.0	126.5	306.0	114.0	4.0	453.5	0.0	8.5	0.0	89.0	356.0	358.0	0.0	0.0	0.0	36.0	322.0	1,362.0
Son La	445.7	0.0	227.0	81.7	137.0	0.0	318.0	0.0	1.5	4.0	186.5	126.0	42.5	0.0	11.3	2.9	19.8	8.5	806.2
Lao Cai	472.0	0.0	100.0	201.0	19.0	152.0	186.0	0.0	2.0	83.0	27.0	74.0	184.0	0.0	0.0	21.0	29.0	134.0	842.0
Yen Bai	353.5	0.0	203.5	150.0	0.0	0.0	144.0	0.0	34.0	6.0	5.0	99.0	300.5	0.0	0.0	47.5	33.0	220.0	798.0
Tuyen Quang	255.0	0.0	100.6	10.4	104.0	40.0	169.7	0.0	19.7	70.0	59.0	21.0	546.0	0.0	0.0	0.0	0.0	546.0	970.7
Ha Giang	328.5	0.0	97.0	130.0	101.5	0.0	453.0	0.0	27.0	0.0	174.0	252.0	478.6	0.0	0.0	1.6	202.0	275.0	1,260.1
Cao Bang	230.0	0.0	100.0	85.0	20.0	25.0	540.0	0.0	49.0	168.0	205.0	118.0	267.0	0.0	0.0	0.0	15.0	252.0	1,037.0
Lang Son	504.0	0.0	299.0	61.0	144.0	0.0	294.0	0.0	1.5	59.0	90.5	143.0	348.0	0.0	0.0	105.0	43.0	200.0	1,146.0
Bac Thai	315.0	0.0	207.0	0.0	72.0	36.0	336.0	0.0	173.0	55.0	36.0	72.0	626.0	0.0	49.0	29.0	312.0	236.0	1,277.0
Quang Ninh	330.0	0.0	289.0	0.0	41.0	0.0	193.0	0.0	37.0	38.0	81.0	37.0	997.0	0.0	22.0	0.0	34.0	941.0	1,520.0
Vinh Phu	269.0	0.0	169.0	0.0	100.0	0.0	761.0	0.0	155.6	99.0	450.6	55.8	750.0	0.0	0.0	0.0	250.0	500.0	1,780.0
Ha Bac	316.8	0.0	106.1	46.2	114.6	49.9	278.8	0.0	54.8	0.0	175.1	48.9	561.0	0.0	0.0	0.0	0.0	561.0	1,156.6
Hoa Binh	378.5	0.0	229.2	24.0	77.0	48.3	186.2	0.0	9.8	27.0	109.4	40.0	1,030.0	0.0	3.0	6.0	31.0	990.0	1,594.7
Ha Tay	153.4	88.4	47.3	2.0	0.0	15.7	315.4	0.0	119.5	10.9	0.0	185.0	475.4	0.0	31.0	186.8	0.0	257.6	944.2
Hai Hung	125.0	47.0	40.0	25.0	0.0	13.0	370.0	0.0	74.0	296.0	0.0	0.0	430.0	0.0	22.0	300.0	0.0	108.0	925.0
Thai Binh	41.0	0.0	41.0	0.0	0.0	0.0	140.0	0.0	90.0	50.0	0.0	0.0	600.0	0.0	0.0	100.0	0.0	500.0	781.0
Hai Phong	88.0	20.0	68.0	0.0	0.0	0.0	125.0*	0.0	125.0*	0.0	0.0	0.0	345.0	0.0	0.0	145.0	0.0	200.0	558.0
Ha Noi	121.0	100.0	21.0	0.0	0.0	0.0	436.0*	0.0	332.0*	104.0	0.0	0.0	1,382.0	0.0	0.0	500.0	0.0	882.0	1,939.0
Ha Nam	114.0	0.0	114.0	0.0	0.0	0.0	318.0	0.0	64.0	0.0	0.0	254.0	1,195.0	0.0	0.0	500.0	0.0	695.0	1,627.0
Ninh Binh	70.0	1.0	44.0	25.0	0.0	0.0	118.5	0.0	45.0	73.5	0.0	0.0	200.0	0.0	0.0	200.0	0.0	0.0	388.5
Grand Total	5,460.9	256.4	2,629.2	1,147.3	1,044.1	383.9	6,136.1	0.0	1,422.9	1,143.4	1,688.1	1,881.7	11,116.0	0.0	138.3	2,144.8	1,004.8	7,828.1	22,713.0

Source: Vietnam Road Administration Bureau, and JICA Study Team's Survey
Note: Figure with asterisk indicates the inclusion of Urban Roads

Table 2.2.7 Inventory of National Roads by Surface Conditions Found in the Study

Road No.	Length (km)	Condition of Surface				Width of Pavement (m)	
		Good (1)	Fair (2)	Poor (3)	Very Poor (4)		
1	290.0	116.2	116.7	28.7	28.4	5.0 - 15.0	
1B	145.1	2.0	29.1	92.0	22.0	4.0 - 7.0	
2	307.0	23.0	111.0	148.0	25.0	3.0 - 12.0	
3	316.0	29.0	226.1	38.6	22.3	3.0 - 10.0	
4A	123.0	0.0	22.8	29.4	70.8	3.0 - 10.0	
4B	201.0	0.0	3.0	6.0	192.0	2.5 - 10.0	
4C	166.0	0.0	0.0	150.0	16.0	3.0 - 3.5	
5	99.0	22.0	77.0	0.0	0.0	7.0 - 15.0	
6	519.0	2.0	78.0	349.0	90.0	3.5 - 46.0	
10	150.0	0.0	75.0	74.0	1.0	4.0 - 12.0	
12	206.0	0.0	0.0	151.0	55.0	5.0 - 6.0	
18	206.0	0.0	140.5	34.5	34.0	3.0 - 18.0	
21	120.1	30.0	20.1	14.0	56.0	3.5 - 6.0	
32	172.0	28.0	14.0	114.0	16.0	4.0 - 14.0	
70	192.5	0.0	21.5	69.0	102.0	4.0 - 6.0	
183	20.0	0.0	12.0	8.0	0.0	5.0 - 7.0	
279	125.5	0.0	6.0	91.5	28.0	4.0 - 7.0	Dong Mo-JC Route 18
379	57.5	8.0	11.5	34.0	4.0	4.0 - 15.0	Ba Khe-JC Route 70
	74.2	2.0	10.2	34.0	28.0	4.0 - 7.0	Binh Cha Ferry-Bo Dau
	17.0	0.0	2.0	8.0	7.0	4.5 - 6.0	JC Route 1-the dead end
	25.7	0.0	2.0	23.7	0.0	4.5 - 6.0	JC Route 18-the dead end
	3,532.6	262.2	978.5	1,494.4	797.5		

Source: Vietnam Road Administration Bureau, and JICA Study Team's Survey

Table 2.2.8 Criteria of National Road Surface Conditions

CODE	CRACKS	RUTTING	POTHOLES	RIDING CONDITION	OTHER REMARKS
0	Not visible	None	None	Very good	Speed limited only by road geometry and safety factors
1	Less than 5 %	Less than 10 mm	Less than 1 %	Good	Speed mainly limited by geometry and safety factors with small influence of surface irregularities
2	Less than 10 %	Less than 20 mm	Less than 5 %	Fair	Speed partly restricted due to unevenness of riding surface (comfortable speed below 60 km/h)
3	10 % - 30 %	20 to 30 mm	Less than 30 %	Poor	Speed restricted by surface conditions, comfortable speed below 40 km/h
4	above 30 %	above 30 mm	above 30 %	Very poor	Speed severely restricted, traveling speed below 20 km/h

Source : National Transportation Sector Review, UNDP, 1992

2.2.5 Maintenance and Operation

(1) National Level

For the purpose of national road and bridge maintenance, rehabilitation and improvement, VRAB has 4 Regional Road Maintenance Units (RRMU) as follows:

- RRMU 2 : situated in Ha Noi, responsible for the Northern part of Vietnam (the Study area).
- RRMU 4 : situated in Vinh, responsible for the northern half of Central Vietnam.
- RRMU 5 : situated in Da Nang, responsible for the southern half of Central Vietnam.
- RRMU 7 : situated in Ho Chi Minh City, responsible for the Southern part of Vietnam.

RRMU are subdivided into Sub-RRMU (responsible for 150 to 250 km road length) which are further subdivided into gangs (responsible for 30 to 50 km road length). The Sub-RRMU are responsible for routine maintenance works and receive an annual budget allocation from MOTC. The former group of RRMU, which was charged with rehabilitation and improvement, has been divided into parastatal enterprises (Road repair and construction companies). These autonomous enterprises are planned to be fully

privatized. The present RRMU 2 is responsible for maintenance, of the following national roads:

National Road No.	Length (km)
1	287.0
2	313.0
3	33.5
5	94.0
6	397.0
15	20.0
279	116.0
Total	1,260.5 km

RRMU 2 presently comprises 8 Sub-RRMU and 7 autonomous enterprises, including an Equipment Material Company, Material Production Company, Mechanical work shop, Design/Survey Company, Construction Management Company, Professional Technical school, and clinic. Road repair and construction companies work on a competitive negotiation basis and their operations are not restricted to the rehabilitation and improvement of national roads within the Northern part of Vietnam. They may also work as a general contractor, finding their own clients.

Many broken and damaged bridges presently remain without repair work. Severe defects include broken bridge surfaces, damaged reinforced concrete cantilever slabs, broken reinforced concrete handrails and damaged expansion joints. Most of the steel structures have not been painted to protect against corrosion for a long time. Steel bridge members are rusted and corroded. The RRMU is not functioning properly regarding bridge maintenance.

(2) Provincial Level

The Provincial Department of Transport and Communication under the People's Committee is responsible for maintenance, rehabilitation and improvement of roads belonging to the following categories:

- National Roads not included in the jurisdiction of the RRMU
- Provincial Roads
- District Roads
- Urban Roads

2.2.6 Obstacles and Problems

The following obstacles and problems need to be overcome in order to facilitate rapid economic growth, motorization and traffic safety:

- The existing road network in the Red River Delta cannot accommodate future traffic demand.
- Existing road structural strength is insufficient for heavier vehicles to be introduced. Bearing capacity of road surfaces and bridges thus needs to be increased.
- River crossing by ferry constitutes a serious traffic obstacle.
- Road pavement ratio in the Study area is very low.
- Road maintenance conditions, particularly condition of the road surface, are very poor due to the lack of maintenance budget.
- Road facilities in the North Mountain and Midland Region are of very low standard and the feeder road network is not well developed.
- Road side safety facilities are insufficient.
- Rail-and-road bridges, with road vehicles straddling the rail track are used at some places in the project area. Traffic jams frequently occur at the approach to such bridges.
- The reliability of the current pre-stressed concrete standard beams is doubtful, because of inadequate cable arrangement, risks of corrosion of cables and insufficient arrangement reinforcements.
- Traffic education for both drivers and pedestrians is not enforced.
- The public transportation system is not well developed and organized.
- A vehicle inspection system remains to be introduced.
- A fuel tax remains to be introduced.
- Public bus transport services in the North Mountain and Midland Region should be improved.
- Traffic signals at at-grade intersections in urban areas remain to be installed and synchronized.

2.3 RAILWAY

2.3.1 Railways in the Northern Part of Vietnam

Vietnam Railways (Duong Sat Vietnam, hereinafter VNR) is an organ of the Vietnamese Ministry of Transport and Communications. VNR is a state-owned enterprise, but VNR's name includes neither the word 'national' nor 'state'. Reformed responsibilities, rights and duties of VNR have been specified by the Decision of the Minister of MOTC in October 1991. This Decision gave VNR autonomy in management and operation, accompanied by an independent finance system.

VNR conducts planning for its budget, to manage capital and assets efficiently, and formulates a development plan. The General Director of VNR can revise salaries and wages of employees and the levels of tariffs and fees with approval of MOTC. The railway transport activities are geographically divided into Northern, Central and Southern Zones operated by the autonomous Union 1, Union 2 and Union 3, respectively. Railway transport activities operated by Union 1 cover the whole study area plus an additional area which stretches up to 200 km south of the study area.

The route length operated by VNR is as follows:

• 1,000 mm gauge (meter gauge, MG)	2,204.6 km
• 1,435 mm gauge (standard gauge, StG)	172.2 km
• Mixed gauge (3 rails for MG and StG, MxG)	227.5 km
• Total length	2,604.3 km

Operational route length by line is as follows:

• Ha Noi - Ho Chi Minh City	1,730 km	(MG)
• Ha Noi - Hai Phong	104 km	(MG)
• Ha Noi - Lao Cai	296 km	(MG)
• Ha Noi - Dong Dang	163 km	(MxG)
• Kep - Ha Long	106 km	(StG)
• Ha Noi - Luu Xa	69 km	(MxG)
• Luu Xa - Nui Hong	38 km	(MG)
• Luu Xa - Kep	55 km	(StG)
• Mai Pha - Na Duong	31 km	(MG)
• Ha Noi - Bac Hong (via Thang Long Bridge)	44 km	(MG)

Most meter gauge tracks in the north have 43 kg/m rail, 2 block concrete sleepers and an axle load of 14 tons. The axle load of the standard gauge tracks is 19 tons. The railway network in the Northern part of Vietnam is illustrated in Figure 2.3.1.

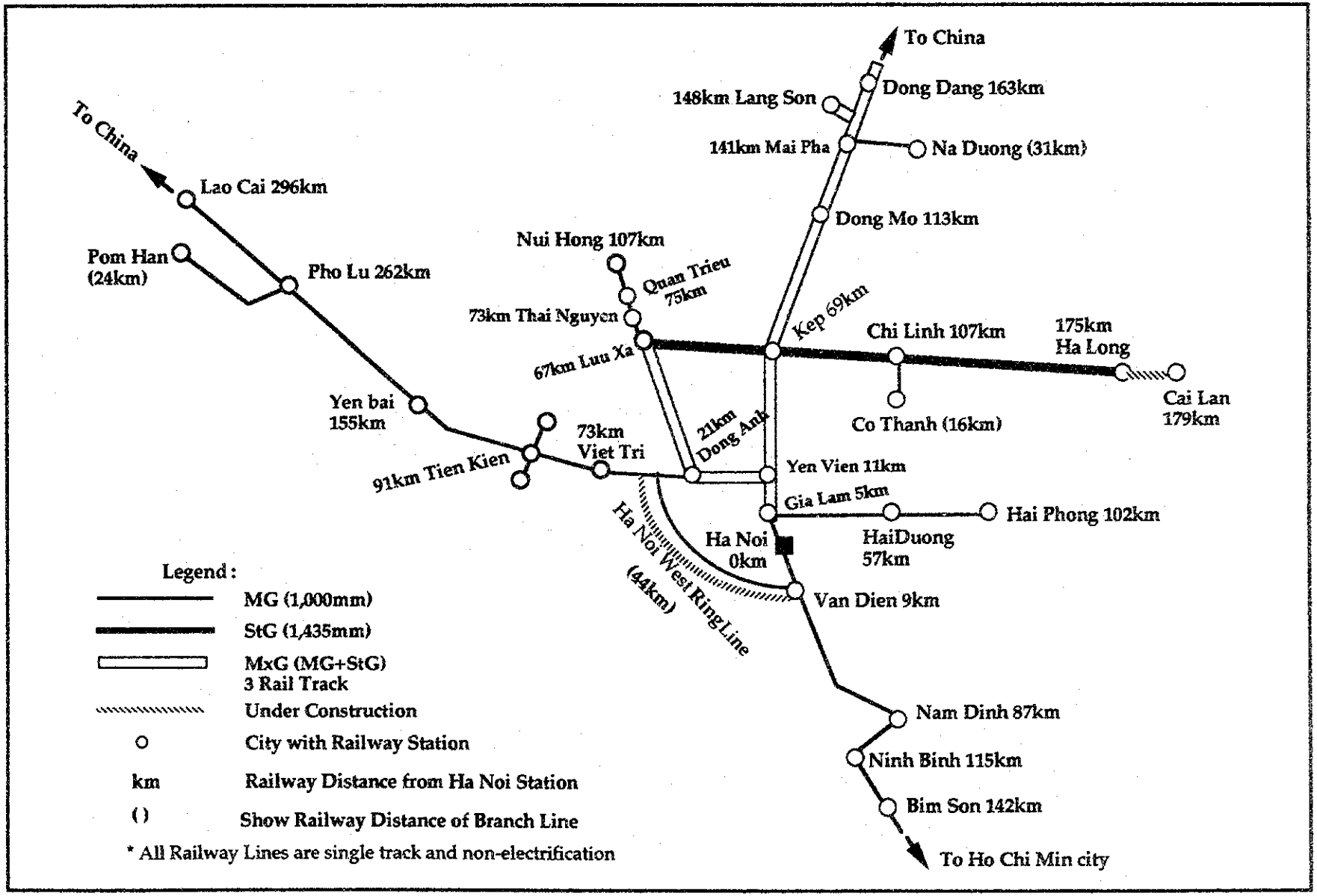


Figure 2.3.1 Railway Network in the Study Area

2.3.2 Passenger Transport

The volume of passenger and freight transport from 1985 to 1992 is given in Table 2.3.1. Passenger transport has significantly decreased since 1988. VNR lacks such necessary services for passenger transport as fast train operations, frequent train services, comfortable accommodations and feeder services to and from stations. Government allocations for passenger railway and bus transport have expanded since free-market reforms started. Since then, many private bus companies have been established, and travelers can freely choose from among rail, bus and air transport. Given these choices, they have been not attracted by the low quality of passenger service at VNR on slow and dilapidated passenger trains.

VNR has reduced the frequency of trains as passenger volume has fallen off, and this has accelerated the reduction in customers. There are a minimum 5 round trips a day on the Lao Cai Line, but the Dong Dang, Thai Nguyen and Ha Long lines have only one or 2 round trips a day and have thus lost their function in passenger transport. There are no feeder services for a train arriving at a station, which is another reason why customers prefer bus transport despite the narrow seats and poor conditions of buses.

As a result of these factors, the number of rail passengers decreased by 52 % over the two years from 1987 to 1989, and the passenger-km carried fell similarly. The number of passengers carried by Union 1 has decreased by 5 % since 1989, but their average traveling distance has grown slightly. The Unified Line between Ha Noi and Ho Chi Minh City carries about half of all VNR passengers and accounts for 82 % of passenger-km. Union 1 carries 71 % of VNR passengers and accounts for 45 % of passenger-km. The peak transport months are February, March and August, and the bottom ones are July, November and December. The ratio of fluctuation is 23 %. Almost all passenger trains operate on schedule.

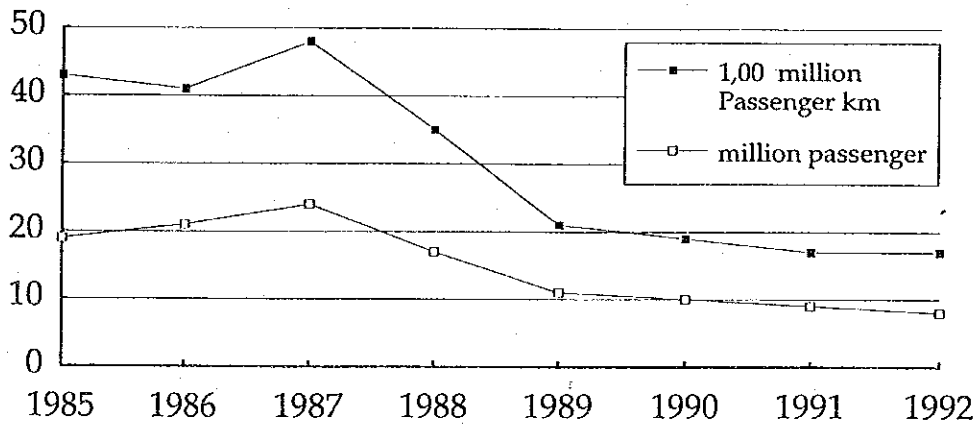
(1) Ha Noi - Hai Phong Line

The number of passengers has been increasing from its low in 1991. 2 express trains run every day and about 70 % of passengers prefer express trains. All seats on express trains are reserved, and the train accepts standing passengers in numbers up to 10 % of their seats, not more because of a weight limitation. Train weight is restricted as their locomotives are of relatively low power for fast operation, and there are load restrictions on Long Bien Bridge. Traveling time is currently shorter by rail than by road because Road No. 5 is under reconstruction. Hence, the railway is currently the predominant form of passenger transport on this route.

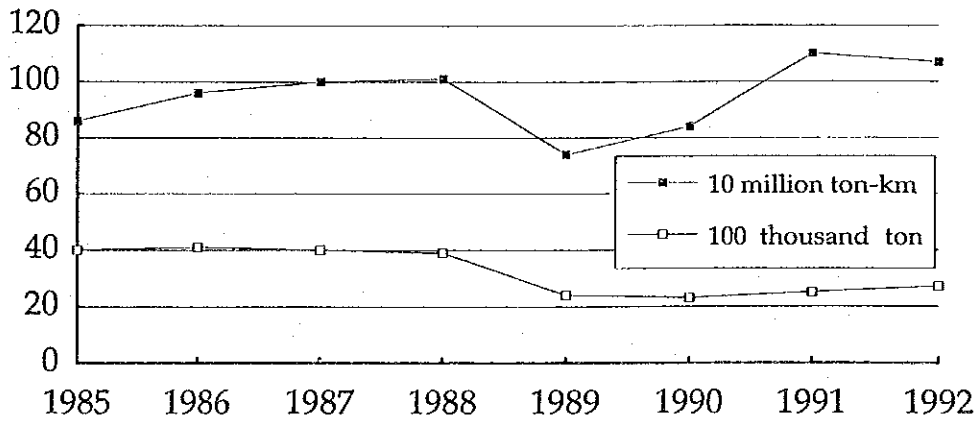
Table 2.3.1 Passenger and Freight Transport Volume of Vietnam Railways

	Whole VNR Passengers		Whole VNR Freight	
	Passenger (1,000)	1,000 passenger km/year	1,000 ton/year	1,000 ton-km/year
1985	19,120	4,358,684	4,050	868,785
1986	21,127	4,195,605	4,137	960,601
1987	24,042	4,854,070	4,008	1,001,172
1988	17,750	3,505,558	3,928	1,015,575
1989	11,768	2,109,341	2,472	743,329
1990	10,443	1,912,957	2,341	847,022
1991	9,518	1,767,069	2,567	1,103,309
1992	8,719	1,751,669	2,774	1,076,897

Passenger Traffic



Freight Traffic



Source: VNR

(2) Ha Noi - Lao Cai Line

The road network is not convenient for inhabitants along the railway line. Moreover, the roads are in poor condition. Passenger trains make 5 round trips every day, and sleeping cars are connected on night trains. The section between Pho Lu and Lao Cai was destroyed by war, but reopened in September 1993. The maximum gradient is 1 % in both directions. As the number and length of steep gradients are both small, they can be dealt with by train operational measures. Sharp curves with radius of 100 m to 150 m remain in the section between Yen Bai and Lao Cai.

The railway track has already been connected with China Railways. There are many uncertainties in forecasting rail traffic demand for transport of mineral products. There is an apatite mining company's railway of 24 km, between Pho Lu and Pom Han. Apatite mining has many obstacles to increasing production: high quality apatite reserves are limited, facilities for production are superannuated and the demand for fertilizer is estimated not to increase. There are copper ore and iron ore in Yen Bai and Lao Cai provinces, but development of those resources would require huge amounts of investment, electric power and construction work to develop. VNR is better advised to observe their progress carefully, rather than anticipate increasing transport loads from these sources. On this line 2 passenger trains (round trip) are operated as local trains. On the Pom Han Line there are 3 idle truss beams of 60 m span, which were installed to carry a second track. These beams should be utilized on other active lines because there is now no plan to realize double tracking of the Pom Han Line.

(3) Ha Noi - Dong Dang Line

Passenger trains operate 2 daily round trips. One train entered service in July 1993. There are more passengers between Kep and Dong Dang than between Ha Noi and Kep. The lesser demand for rail transport on this segment nearer to the capital is accounted for by the fact that roads and bus services between Ha Noi and Kep are in better condition.

Steep gradients of 1.7 % remain between Dong Mo and Lang Son. The railway track has already been connected with China Railways. In the past China Railways has operated an international passenger train from Beijing to Ha Noi but presently the section in Vietnam is not operated.

(4) Kep - Ha Long Line

Only one daily passenger train is in operation. Passenger cars are used to carry vegetables, animals and other commodities to the 'Ha Long station market'. It should not be the function of a passenger train to operate as a food market and freight train.

(5) Luu Xa - Kep Line

There is standard gauge track between Luu Xa and Kep but no train is operated. Train operation safety has deteriorated because many of the wooden sleepers are decayed. There is coal mining at Thai Nguyen and Nui Hong, high quality iron ore mining along the line and a big steel works at Luu Xa which presently can produce only 50,000 tons of steel per year. Coal presently produced in Vietnam is not suitable for steel manufacture, so it is necessary to import coke. There are possibilities to export iron ore or iron brickets (small-size bricks in which the iron content is concentrated to more than 90 %) through Cai Lan Port by 5,000-ton traction trains on StG. If this area is revitalized as an industrial zone, as had been planned in the past, the line will be an useful railway to Cai Lan port. However, up to now no schedule for that development has been fixed.

(6) Dong Anh - Nui Hong Line

The track between Dong Anh and Luu Xa has mixed-gauge track, but the standard gauge track is rarely used. The track between Luu Xa and Nui Hong is meter-gauge. A passenger train is operated from Ha Noi to Quan Trieu via Thai Nguyen and a freight train is operated from Nui Hong to Yen Vien. Coal is produced at Thai Nguyen and Nui Hong and transported to many places. At Luu Xa the steel works itself, and Luu Xa station have many sidings and tracks which are now idle.

(7) Ha Noi West Ling Line (via Thang Long Bridge)

This line was constructed after the war, as a by-pass route for Ha Noi and connects Van Dien and Bac Hong stations over Thang Long Bridge. It has a double track road bed, but one is for MG and the other for StG; two single track railways. A track for MG is in service but StG track have been laid only on the Thang Long Bridge. The line is located 10 km to the west of Ha Noi station but the urban area of Ha Noi city has not yet reached the line. Passenger and freight trains are operated now.

This route is not very useful right now, but in the future it will be used for urban transport and as a by-pass route for freight trains. It is certain that the urban area of Ha Noi will expand over this route. The role of the line will be defined in a study on a 'Ha Noi Development Plan'. When an inland depot is located on the line, StG track will be constructed from Yen Vien to the inland depot via Bac Hong Station and Thang Long Bridge.

(8) Ha Noi - Ninh Binh Line

3 passenger trains are operated from Ha Noi to Vinh, a train to Thanh Hoa and a train to Nam Dinh every day. A passenger train is operated from Ha Noi to Ho Chi Minh City every day. 3 other trains to Ho Chi Minh City are operated on a weekly schedule.

Trains No.	Mon.	Tues.	Wed.	Thur.	Fri.	Sat.	Sun.	Travel Time
S3	O							38 hours
CM5		O		O		O		42 hours
S9	O		O		O		O	46 hours
S7	O	O	O	O	O	O	O	46 hours

(1) Departure date from Ha Noi station
(2) Trip time between Ha Noi and Ho Chi Minh City

The railway track is parallel with the road of Route No. 1 until Nam Dinh. Traveling time by rail is shorter now than by road because there is also much bicycle traffic on the road. Hence, the railway is currently the predominant form of passenger movement between Ha Noi and Nam Dinh. But the current passenger train schedule is not convenient for middle distance passengers because trains are scheduled for long distant passengers e.g. to Thanh Hoa and Vinh.

As railway tracks in many places run closely parallel to roads, accidents in which cars jump into the track from the road will increase as roads are improved and vehicle speed increases, according to the experience of Japanese railways. It is therefore recommended to equip closely - parallel roads with tall guard rails at the time of road improvement work.

7 freight trains are operated. Coal accounts for the largest volume of freight in this section. Coal is carried from Na Duong and Ninh Binh to a cement factory at Bim Son. Coal for Ninh Binh station's coal yard is transported by ship from Quang Ninh. Cement produced at Bim Son is mainly transported southbound by rail.

2.3.3 Freight Transport

Peak freight transport reached 4.1 million tons in 1986, and seemingly fell to 2.7 million tons in 1992, but this was largely a consequence of a change in VNR's calculation methodology. The new accounting system more accurately reflects the actual cargo volume since it no longer double-counts freight which is dispatched via Ha Noi. Freight transport ton-km is a better indicator than transport tonnage to reflect the actual level of transport (refer to Table 2.3.1).

Freight transport totaled 1,001 million ton-km in 1987 and 1,077 million ton-km in 1992. The commodity with the largest volume is coal (23 %), followed by cement (16 %), construction materials (17 %) and apatite (phosphate ore) (11 %). Bulk freight comprises 67 % of total transported commodities. Union 1 transports about 82 % of total VNR freight in terms of tonnage and 54 % in ton-km. The present transport volume of each northern line at 200 to 500 thousand tons per year is commercially not feasible for railway operation. Coal is produced at Uong Bi along the Ha Long Line, Quan Trieu along the Thai Nguyen Line and Na Duong along the Dong Dang Line. Cement is produced at Uong Bi, Hai Phong and Bim Son along the Unified Line. Apatite is produced at Lao Cai. Iron

ore is produced at Thai Nguyen and transported to a nearby steel factory. Containers to and from Hai Phong Port are not transported by rail due to a lack of loading and unloading facilities. 82 % of the coal from Uong Bi is transported to the electric thermal power station along Ha Long Line. 62 % of the apatite is transported to fertilizer factories at Viet Tri along Lao Cai Line, and 22 % to Ha Noi.

2.3.4 Operation and Maintenance

(1) Financial Status of VNR

In 1992, total revenue reached Dg 400 billion (equivalent to US$36.4 million) and total costs amounted to Dg 435 billion with a deficit of Dg 35 .4 billion after taxes, or Dg 6.9 billion before taxes as shown in Table 2.3.2. There are no subsidies from the government with the exception of investments. VNR has requested tax exemption in order to reduce its deficit. It is noteworthy that VNR's budget is already apparently in better balance than those of many other national railways, and the reasons for this are as follows;

- Extraordinarily low prices for rolling stock and railway materials purchased from the eastern countries in the past.

- Depreciation allowance is not sufficient for reasonable repair and replacement because it is calculated on the basis of the extraordinarily low historical prices mentioned above. Consequently, facilities have deteriorated to the extent of jeopardizing the basic functioning of the railways.

- Budgets for repair and replacement of railway facilities have been reduced under the conditions of overall austerity, to the point that it must be said, "VNR eats railway property" to sustain its current operations. The effects of insufficient depreciation and repair have accumulated to become a severe burden.

An examination of the operation ratios of railways in the world shows that in the management of railways it is almost always impossible to maintain balanced budgets with reasonable maintenance and replacement. It can be expected that in the fairly near future VNR will face difficulty in maintaining its independent finance system.

The operation ratios (ratio of total costs after depreciation to total revenue) for the selected national railways are compared in the Table 2.3.3

Table 2.3.2 Profit and Loss Account of Vietnam Railways

(unit: billion Dong)

Year	1989	1990	1991	1992
Operating income	85.9	143.1	277.3	400.1
(million US$)		(28.6)	(26.5)	(36.4)
Traffic receipts				
Freight traffic	39.1	74.0	148.7	217.7
Passenger traffic	41.1	59.1	110.6	160.0
Baggage & parcels	2.8	6.1	11.9	18.8
Others	2.9	3.9	6.1	3.6
Operating Expenditure	95.5	158.6	299.4	435.5
Staff cost subtotal	24.6	38.7	82.5	139.7
Salaries and wages	21.4	33.7	70.5	121.2
Social security cost	3.2	5.0	12.0	18.5
Material & energy costs				
Materials	16.2	26.4	54.8	76.3
Fuel	10.2	23.3	55.0	64.0
Electricity	1.1	1.2	2.4	4.3
Other operating expenditure	13.4	24.4	35.2	44.4
Depreciation for construction	10.0	12.0	15.0	20.0
Depreciation for heavy repair	16.0	26.3	37.0	57.3
Income Tax	4.0	6.3	8.0	11.4
Capital Tax	0	0	9.5	17.1
Profit and Loss Account Profit	-9.6	-15.5	-22.1	-35.4
Balance before tax			-4.6	-6.9

Source: VNR

Table 2.3.3 Operation Ratio of Selected Railways

Country	Operation Ratio
<Centrally-Planned Economic>	
Vietnam (1992)	1.09
PR China (1987)	0.61
Mongolia (1991)	0.73
Poland (1.14)	1.14
<ASEAN Countries>	
Thailand (1987)	1.27
Malaysia (1987)	1.67
Indonesia (1987)	1.36
Philippines (1987)	1.70
<Industrialized Countries>	
Germany (DB, 1988)	2.14
France (1988)	1.81
Spain (1988)	2.73
Japan (JNR, 1985)	1.49
<Japan after Reformation, 1992>	
JR East	0.94
JR Central	0.93
JR West	0.93
JR Kyushu	1.17
JR Hokkaido	1.44
JR Shikoku	1.17

Note: Operation Ratio = Expenditure/Revenue

In the past, railway budgets in the centrally-planned economies such as PR China, Mongolia and Poland were balanced due to extraordinarily low prices for rolling stock and railway materials purchased. For example, the original price of Vietnam's Russian made D4H locomotives was US$20,000. If VNR were to purchase a D4H now, its price would be more than US$500,000. Since prices for capital investments have now been adjusted to international levels, financial resources from past and present depreciation will be far short even for the most urgent rehabilitation works.

Railways in ASEAN countries are operated with railway revenue but their deficits are subsidized by governments. Investments are implemented by the responsibility of governments. Railways pay only a part of the interest and the principal repayments on investment loans. All ASEAN railways have also generated vast operating deficits. This fact shows one possible budgetary future for VNR, because the social and economic situation of Vietnam is rather similar to the present ASEAN countries.

In some industrialized countries an attempt is made to implement rail transport operations and investment by the railway's own budget. But deficits in operation and investment finance resources are typically supplied by the governments from the public budget and loans. Consequently, this creates another problem in that loans for railways have accumulated. In the case of Japanese National Railways (JNR), the amount of loans accumulated was 250 billion US$. Most of the loans for JNR have been held by a governmental organization, JNR Settlement Corporation. Social conditions and the railway networks of JR Kyushu, JR Hokkaido and JR Shikoku are not suitable to make a profit in railway operation, so these three railway companies have funds established by the Government to supply money to cover their deficits.

VNR assets were Dg 3.145 billion in 1990, with operating assets totaling Dg 2,663 billion. Depreciation was equivalent to 18 % of total costs. Depreciation has been calculated only for rolling stock and buildings, based on standard values prescribed by the Ministry of Finance. Moreover, the results have been adjusted in order to maintain a balanced budget. Depreciation is transferred to the investment account for construction and major repairs. The investment account is financed by depreciation allowances and government subsidies.

Passenger and freight tariffs are set by VNR, but its budget requires government approval. VNR offers discounted student fares for which it is compensated by the government. VNR has no long-term loans. Most of the 29 enterprises under its umbrella made profits in 1992, indicating a successful autonomy reform. Union 1 receives 64 % of its income from the Effective Unified Line. The Unified Line accounts for half of total transport, with unit prices per passenger higher than on the other lines.

The share of personnel costs is mandated not to exceed 30 % of total costs. Personnel costs in 1992 were 28 % of total costs. Despite the low salary level of the staff, VNR personnel costs are rather high. Full social security costs were covered by the government and VNR until 1992, but, as of 1993, employees have to contribute as well.

(2) Passenger and Freight Tariffs

Each Union sets the fees it charges. Passenger tariffs differ according to the type of train. The passenger rate for a place in a sleeping car is Dg 175 to 200/km, for a soft seat Dg 170/km and for a hard seat Dg 90 to 130/km. The baggage rate is Dg 120 per 100 kg-km, and there are 5 categories of freight.

The average rates in 1992 were Dg 202/ton per km for freight and Dg 91/person per km. If standard costing methods were applied, VNR would earn profits on freight transport, especially bulk cargo transport, and lose money on passenger transport.

(3) Organization and Employees

VNR was previously a self-supplied enterprise. Most production of passenger and freight cars, track materials, construction works and supporting services for the railway and its employees were executed by VNR itself. The resulting conglomerate was divided into 32 business units in order to apply private management principles. Each business unit is managed autonomously. The head office of VNR (201 staff) is supported by contributions from the Unions. Other activities are split among 12 production enterprises (4,277 employees), 8 construction enterprises (3,832 employees) and 12 service enterprises (4,320 employees). The total number of employees has been gradually reduced and stood at 47,083 in April 1993. VNR is still overstaffed, but each enterprise has made efforts to contract work outside VNR.

Staff graduated from university or college amounted to 2,937 in April 1993, and those who had finished advanced courses at railway training schools were 3,527. The organizations and number of staff are shown in Figure 2.3.2. Of these, the Medical Department was transferred to the Ministry of Transport and Communications in July 1993. Railway engineering vocational schools are financed by the Ministry of Education.

(4) Education and Training

Railway Technical Vocational School No. 1 is located 2 hours from Ha Noi by car. School No. 2 is in Ho Chi Minh City. The schools have educated 1,380 employees. Curricula were changed in 1989 to prepare trainees to work in a free-market environment after the reforms and to handle modern technology. Education in market economics and management has been conducted with university assistance. Employees with high school education who have passed a selection process are educated for one to 2.5

years. There are approximately 800 students who have received a diploma authorized by the Ministry of Education.

The schools are financed by the Ministry of Education at Dg 2 million per student. 30 % of the funds are spent on student scholarships, 30 % on staff salaries and 40 % on teaching materials and school maintenance. VNR contributes some funds to the maintenance of buildings and other facilities. Existing buildings, which were constructed during the war to facilitate evacuation, are not suitable for education. The government has approved construction of a new school and new buildings are under construction at Gia Lam in Ha Noi. The budget of the new school is Dg 8 billion, however, this is not sufficient for the upgrading of existing facilities.

(5) Train Operation

Train operation diagrams are planned every day at the Central Train Dispatching Center because the schedule of freight trains changes every day. Most passenger trains operate on time. Long-distance passenger trains on the Unified Line are hauled by D12E locomotives and trains on other lines by D4H locomotives. Dong Dang Line has a steep gradient of 1.7 % between Dong Mo and Lang Son. On this segment a pusher locomotive is coupled to passenger trains, and freight trains are divided into 2 or 3 trains. In spite of the low number of train operations, all stations on the lines have siding tracks and signaling facilities with signal men. The necessity of these signaling facilities, turnouts and signal men should be reviewed in order to save cost, based on review of the train diagrams. Except for trains on the Lao Cai Line, freight trains are hauled by steam locomotives. The traction weight of a D4H is 300 tons and that of a steam locomotives 700 tons. The number of trains is as follows:

Section	Ha Noi-Lang Son	Ha Noi-Yen Bai	Yen Bai-Lao Cai	Kep- Ha Long	Ha Noi-Hai Phong	Ha Noi-Than Hoa
Passenger trains	2	5	3	1	4	7
Freight trains	1	6	5	1	4	7
No. of Stations	23	21	17	13	18	22

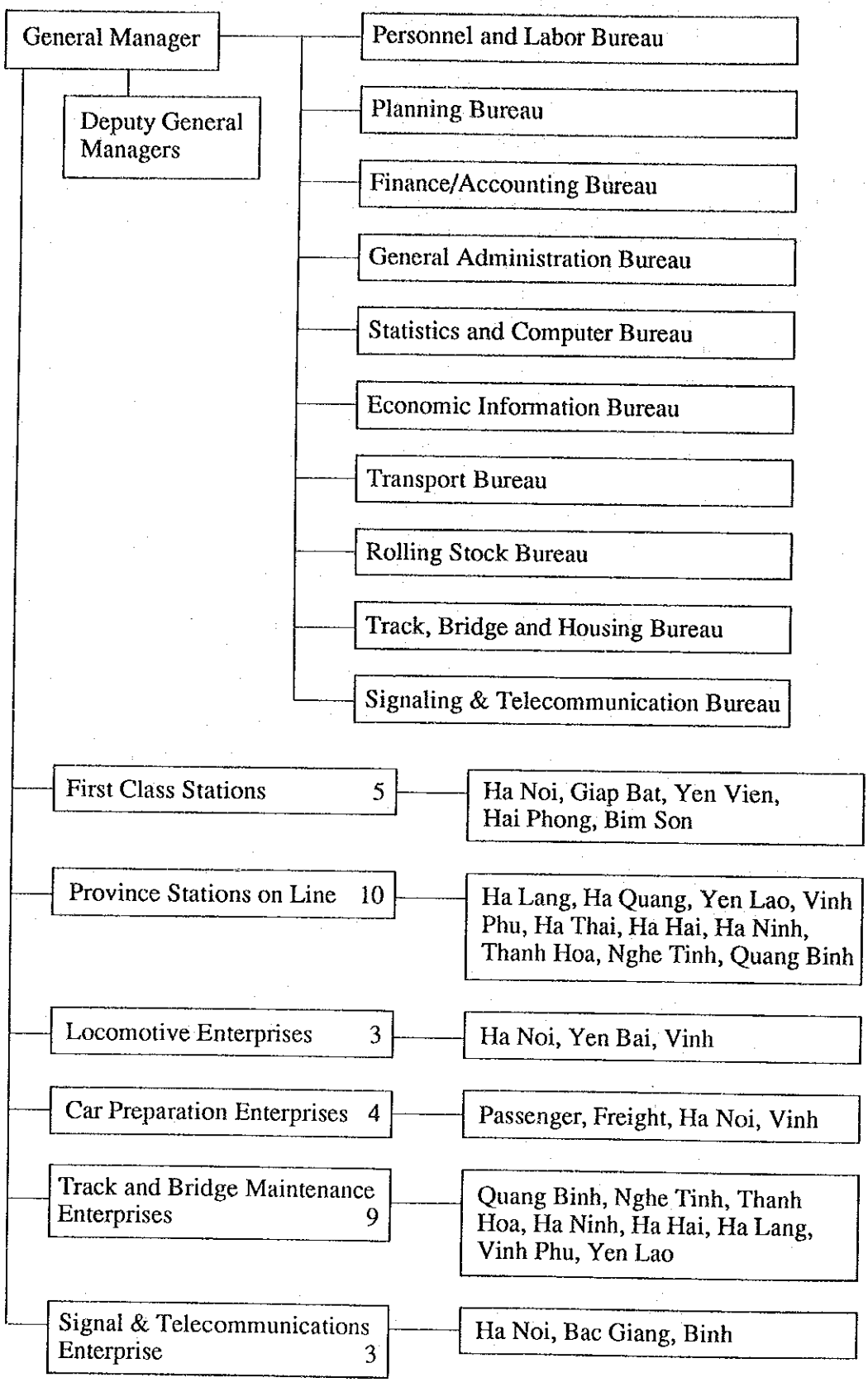


Figure 2.3.2 Organization of Vietnam Railways Union 1

(6) Rolling Stock

There are 123 D4H diesel hydraulic locomotives and only 11 steam locomotives on MG railways within the Study area. 58 D4H are used in train operations, whereas 65 D4H are presently not operated including 10 D4H awaiting overhaul. 5 D8H diesel and 2 steam locomotives are operated on StG tracks. Ha Noi Depot has 15 D12H diesel locomotives, of which 9 D12H's are operated on the Unified Line and 6 are not in operation. There are locomotive depots at Ha Noi and Yen Bai in the north. Nationwide VNR has 247 D4H locomotives, including the 123 D4H's belonging to the Ha Noi and Yen Bai depots. Union 1 has 180 D4H's.

D4H data are as follows:

- Country of Manufacture : Russia
- Power transmission : Hydraulic
- Maximum speed : 50 km/h
- Traction power : 7,200 kg
- Horse power : 400
- Layout of axles : B-B
- Axle load : 6.25 ton

The vintages of D4H's in Union 1, by procurement year are as follows:

Year	Before 1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
No.	12	8	26	6	17	19	23	38	12	19

The acquisition unit price of these D4H's was only US$20,000. The fuel consumption rate of a D4H is twice that of the D12E made in Czechoslovakia. VNR engineers thus want to replace D4H with D12E, however, it is not economically feasible. The price of a locomotive equivalent to a D4H would be more than US$500,000. As locomotives are generally used for 20 to 30 years, the D4H's should undergo minor rehabilitation and improved maintenance so as to ensure their operation for another 15 years. No budget should be therefore allocated to replace locomotives in the medium-term since rehabilitation projects should be executed with greater urgency.

The Ha Noi passenger car depot covering all Union 1 lines has 479 passenger cars on MG and 53 cars on StG. Of these, 216 cars have roller bearings and the remaining cars have plane bearings. All passenger cars are in a deteriorated condition, except those on the Unified Line. VNR has 4,544 freight wagons on MG and 655 on StG. The latter are in rather good condition, whereas the former are in great need of maintenance. About half of the freight wagons have plane bearings.

(7) Track

Track conditions are good for the current train speed and passing tonnage, however, the track structure and the maintenance system are not suitable for fast train operation. All rails are 43 kg/m rail, 12.5 m in length and in good condition and could be used for a long-term period. MG tracks have 2 block concrete sleepers with nonelastic fastening. StG tracks have PC sleepers with rigid fastening. MxG tracks have wooden sleepers with dog spikes and tie plates. VNR used concrete sleepers for MxG until recently.

Ballast is sufficient under the sleepers and beside the shoulder, but not sufficient for the full profile. The large-grained ballast currently used is not convenient for track maintenance. Most track maintenance work is done by hand, and workers reach the sites on foot or by bicycle. Their tools and machinery can be carried by hand or bicycle. Despite inadequate tools and equipment, the tracks are well maintained due to the plentiful well-trained manpower.

There is a 'Standard of Track Structure' in Japanese National Railways that was designed based on economic and technical studies including maintenance cost. It is as follows:

Class	Passing tonnage million ton/year	Maximum speed (km/h)	Rail type (kg/m)	Sleeper pis/25 m	Ballast thickness (mm)
1st	over 20	110 (120)	60	PC44	250
2nd	20 - 10	100 (120)	50	PC39	250
3rd	10 - 5	95 (105)	40	W 39	200
4th	5 - 2	85 (95)	40	W 37	200
5th	under 2	75 (85)	40	W 34	150
VNR	2	70	43	C 36	200

(1) Passing tonnage given for VNR is the forecast for the heaviest section between Viet Tri - Lao Cai in the year 2000.
(2) Maximum speed in ( ) is for light-weight axle trains such as electric rail cars and diesel rail cars.
(3) Sleepers: PC; pre-stressed concrete sleeper, W: wooden sleeper, C; concrete 2 block sleeper

This table shows that the track structure of VNR is sufficient for the train speed and passing tonnage of lines in the near future.

(8) Railway bridges

Long Bien Bridge and other bridges which also serve road traffic are potentially near collapse. Inspections of bridges to plan repair or replacement are executed by experts with inadequate measuring equipment. Important inspections are thus contracted out to universities and institutes.

24 bridges of 637 m total length were temporarily rehabilitated during the war. They now need to be scientifically examined and repaired.

Long Bien Bridge is 1,682 m long and was frequently bombed and rebuilt. Train speed and load are restricted on the bridge to 15 km/h and 12 ton/axle, respectively. The upper structure was repaired with low quality steel and has loosened. The temporary piers made of low quality steel are corroded.

(9) Signaling

1) Block system

The following block systems are adopted on these lines:

Automatic block system:	Ha Noi - Gialam	(5.5 km)
Tokenless block system:	Gialam - Hai Phong	(96.4 km)
	Ha Noi - Nam Dinh	(86.7 km)
Token block system:	other lines	

All stations have siding(s) and signaling block systems. The signaling and block instruments have mostly been supplied by China.

2) Signaling system

Two types of signals are used, a color light signal and a semaphore signal. The color light signals are used at the stations on the automatic block sections and at some main stations on the tokenless block sections, while the semaphore signals are used at other stations, mainly at the stations on the token block sections, and at some stations on the tokenless block sections.

Three kinds of signals are erected at each station: a home signal, a starting signal and a distant signal. An exception to this is made at some small stations on the tablet block section, where starting signals are not installed.

(10) Telecommunications

An ordinary telephone network is utilized over the whole VNR system for general purposes. Block telephone circuits are established between adjacent stations to serve the purpose of train block operations. A train despatching telephone network is utilized between the train control center and the stations, as well as among other offices related to train operation. The systems are over 50 years old and rely mostly on overhead bare wire.

2.3.5 Obstacles and Problems

(1) Organization

- The former enterprises of VNR, which have been privatized, lack the financial resources for needed investment.
- VNR lacks sufficient qualified manpower to formulate strategies, develop technological potential and plan future programs.
- The separation of management for railway operations from the management for development of fixed railway infrastructures remains to be undertaken as an important step of the privatization reform.

(2) Budget

- Passenger transport incurs regular losses for VNR.
- Insufficient depreciation allowance has caused the deterioration of railway facilities because necessary rehabilitation and replacement measures could not be financed.
- Financial resources from depreciation allowances and government subsidies are not sufficient for major repairs and replacements.

(3) Employees and training

- VNR is overstaffed, resulting in unnecessary and inefficient work procedures.
- Salary costs are high, accounting for 27 % of total costs.
- Despite the necessity for high quality education and training facilities, those available now are very inadequate.

(4) Passenger transport

- VNR lacks the following functions necessary for passenger service : speed, frequency, comfortable accommodations and feeder services.
- The transport capacity of the railways is largely underutilized.
- Dilapidated passenger cars and reduced frequency of passenger trains have accelerated the decline in customers.
- Reserved seat tickets are still manually written, a slow procedure.

(5) Freight transport

- VNR does not yet focus its freight transport activities on bulk cargo, which constitutes the main income source with the greatest future potential.
- Loading and unloading facilities are inadequate.
- The turnaround cycle of a wagon is around 10 days compared to 3 to 5 days on other national railways.
- Stations serving small amounts of cargo should be reviewed for possible closure in the interests of rationalization.

2.4 PORT AND SEA TRANSPORT

2.4.1 Ports in the Northern Part of Vietnam

(1) Port Classification

Ports are classified into Sea Ports and River Ports. Seaports are sub-classified into two categories: (a) general-use ports, such as Hai Phong Port and (b) special-use ports, such as coal and oil terminals. Table 2.4.1 lists the 6 major seaports in the Northern part of Vietnam, and their locations are shown in Figure 2.4.1.

Table 2.4.1 Classification of Seaports in the Northern Part of Vietnam

Port Classification	Name of Port	Port Management Authority	Government Authority
General-Use	Quang Ninh	VINAMARINE	MOTC
	Cai Lan (under construction)	VINAMARINE	MOTC
	Hai Phong	VINAMARINE	MOTC
Special Use	Cam Pha	Cam Pha Coal Co.	Ministry of Energy
	Hon Gai	Hon Gai Coal Co.	Ministry of Energy
	B-21	B-12 Oil Co.	Ministry of Trade

(2) Port Activities

The berthing facilities and the cargo-throughput of the 6 major seaports in the Northern part of Vietnam are shown in Table 2.4.2. The total cargo-throughput of these 6 seaports reached 6,294,000 tons in 1992, and is estimated to have totaled 6,680,000 tons in 1993.

Table 2.4.2 Berthing Facilities and Cargo-Throughput of Ports in the Northern Part of Vietnam

Name of Port	Berthing Facility	Cargo-Throughput (in 1,000 tons)			
			1990	1991	1992
Cam Pha	1(-9) 300 m		713	653	1,509
Hon Gai	1(-8) 200 m			327	688
B-12	mooring buoy			500	700
Quang Ninh	anchorage (-9 ~ 10)		298	425	719
Hai Phong		total	2,516	2,433	2,378
Vat Cach	3(-3) 314 m	foreign	1,501	1,030	1,230
Main Port	11(-8.4) 1,722 m	domestic	1,015	1,403	1,148
Chuave	2(-8.4) 330 m				

Source: VINAMARINE

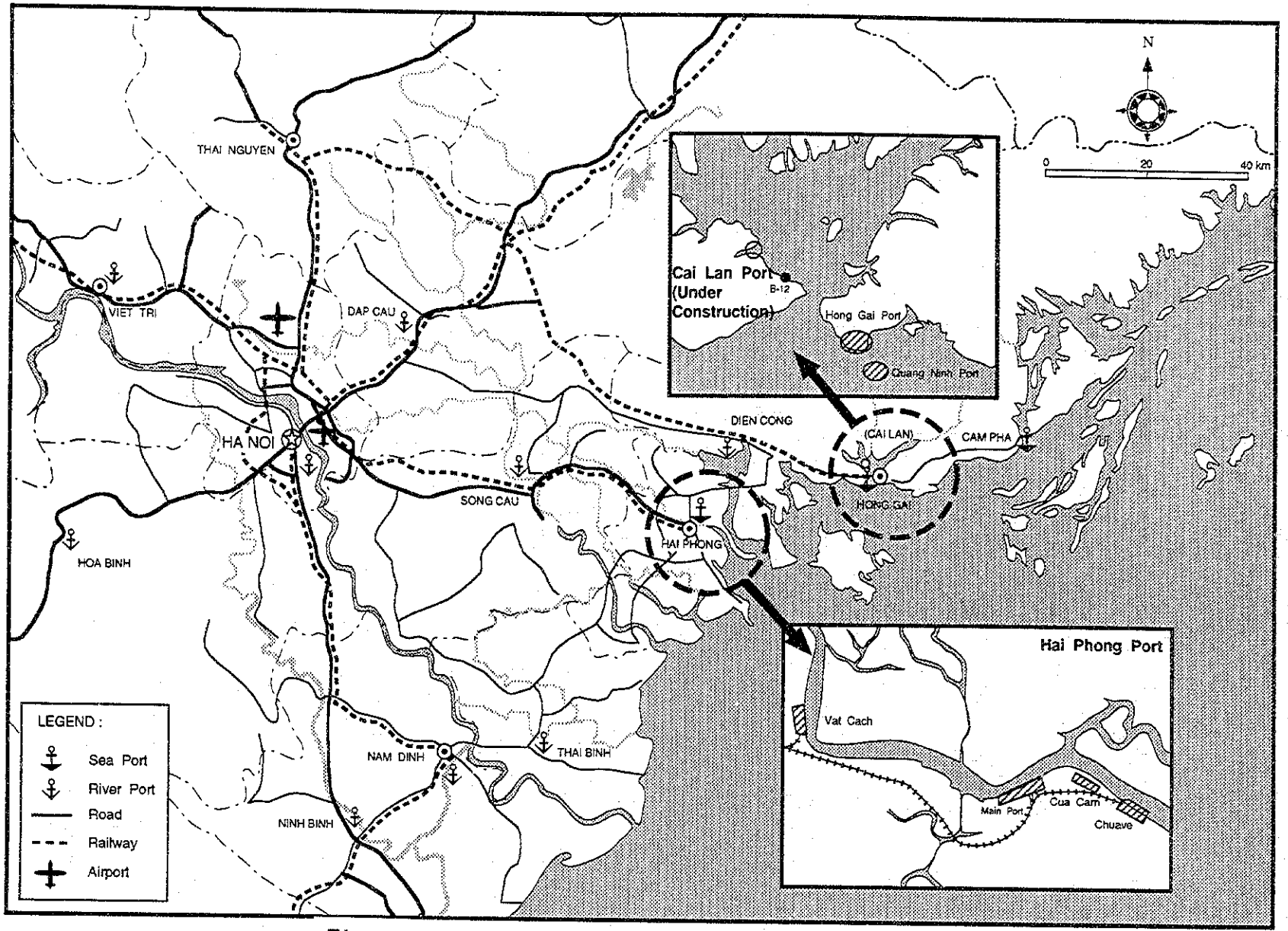


Figure 2.4.1 Location of the Major Sea Ports

2.4.2 Port Management and Operation System

(1) Central Administrative Structure

The administration of ports, like other operations of traffic and communication in Vietnam, are controlled by the State Planning Committee and Ministry of Transport and Communication.

In the past MOTC exercised its control directly, but now there is an organizational change under way in the port-related administrative structure; key management functions are being transferred to the Vietnam National Maritime Bureau, VINAMARINE, as stipulated by regulation No. 31 issued on February 2, 1993. Main organs of VINAMARINE are outlined in Figure 2.4.2.

VINAMARINE is in charge of the planning, construction and operational management of the major ports in Vietnam.

Other management organizations related to some aspects of port functioning, include the Ministry of Heavy Industry and the Ministry of Energy.

(2) Port Authorities

The port authorities take care of the improvement, management and operation, and stevedoring of seven ports under the direct supervision of the Vietnam National Maritime Bureau.

The relation among the port authorities, VINAMARINE and the central government concerning the port operational management system is described below.

① Central Government's Role

Under SPC and MOTC guidance as described above, VINAMARINE directly controls the seven ports in the country, and the port authorities function as its management organs.

② Local Government's Role

Local ports are controlled by prefectures and cities, under guidance of the MOTC and VINAMARINE.

③ Other Organizations

Two other organizations, both under the control of the Ministry of Transport and Communication, are in charge of planning and technical aspects of ports.

Transport Engineering Design Institute (TEDI)
Transport Economic Science Institute (TESI)

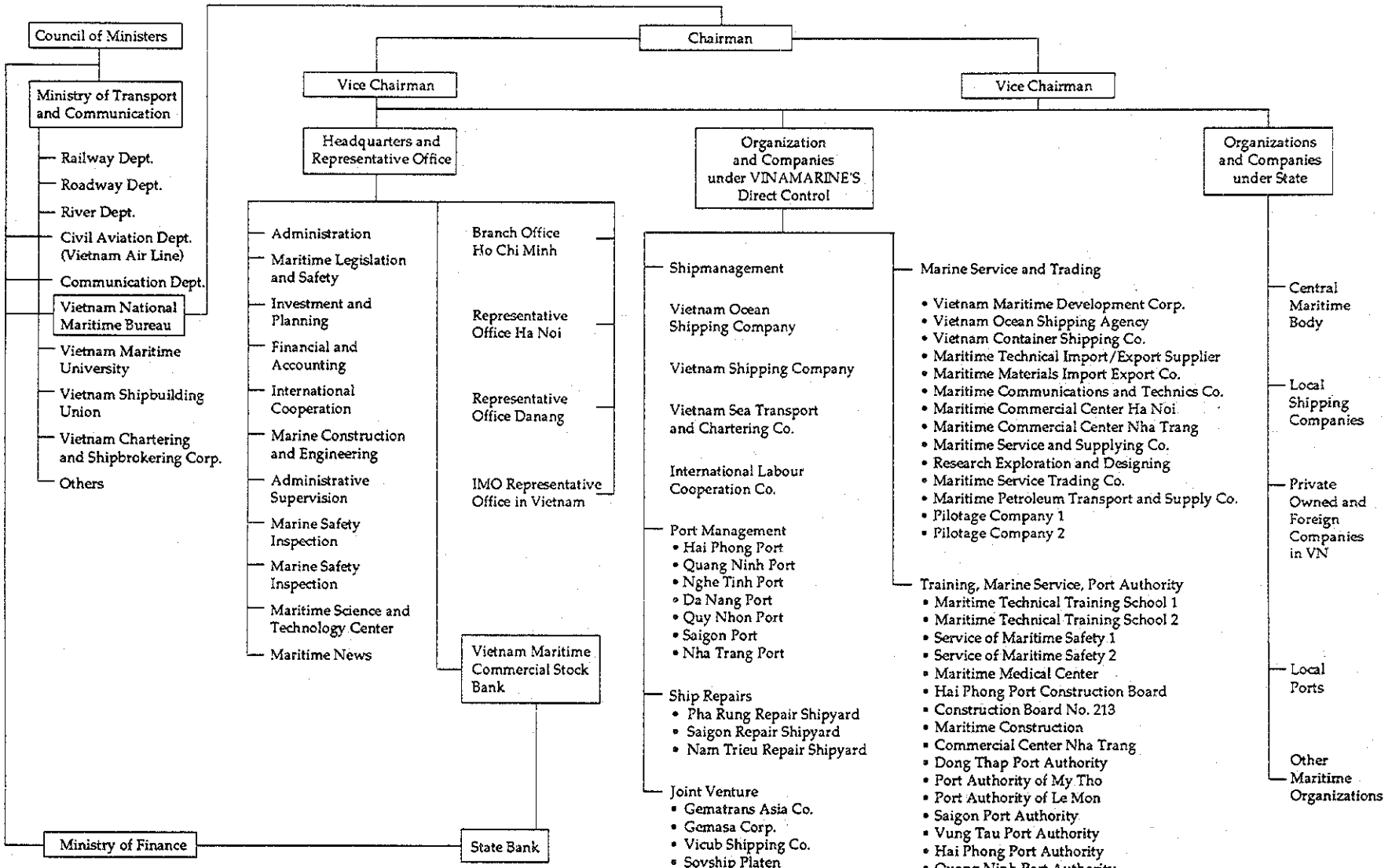


Figure 2.4.2 Organization Chart of the Vietnam National Maritime Bureau

(3) Budget of VINAMARINE

The Budget of VINAMARINE is shown in the form of the total income and total expenditure in Table 2.4.3. A turnover tax of 4 % is included in the total expenditure. Total profits are calculated by (total income) - (total expenditure). The major part of the total profits are applied to taxes and to payments on long term loans.

Table 2.4.3 Budget of the Vietnam National Maritime Bureau

(Billion Dong)

	1991	1992	1993
1. Income (total)	752	1,000	1,069
2. Expenditure (total)	716	924	1,021
3. Profits (total)	6	76	48

Source: VINAMARINE

2.4.3 Hai Phong Port Activities

In 1988, Hai Phong Port was the largest international port of Vietnam and handled 3.0 million tons of cargo accounting for 40 % of the country's total. Foreign trade through Hai Phong has recently remained below the 1988 peak and the annual cargo throughput in 1992 was 2.4 million tons. This downward trend in shipments is attributed to both economic and physical constraints, such as heavy siltation in the navigation channel of the port.

(1) Cargoes

Table 2.4.4 gives the breakdown of the cargo-throughput at Hai Phong Port into export, import and domestic cargo, as well as the share of container cargo. The volume of import cargo is more than twice as large as the volume of export cargo. Major import commodities are fertilizer, metal, ore, machinery and equipment. Major export commodities are logs and timber, ore and rice. Roughly half of the international carriage is bulk cargo which comprises ore, logs, rice, fertilizer, cement and wheat-flour. Container cargo sharply increased since 1991. Half of the domestic cargo is transshipped on inland waterways.

Table 2.4.4 Cargo-Throughput at Hai Phong Port (in 1,000 tons)

	1988	1989	1990	1991	1992	1993*
1. Total	2,982	2,725	2,516	2,433	2,378	1,326
2. Export	234	751	524	409	382	169
2-1. Container	-	-	13	51	116	73
3. Import	1,499	1,068	976	621	848	518
3-1. Container	-	-	40	100	117	128
4. Domestic	1,249	905	1,015	1,403	1,148	639

Source : Hai Phong Port, VINAMARINE.
* : Jan. ~ Jun. 1993

(2) Vessels Calling at Hai Phong Port

Table 2.4.5 shows the number and tonnage of vessels calling at Hai Phong Port. Because of the siltation in the entrance channel, vessels above 7,000 Dead Weight Tons (DWT) can only enter the port at high-tide with adjusted draft.

Table 2.4.5 Ships Calling at Hai Phong Port

Gross Registered Tonnage (GRT)	Length in meters	1990	1991	1992	3 year mean (%)
less than 3,000	<85	155	186	357	41
3,001 ~ 5,000	85 ~ 125	96	88	143	19
5,001 ~ 7,000	125 ~ 140	97	110	98	18
7,001 ~ 10,000	140 ~ 160	141	100	89	19
over 10,000	160 ~ 185	10	13	15	3
total		499	497	702	100

Source : Hai Phong Port, VINAMARINE.

(3) Cargo Handling Equipment

Most cranes have a capacity of 10 tons which is insufficient for handling container cargo. Furthermore, they are more than 20 years old and some of them do not properly function.

2.4.4 Sea Transport

(1) Shipping Companies and Their Fleets

VINAMARINE directly controls the following three shipping companies : (a) Vietnam Ocean Shipping Co. (VOSCO), (b) Vietnam Sea Transport and Chartering Co. (VITRANSCHART) and (c) Vietnam Shipping Co. (VINASHIP). VINAMARINE also has several joint-venture shipping companies, such as GEMATRANS ASIA Co. The Fleet which VOSCO owns is shown in Table 2.4.6.

Table 2.4.6 Fleet of Vietnam Ocean Shipping Company (VOSCO)

Vessel Name	Type	Year	Place Built	GRT	DWT (K/T)	Draft (m)	Cargo Capacity	
HAU GIANG	Ro-Ro	1977	Denmark	9,703.3	12,800	9.40	Bale	10,605 m³ 380 TEU
SONG DUONG	Conv.	1978	UK	9,100.0	15,025	8.87	Grain	21,320 m³
SONG THUONG	Conv.	1976	Japan	6,051.5	10,029	7.73	Grain	13,036 m³
DIEN BIENI	Conv.	1975	Japan	5,109.0	8,294	7.20	Grain	10,877 m³
SONG BENHAI	Conv.	1973	Japan	7,097.4	11,845	7.91	Grain	14,815 m³
FORTUNE FREIGHTER	Conv.	1978	Japan	3,778.6	6,560	6.82	Grain	8,382 m³
CABOT ORIENT	Conv.	1984	Japan	2,494.0	4,485	5.50	Grain	5,452 m³
NHAT LE	Conv.	1975	Japan	3,266.0	5,924	6.60	Grain	7,454 m³
HOALU 02	Multi.	1963	USSR	11,089.0	12,730	9.10	Bale	16,780 m³ 138 TEU
TRIAN	Multi.	1963	G.D.R.	3,725.0	4,150	6.56	Bale	5,767 m³ 33 TEU
PHA LAI	Conv.	1961	USSR	3,959	4,354	5.58	Grain	5,911 m³

Source: VOSCO

VOSCO owns 11 ships altogether and their total tonnage is 65,372 GRT. The average tonnage per ship is 5,940 GRT. The corresponding data for other shipping companies is:

	number of ships	total tonnage	average tonnage
VITRANSCHART	14	72,496 GRT	5,180 GRT
VINASHIP	9	32,498	3,600

(2) Sea Transport

The two most frequent routes for container cargo are as follows:

- Kaohsinng ~ Hong Kong ~ Hai Phong ~ Ho Chi Minh (9 days)
- Hai Phong ~ Ho Chi Minh ~ Singapore (7 to 10 days)

For both routes, Hai Phong and Ho Chi Minh only function as feeder ports. (Figure 2.4.3)

Export cargo is mainly transshipped to Taiwan, Thailand, Indonesia and Japan. Most cargo is imported from Japan, Republic of Korea and Russia. International container cargo is transported by feeder ships to and from Singapore. Coastal domestic transport remains relatively low in volume, the major commodities in coastal traffic being cement, construction materials, clinker, ore, fertilizer and sugar.

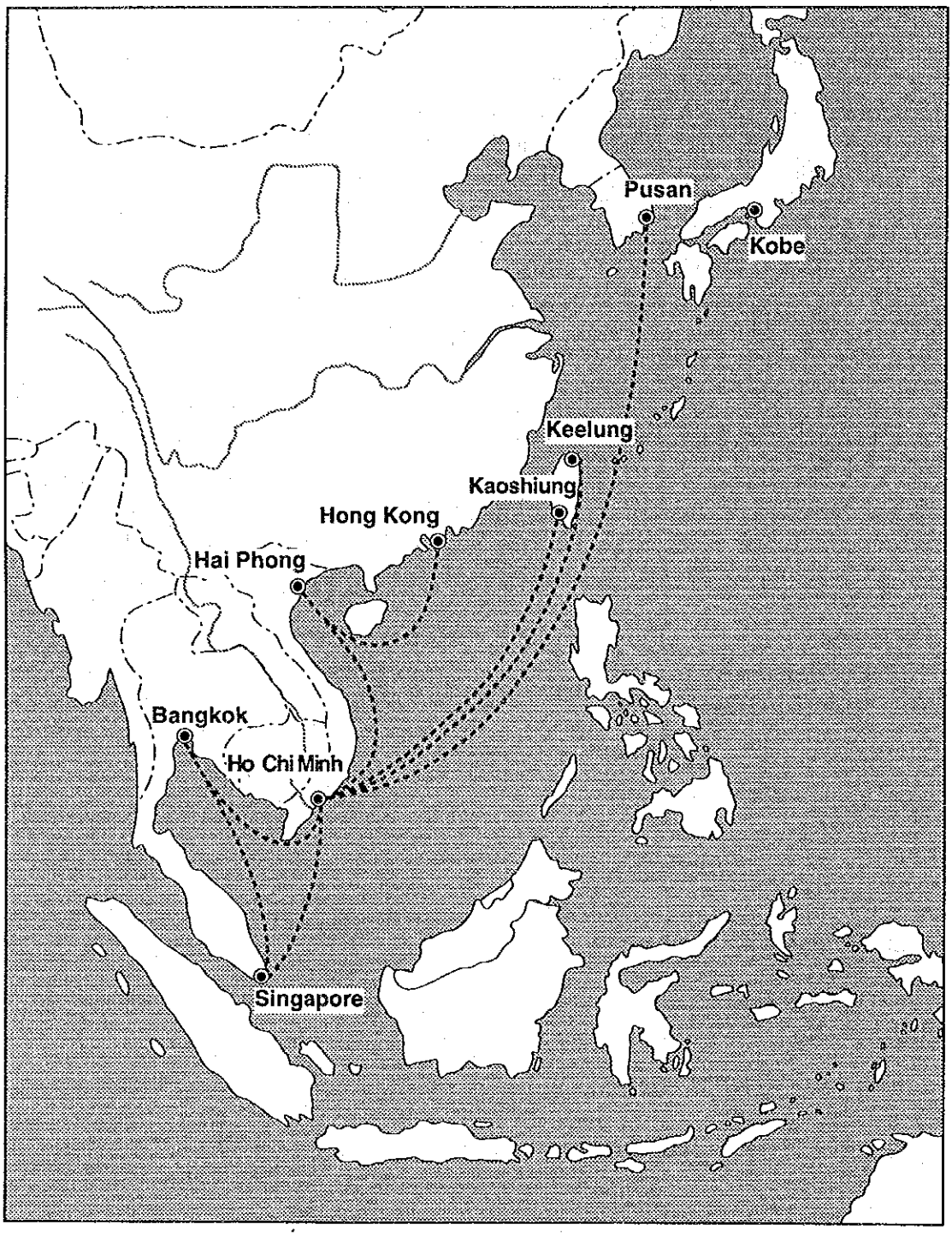


Figure 2.4.3 Vietnam's Container Transportation Routes

Table 2.4.7 shows the movements of the international sea transport cargoes with the major points of origin and destination of each commodities.

Table 2.4.7 Major Origins and Destinations of Commodities Handled by Hai Phong Port, 1992

Commodities	Cargo Volume Thousand T		Origin and Destination of Major Commodities	
			Major Origin	Major Destination
Export Cargo	382	16.0 %		
Container	116	30.4 %	Feeder Vessels VIA S' Pore, Hong Kong, Taiwan	
Logs, Timber	98	25.6 %	Thanh Hoa, Tuyen Quang	Thailand, Taiwan
Metal (Scrap)	75	19.6 %	Northern Provinces	Thailand, Taiwan, Japan, Indonesia
Ore (Zinc)	41	10.7 %	Lao Cai	Thailand
Rice	25	6.6 %	Thai Binh, Hai Hung	Cuba, CIS, Africa
General Cargo	13	3.3 %	Red River Delta	Eastern Europe
Foodstuffs	8	2.2 %	Red River Delta	Japan, S' Pore
Rattan Wares, Jute Tapis	3	0.9 %	Red River Delta	Eastern Europe
Vegetables	2	0.6 %	Red River Delta	Russia (CIS)
Machinery, Equipment	0	0.1 %	Ha Noi	Cuba
Apatite			Thai Nguyen	Korea
Import Cargo	849	35.7 %		
Fertilizer	374	44.1 %	Malaysia, Indonesia, Russia,	Red River Delta
Container	117	13.8 %	Feeder Vessels VIA S' Pore, Hong Kong, Taiwan	
Metal	99	11.7 %	Russia (CIS), Japan, Korea	Northern Provinces, China
Ore (Copper)	59	6.9 %	Russia (CIS), Albania	Thai Nguyen
Wheat Flour	33	3.9 %	UN/FAO Project	Northern Provinces
Asphalt	32	3.7 %	S' Pore, Korea, Japan	City Area
Machinery, Equipment	23	2.8 %	Russia (CIS), Taiwan, Korea	Northern Provinces
Chemicals	18	2.2 %	Japan, CIS, Korea	Ha Noi
Foodstuffs	7	0.8 %	Russia (CIS)	Ha Noi
Cement	3	0.3 %	Japan, CIS	Northern Provinces
Cotton, Yarn & Textiles	1	0.1 %	Russia (CIS), Korea, Japan	Nam Dinh, Ha Noi
Coal			Australia, Japan	Thai Nguyen
Rice				
Others	82	9.7 %		

Source: "The Urgent Rehabilitation Plan of Hai Phong Port" Sept. 1993, OCDI (Japan)

(3) Shipping Activities

It Vietnam were to follow the pattern of many other countries, its national merchandise fleets would have a capacity to transport 30 ~ 40 % of the country's total foreign trade traffic volume.

The cargo volume transported by the national fleets of VOSCO, VITRANSCHART and VINASHIP in 1991 was 3.3 million tons in total, including domestic carriage, and 2.3 million tons internationally. These figures correspond to 25 % of Vietnam's total cargo volume, and 34 % of its international cargo volume, respectively.

2.4.5 Obstacles and Problems

(1) Decreasing Cargo-Throughput

Cargo-throughput at Hai Phong Port has gradually decreased in recent years mainly as a consequence of both the collapse of trade with former COMECON countries and the shallowness of the entrance channel.

(2) Imbalanced Container Transport

Table 2.4.8 shows that the volume of imported container cargo is 1.5 to 1.8 times higher than the volume of exported container cargo. Hence, the percentage of empty exported containers is large. The largely one-way transport of containers makes it difficult to attract more container service lines.

(3) Outdated and Insufficient Equipment

Equipment and machinery are outdated and of low capacity with insufficient maintenance. As a consequence, cargo handling capacity and efficiency are both low, and the operations system is unsuitable for modernized transport systems, particularly with respect to containers. Although container cargo has sharply increased recently, the full potential of container transport remains incompletely exploited.

(4) Shallowness of the Hai Phong Entrance Channel, Siltation and Dredging

The entrance channel of Hai Phong Port is 36 km long and in order to keep a sufficient water depth in it, continuous maintenance dredging is necessary. Previously, there was frequent dredging and the water depth was kept at a moderate level. Due to a funding shortage, maintenance dredging removed only 1.2 to 1.8 million m^3 of burden in 1991 and 1992, and, as a result, the water depth of the entrance channel is presently only 4 to 4.5 m. Vessels above 7,000 DWT must therefore adjust their draft to enter the port. As a consequence, the percentage of vessels above 7,000 DWT calling at Hai Phong Port has declined from 30.4 % in 1990 to 14.8 % in 1992 (see Table 2.4.9). Figure 2.4.4 shows the volume of maintenance dredging and the water depth of the entrance channel.

Table 2.4.8 Container Cargo at Hai Phong Port

(TEU)

		1990	1991	1992
Import	Stuffed	8,908	8,952	16,508
	Empty	184	255	326
	Total	9,092	9,207	16,834
Export	Stuffed	8,283	5,437	8,959
	Empty	1,181	4,483	8,318
	Total	9,464	9,220	17,277
Total	Stuffed	17,191	14,389	25,467
	Empty	1,365	4,738	8,644
	Total	18,556	19,127	34,111

Source : Hai Phong Port, VINAMARINE.

Table 2.4.9 Decline in Large Vessels Calling at Hai Phong Port

Year	Total number of vessels	Vessels above 7,000 DWT	
		Number	%
1990	499	151	30.3
1991	497	113	22.7
1992	702	104	14.8

Source : Hai Phong Port, VINAMARINE.

(5) No Competition between Ports

Government control of the shipping business and the management of all major seaports prevents competition between individual ports which might stimulate more efficient operations.

(6) Low Efficiency of Terminal Operation

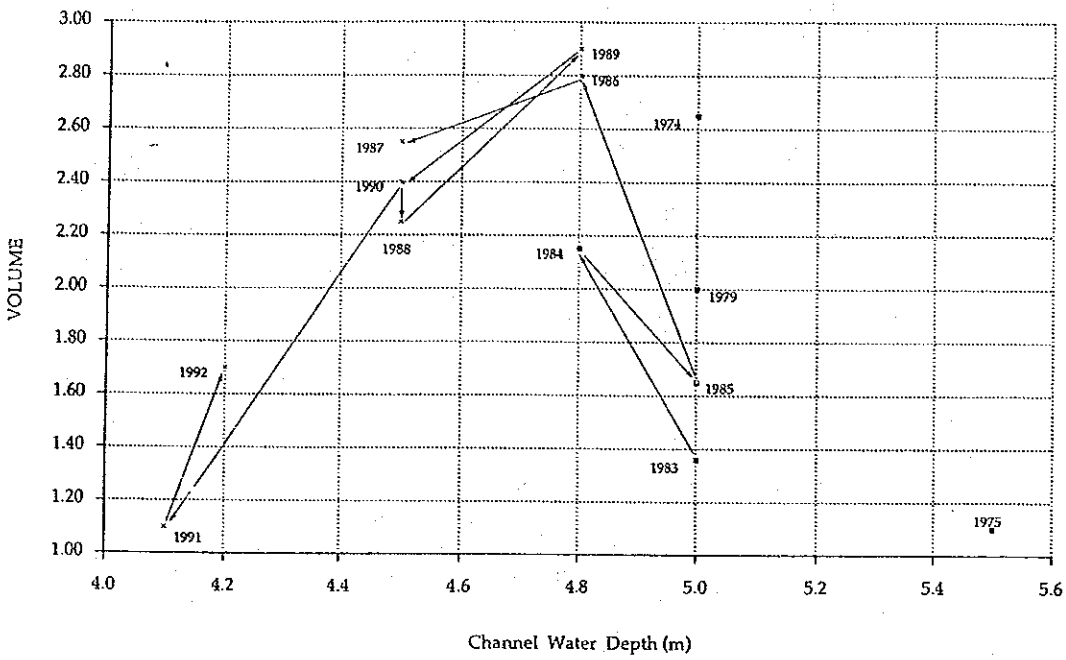
Owing to the outdated and insufficient facilities, the complicated procedure for cargo transport in the port area, and the undeveloped operational system for the cargo handling, the efficiency of terminal operation presently remains at a relatively low level.

(7) Limited Capacity of the Vietnamese Cargo Fleet

The Vietnamese cargo fleet's capacity for ocean-going cargo transport is insufficient. Vietnam is losing benefits it could gain in the field of the shipping business with a fleet of greater capacity.

(8) Inadequate Data Systems

Port-related data and information management systems are presently inadequate and require standardization as a precondition for efficient port operations.



Source : "The Urgent Rehabilitation Plan of Hai Phong Port", Sept. 1993, OCDI (Japan)

Figure 2.4.4 Maintenance Dredging of the Hai Phong Entrance Channel (Nam Trieu)

2.5 INLAND WATERWAY

2.5.1 Inland Waterways in the Northern Part of Vietnam

The total length of natural rivers is about 25,000 km in the Northern part of Vietnam and 2,500 km of inland waterway has been developed in the north, out of a national total of 11,000 km. The seasonal fluctuation of water level during the year is severe in many places. For example, along the Red River, the fluctuation of the water level upstream of Viet Tri is 10 to 15 m, from Hung Yen to Viet Tri 5 to 10 m and from Hung Yen to the estuaries about 5 m. In addition, there is evidence of heavy siltation and erosion along the river banks.

The main population and economic centers situated along rivers, include thermal power plants and large-scale cement and fertilizer plants. Inland waterways are effectively used mainly for coal transport.

2.5.2 Inland Waterway Network and Activities

(1) Inland Waterway Network

The Red River and Thai Binh River are the main river networks in the Northern part of Vietnam, and they are linked by two canals as well as by the Duong and Luoc rivers. The average depth of the Red River during the dry season is 1.8 m downstream near its mouth, 1.5 m in the mid-course of the river and 1.2 m upstream near its sources.

(2) Inland Waterways Classification

Inland waterways are operated by MOTC. Inland waterways are classified into six levels as indicated in Table 2.5.1.

Table 2.5.1 Inland Waterways Classification

Level	Depth (m)	Width (m)	Curvature (m)	Length (km)
Level 1	>2.8	>90	>700	129
2	2.0 ~ 2.8	70 ~ 90	400 ~ 700	393
3	1.5 ~ 2.0	50 ~ 70	300 ~ 500	316
4	1.2 ~ 1.5	30 ~ 50	200 ~ 300	407
5	1.0 ~ 1.2	20 ~ 30	100 ~ 200	480
6	<1.0	<20	60 ~ 150	399
Total				2,074

Note : Excluding 200 km lake area and 276 km coastal area.
Source : MOTC

The main inland waterway routes in the Study area are shown in Figure 2.5.1. The three main routes are:

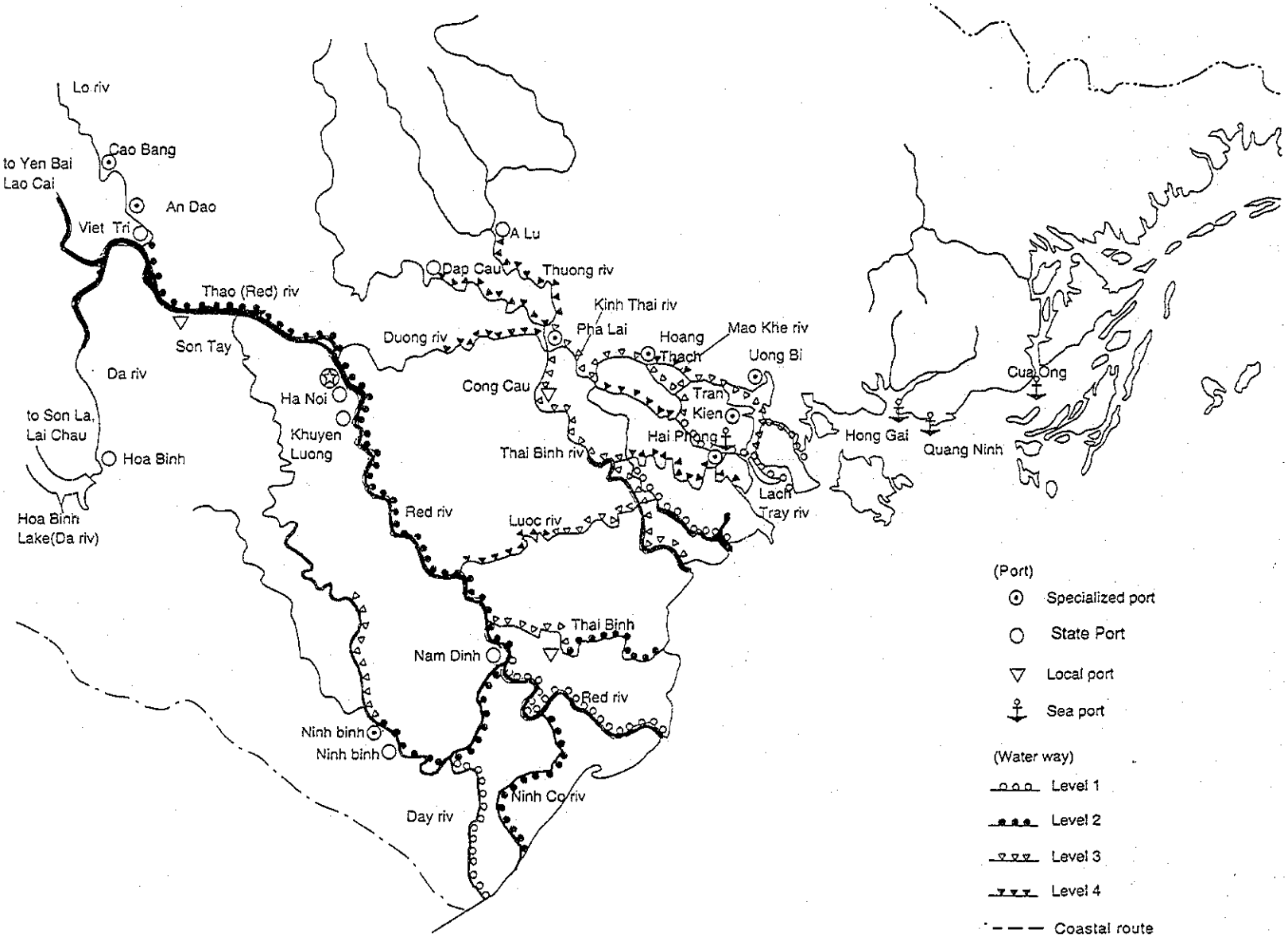


Figure 2.5.1 Location of Inland Waterways at Present (Red River Delta)

- Quang Ninh - Hai Phong - Ha Noi-Viet Tri (via Duong, Luoc, and Red rivers) to serve Ha Noi Metropolitan Region.
- Quang Ninh - Hai Phong - Ninh Binh (via Luoc River) to transport coal to the Ninh Binh Thermal Power Plant and other industries.
- Quang Ninh - Pha Lai - Bach Giang (via Bach Dang, Da Bach and Mao Khe rivers) to transport coal to the Pha Lai Thermal Power Plant which is the largest power plant in the Study area.

(3) River Ports

There are three main types of river ports: state-owned, specialized and provincial ports.

- State-owned River Ports

Table 2.5.2 provides information regarding location, organization, port facilities and freight volume of the following five main ports which are operated by the Inland Waterway Bureau (IWB) of MOTC: Ha Noi, Ninh Binh, Viet Tri, Ha Bac and Hoa Binh. The Vietnam Sea - River Transport Enterprise (VISERITRANS) under MOTC, which is in charge of coastal sea transport, operates the following two river ports: Khuyen Luong (near Ha Noi) and Nam Dinh.

Table 2.5.2 State-owned River Ports Operated by Inland Waterways Bureau

Port / Item	Ninh Binh	Viet Tri	Ha Bac		Hoa Binh	Ha Noi
			Dap Cau	A Lu		
Location:						
Province	Ninh Binh	Vinh Phu	Ha Bac	Ha Bac	Hoa Binh	Ha Noi
City	Ninh Binh	Viet Tri	Bac Ninh	Bac Giang	Hoa Binh	Ha Noi
River	Day	Lo	Cau	Thuong	Da	Red
River network	Red	Red	Thai Binh	Thai Binh	Red	Red
from Ha Noi	S 80 km	NW 40 km	NE 27 km	NE 40 km	WSW 70 km	-
Organization:						
Year of establishment	1965	1967	1965	1965	1970	1965
Employees	499	361	80	52	70	450
Port facilities:						
Berth length	300 m	700 m	300 m	200 m	1,800 m	1,800 m
Berth depth	5 to 8 m	2.2 to 6 m	1.5 to 4 m	1.5 to 4 m	1.5 to 5 m	6 to 9 m
Site area	14 ha	17 ha	1 ha	2 ha	2 ha	24 ha
Freight (in 10^3 tons):						
in 1988	542	368	441		78	531
in 1992	313	230	70		50	484

Source: MOTC