Bridges on National Roads Nos. 5 and 183 are not listed in the table, because projects for these bridges are already being implemented, or at least the project costs are already fixed.

(4) Definition and Timing of Rehabilitation and Improvement

Improvement is defined as raising the standards of the road width, alignments, radius of curves, and gradient to allow for greater traffic speed, safety and vehicle capacity. To accommodate the increases in vehicle weights and traffic volume due to the rapidly expanding economy and related transport needs, it is very important to upgrade roads and bridges in many ways, but particularly as to their strength.

Rehabilitation on the other hand, is defined as repairs and restoration performed in order to bring the roads and bridges back to their original design configuration, after the road and bridge condition has become deteriorated to an unacceptable degree.

Before the year 2000, several sections of National Roads will be improved because of their traffic volume and present poor condition, and the remaining sections will be attended to between 2000 and 2010.

In the case of improvements made between the years 2000 and 2010, prior to the improvement to be carried out, the road and bridge sections will require some rehabilitation before the year 2000.

4.4.3 Urban Road Development Plan

(1) Ha Noi

National Road Routes 1, 2, 3, 5, 6, and 32 exist as radial roads from the center of Ha Noi at present. Only one road functions as a ring road, with a diameter of 5 km (Figure 4.4.4). The ring road has a few sections of 2 lanes which should be widened up to 4 lanes at least. In addition to the present ring road, one or 2 additional ring roads may be needed according to the future expansion of the urban area. The following additional measures are required to accommodate the increasing traffic volume:

- Channelization of at-grade intersections and installation of traffic signals.
- Installation of traffic safety facilities (lane mark, guard rail).
- Installation of a public transport system (Bus and LRT).
- Provision of traffic safety education both for drivers and pedestrians.
- Enforcement of traffic regulations.

(2) Hai Phong

At present, the National Road Routes 5 and 10 function as arterial roads in the urban area of Hai Phong (Figure 4.4.5). Route No. 5, which connects Hai Phong with Ha Noi, could itself be used as the basis to create a ring road within the urban area of Hai Phong. This ring road should be connected with the proposed Ha Noi - Hai Phong freeway.

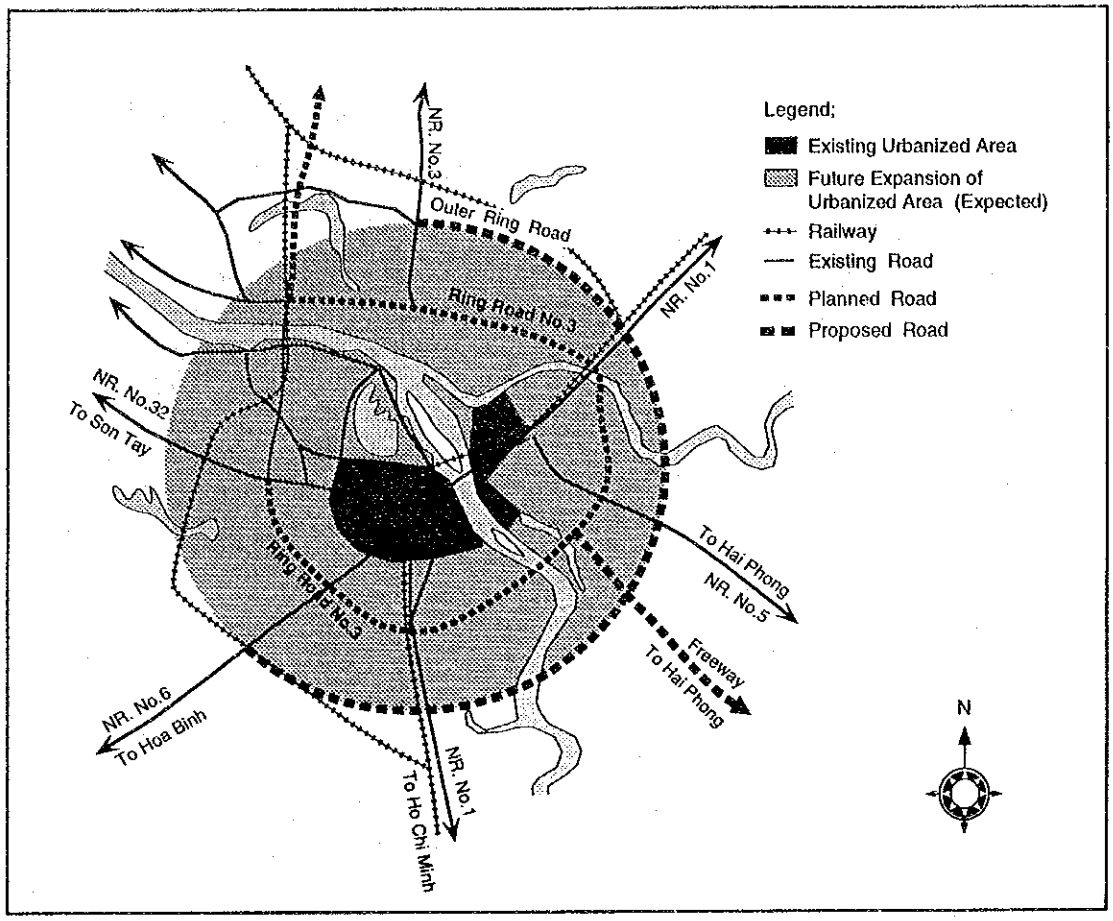


Figure 4.4.4 Planned Road Network System in Ha Noi

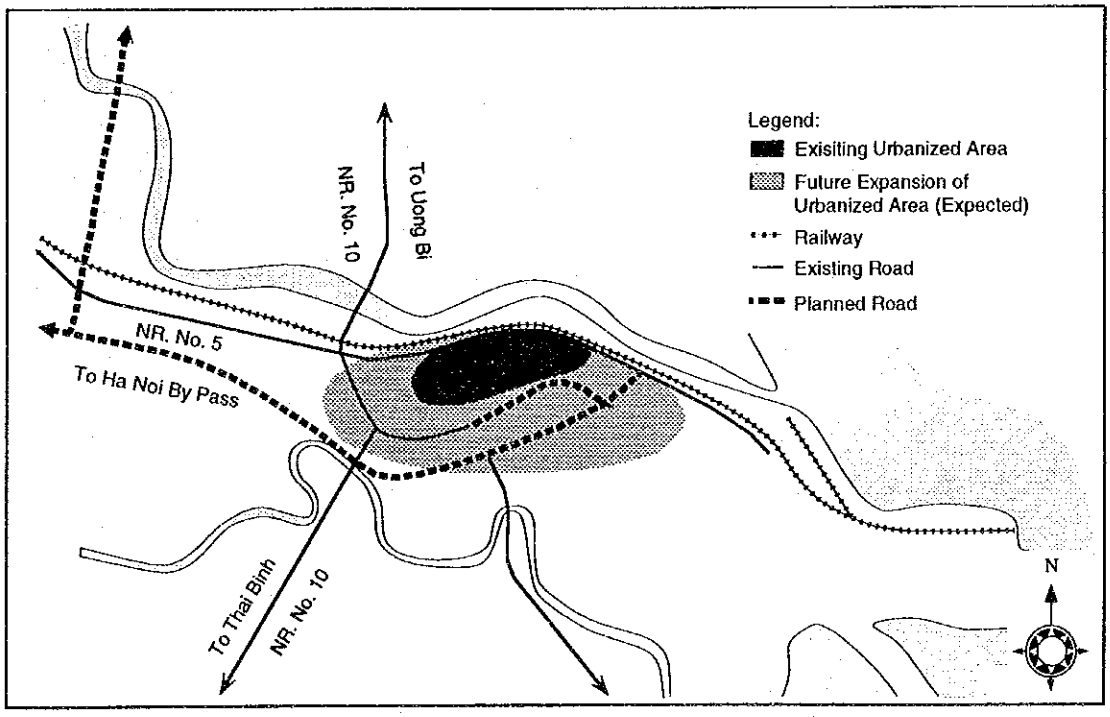


Figure 4.4.5 Planned Road Network System in Hai Phong

4.4.4 Establishment of Road Maintenance System

(1) Definition of Road Maintenance and Rehabilitation

Road maintenance and rehabilitation is defined as systematic activities to preserve and repair a road system with its elements according to accepted configurations. System elements include road surface, shoulders, roadside areas, drainage facilities, bridges, tunnels, traffic safety facilities, traffic management facilities and so forth. Road maintenance and rehabilitation activities are developed to offset the effects of weather, vegetation growth, deterioration, traffic wear, damage and vandalism. Maintenance and repair of necessary buildings, stockpiles and equipment are also included. Road Maintenance is divided into (a) inspection, (b) routine maintenance and (c) periodic maintenance.

For instance, the following explanation of road surface maintenance and rehabilitation clarifies the above definitions. The serviceability of the road surface generally decreases due to traffic and aging as shown in Figure 4.4.6. Routine maintenance of the road surface by minor repairs is thus required in order to preserve its quality within the acceptable range. Routine maintenance work comprises repairs of potholes, patching, surface treatments and minor repairs of rutting and cracking. Periodic maintenance of the road surface is needed so as to restore the road surface to a quality level close to the original standard considered as "perfect". Periodic maintenance includes repairs of rutting and cracking, asphalt overlays and the replacement of pavement.

Figure 4.4.6 illustrates the definitions of road surface maintenance and repair referring to the Present Serviceability Index (AASHTO Guide for Design of Pavement Structure, 1986). Maintenance is defined as work performed on roads which are still within the acceptable range of serviceability, while work done on roads which have already fallen to unacceptable serviceability levels is called rehabilitation (excluding improvement and reconstruction). Improvement is defined as the upgrading of road surface, width, alignments, radius and gradient so as to increase traffic speed, safety and capacity beyond the road's original standard. Reconstruction is defined as renewal of deteriorated road structures and/or renewal of road alignments.

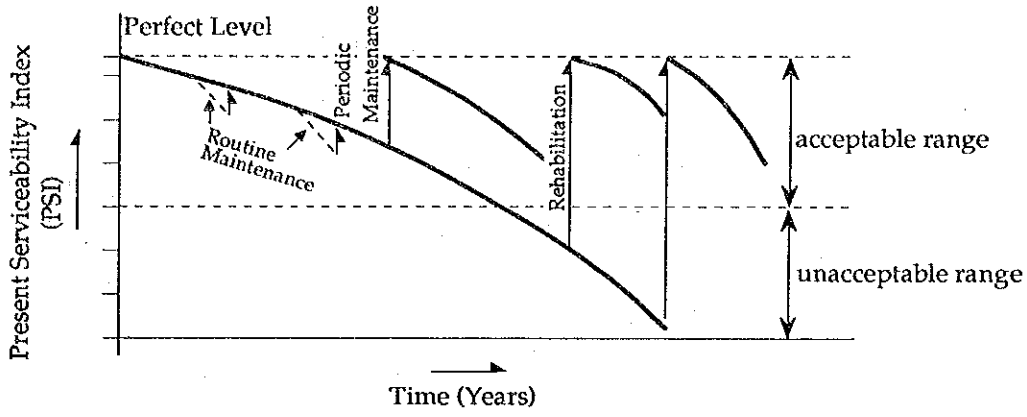


Figure 4.4.6 Definition of Road Surface Maintenance

(2) Road Rehabilitation and Improvement

Road surface rehabilitation is required for road sections in poor and very poor conditions based on the road inventory survey. Road improvement regarding road width and surface is needed for national, provincial, urban and district roads.

(3) Road Maintenance, Operations and Construction Works

Road inspection and routine maintenance should be carried out under national and provincial government accounts. Periodic maintenance, rehabilitation, improvement and new construction works should be carried out on a contract basis by public construction companies under MOTC (national level) or DOTC (provincial level) and/or by private contractors.

4.4.5 Transport Industry Development Plan

(1) Bus Transport Industry

Traffic volume of public bus companies has sharply declined since 1988 as a result of increased competition from private bus companies. The bus network in the urban area of Ha Noi has been reduced to 17 routes. Bus passengers declined from 12 million in 1980 to 6 million in 1991. As a result, the bus traffic modal split ratio was 4 % in the urban area of Ha Noi, whereas the modal split ratio of small car and bicycle/motorcycle were 1 % and 95 %, respectively. The following policies are necessary to promote public bus traffic:

- Roles for private and public bus operations need to be clearly defined. Competitive routes should be operated by the private sector, whereas non-competitive routes (in low demand) should be run either by the state transport company or by subsidized private enterprises.

- The modal split ratio of bus traffic needs to be increased, requiring (a) expansion of bus stops and routes, (b) tax exceptions for bus operators, (c) purchase of buses and related equipment.

(2) Trucking Industry

1) Truck Transport Demand

Freight amounting to 6.75 million tons (46 % of total freight) were transported by trucks within the Study area in 1991. The estimated number of truck vehicles was 40,499 in 1991. The truck fleet is estimated to grow initially at 7.7 percent per year, accelerating to 12.9 %, and is likely to reach 78,700 units in 2000 and 265,100 units in 2010. Assuming an average life span of the 40,499 trucks to be 15 years, 2,700 new trucks will be required annually for replacement. An additional 3,800 trucks will be needed to accommodate an annual traffic growth of 7.7 % until 2000. An annual growth of 12.9 % will be required from 2000 to 2010.

2) Policy for Trucking Industry

The trucking industry is one of the most important transport services for the national economy. The truck transport market has been substantially deregulated since 1989. The following three issues require special attention for the promotion of the trucking industry:

a) Efficient Management

In 1991, 60 % of the total inter-province road freight was carried by public enterprises of provincial and district governments, public enterprises of the national government carried another 20 %, and private enterprises took the remaining 20 %. Private trucking enterprises have rapidly increased their market share since 1991. All public trucking enterprises have become financially autonomous since January 1993.

Efficient management will be best attained through market competition. However, experience in other countries indicates that it is generally necessary to allow some degree of joint action among enterprises. Trucking enterprises should be encouraged to establish region-wide voluntary associations for mutual cooperation regarding (a) market information exchange, including marketing of return cargo, (b) procurement of trucks, fuel and tires, including mutual financing schemes, (c) education and training, (d) managerial rationalization, (e) development of a communication network and (f) establishment of truck terminals and warehouses.

A market monitoring system comprising demand and supply indicators as well as managerial and financial conditions of trucking enterprises would be an important tool for the government to guide the transition to a market economy in an orderly and efficient way. As the trucking industry develops in the future, larger trucking enterprises will organize small- and medium-sized truckers under their leadership to expand their service network. This will increase efficiency of the trucking industry.

b) Development of Truck Terminals

There is a general tendency for trucking enterprises to increase the efficiency of their operations through separating trunk line transport from feeder transport. This enables an immediate "come and go" of trucks on the trunk lines. Large trucking enterprises could develop their own truck terminals at their disposal, whereas medium- and small-sized trucking enterprises will have to rely on truck terminals operated by cooperatives.

Apart from transshipment facilities, truck terminals should also be equipped with container depots, warehouses, sorting and packaging facilities and some kinds of processing facilities. These need to be developed in the vicinity of urban centers with due consideration to good connection between inter-province and intra-city transport, possible impacts on urban environment, including traffic congestion, accidents as well as air and noise pollution.

c) Containerization

Vietnam needs to develop a container transport system for all transport modes. The heaviest fully-loaded 20-foot container might weigh 20 tons, which would imply a gross vehicle weight of about 30 tons. Many recently-built bridges are designed for 25 ton gross vehicle weights, which is enough for most loads. However, the main problem is the large number of weak and dangerous bridges, which restricts the sizes and weights of containers transported.

4.4.6 Road Management and Organization

The Vietnam Road Administration Bureau (VRAB) presently employs a total of 17,600 staff. To meet the requirements of economic efficiency, this number should be significantly reduced.

The following is a recommended configuration of the institutional framework under the VRAB;

- Nine transport enterprises with 4,080 employees should be transformed into private companies with a starting capital including the present assets at minimal costs. In the future, these enterprises should earn the salaries of their employees, and operate buses and trucks by themselves without subsidy.

- The productive repair and business companies should be segregated from Regional Road Management Unit (RRMU) No. 2, and begin to manage construction business by themselves.

- Road Management Divisions No. 222, 224, 226, 232, 234, 236 238 and 240 should continue to be subsidized and should concentrate on the road and bridge maintenance (routine maintenance and small-sized tasks of periodic maintenance).

- A road maintenance and operations system remains to be established, including operations manuals for routine and periodic maintenance and for rehabilitation.

- National and provincial RRMU need to be provided with sufficient maintenance equipment.

- Equipment centers should be established which lease maintenance and construction equipment.

- A quality control system remains to be established.

4.4.7 Cost Estimates

(1) Construction Work Requirements

The amounts of construction required for earth-works and pavement works on each project are estimated based on the road design standards for new construction, and on a comparison between existing road conditions and the proposed road standards for each project.

(2) Unit Construction Cost

Unit construction costs are estimated based on the unit costs in the UNDP report "NATIONAL TRANSPORTATION SECTOR REVIEW" which were computed from the costs of construction works that included nearby countries such as Thailand, the Philippines and Indonesia.

The unit construction costs employed are expressed in US dollars to avoid an inflationary bias, and they represent November 1993 cost levels with an exchange rate of 1US$ = 10,800 Dong.

(3) Implementation Costs

Table 4.4.6 shows the estimated construction costs for each project. Implementation costs for earthworks, pavement structures & drainage, bridges, and other miscellaneous work and contingency costs, are estimated based on the following conditions.

a) For earthworks, it is proposed to apply the following expansion coefficient to determine earthwork volume:

- Flat areas: 1.0
- Mountainous areas: 2.0

b) Bridge Work

Bridge work includes bridges more than 25 m in length. Bridge work is divided into reconstruction (improvement) and rehabilitation work, and each unit construction cost is estimated based on data for Vietnam and other countries as follows:

- Reconstruction: US$2,000/sqm
- Rehabilitation: US$400/sqm

c) In order to estimate the total implementation costs, the construction cost as derived from the volume of earthwork and pavement work, should be increased by the following coefficients.

Structure & Drainage Works	Miscellaneous Works	Contingencies
30 % of earthwork and pavement works	7 % of earthwork and pavement works	10 % of sub-total

Structure & drainage works include bridges less than 25 m length, retaining walls, masonry work, and replacement of pipe and box culverts.

Miscellaneous works include road markings, signposts, different road accessories, connections to side roads and private accesses etc.

Engineering and administration costs are estimated on the basis of the following percentage rates:

- Engineering and administration: 15 % of construction cost

Table 4.4.6 Cost Estimates of Road Projects

Unit: million US$, 1US$ = 10,800 Dg, F/P: Foreign portion, L/P: Local portion

Code	No.	Project Name	Total Length (km)	by 2000			2001 - 2005			2006 - 2010			Grand Total			% of F/P
				F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	
RD	1	Improvement of N.R. No. 1	266	86.8	87.4	174.2	128.0	131.2	259.2				214.8	218.6	433.4	50
RD	2	Improvement of N.R. No. 1B	145							19.1	12.7	31.8	19.1	12.7	31.8	60
RD	3	Improvement of N.R. No. 2	318	52.4	51.2	103.6				45.1	30.1	75.2	97.5	81.3	178.8	55
RD	4	Improvement of N.R. No. 3	317				50.7	54.3	105.0	47.8	31.9	79.7	98.5	86.2	184.7	53
RD	5	Improvement of N.R. No. 4	173							60.0	40.0	100.0	60.0	40.0	100.0	60
RD	6	Improvement of N.R. No. 5	99	121.2	107.1	228.3							121.2	107.1	228.3	53
RD	7	Improvement of N.R. No. 6	419							95.3	82.4	177.7	95.3	82.4	177.7	54
RD	8	Improvement of N.R. No. 10	146				51.1	61.8	112.9				51.1	61.8	112.9	45
RD	9	Improvement of N.R. No. 18	206	67.9	71.3	139.2				43.6	40.0	83.6	111.5	111.3	222.8	50
RD	10	Improvement of N.R. No. 21	30				6.4	4.2	10.6				6.4	4.2	10.6	61
RD	11	Improvement of N.R. No. 32	42				38.2	38.3	76.5				38.2	38.3	76.5	50
RD	12	Improvement of N.R. No. 70	193	48.2	32.1	80.3							48.2	32.1	80.3	60
RD	13	Improvement of N.R. No. 183	20	3.7	2.5	6.2							3.7	2.5	6.2	60
RD	14	Improvement of N.R. No. 279	105							17.6	11.7	29.3	17.6	11.7	29.3	60

Note: RD-1 Road widening of the sections Lang Son - Ha Noi and Ha Noi - Vinh is financed by IBRD. Detailed design has been done and the construction work will bed by the end of 1997.

Table 4.4.6 Cost Estimates of Road Projects (Continued)

Unit: million US$, 1US$ = 10,800 Dg, F/P: Foreign portion, L/P: Local portion

Code	No.	Project Name	Total Length (km)	by 2000			2001 - 2005			2006 - 2010			Grand Total			% of F/P
				F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	
RD	15	Improvement of N.R. No. 286	25							8.2	5.5	13.7	8.2	5.5	13.7	60
RD	16	Improvement of N.R. No. 379	275	40.4	26.9	67.3				18.4	12.3	30.7	58.8	39.2	98.0	60
RD	17	Urgent Bridge Improvement & Reconstruction of National Roads		17.5	9.0	26.5							17.5	9.0	26.5	66
RD	18	Urgent Bridge Improvement & Construction of Rural Roads		30.8	15.8	46.6							30.8	15.8	46.6	66
RD	19	Rehabilitation of National Roads in the Red River Delta Area		22.6	11.7	34.3							22.6	11.7	34.3	66
RD	20	Rehabilitation of National Roads in the Mountainous Area				0.0	54.7	28.2	82.9				54.7	28.2	82.9	66
RD	21	Improvement & Rehabilitation of Rural Roads in the Northern Part of Vietnam		79.4	52.9	132.3	79.4	52.9	132.3	79.4	52.9	132.3	238.2	158.7	396.9	60
RD	22	Training Center & Procurement of Road Maintenance Equipment		47.3	11.8	59.1							47.3	11.8	59.1	80
RD	23	Construction of Freeway, Ha Noi to Hai Phong								132.5	169.9	302.4	132.5	169.9	302.4	44
RD	24	Construction of Ha Noi Outer Ring Road								133.3	121.5	254.8	133.3	121.5	254.8	52
RD	25	Construction of Long Spanned Bridges					260.1	134.0	394.1				260.1	134.0	394.1	66
RD	26	Construction of Truck Terminal								12.0	8.0	20.0	12.0	8.0	20.0	60
		Total		618.2	479.7	1,097.9	668.6	504.9	1,173.5	712.3	618.9	1,331.2	1,999.1	1,603.5	3,602.6	55
				F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	%

(4) Ratio of Expenditures on Local Versus Foreign Construction Material and Personnel

The ratios of expenditures on local versus foreign material and personnel are quoted from the UNDP report as follows:

- Local part: 40 %
- Foreign part: 60 %

These ratios were derived in the UNDP report as follows:

a) Labour is paid entirely in the local currency.

b) Imported materials paid for in foreign currency include fuel, lubricants and bituminous binders (such as cut-back asphalt and eventually emulsified asphalt). Other construction materials are paid for with local currency.

c) Equipment employed for roadwork exists in Vietnam and therefore its unit prices are paid for in foreign and local currency. On the other hand, it should be mentioned that some modern types of heavy equipment (for example asphalt finishers) are not available in Vietnam. At this stage, however, there is insufficient information to form a basis for changing the ratios of local and foreign expenditures.

(5) Compensation Costs for Land and Houses

The rights-of-way for many existing roads are not sufficiently wide or are not clearly demarcated. Therefore, for quick reference, the compensation costs for land and houses which would how to be acquired to rectify the R.O.W. are roughly estimated, following on the process below and using information from TEDI.

a) Estimation of compensation costs is carried out for 4-lane roads and new roads only, since the widening of existing 2-lane roads is rare.

b) The ratios of land use assumed along existing and new roads are as follows:

- Arable land: 70 % of total road length
- Developed land: 30 % of total road length

c) The compensation costs for the above land are as follows:

- Arable land: US$12/sqm
- Developed land: US$19/sqm

d) The compensation costs for houses are assumed as follows:

- Average area of a house (structure only): 60 m^2
- Average area of land attached to house: 200 m^2
- Average cost for a house (structure only): US$4,200

(6) Rehabilitation

Rehabilitation consists of constructing an asphalt-concrete overlay 5 centimeters thick on existing carriageways.

The ratios of the expenditures on local versus foreign material and personnel are based on the UNDP report and are as follows.

- Local part: 34 %
- Foreign part: 66 %

The cost estimates shown in the List of Proposed Projects for the Master Plan are derived from these elements:

- Amounts of construction work required;
- Unit construction costs;
- Earthworks, pavement, structures, drainages, bridges & other installations;
- Foreign and local currency components;
- Compensation cost.

4.4.8 Selection of Projects for the Master Plan

After requirements for National, Provincial, District and village roads have been studied the road transport projects has been selected based on the road inventory and on road development strategies. The project selection process is summarized in Figure 4.4.7.

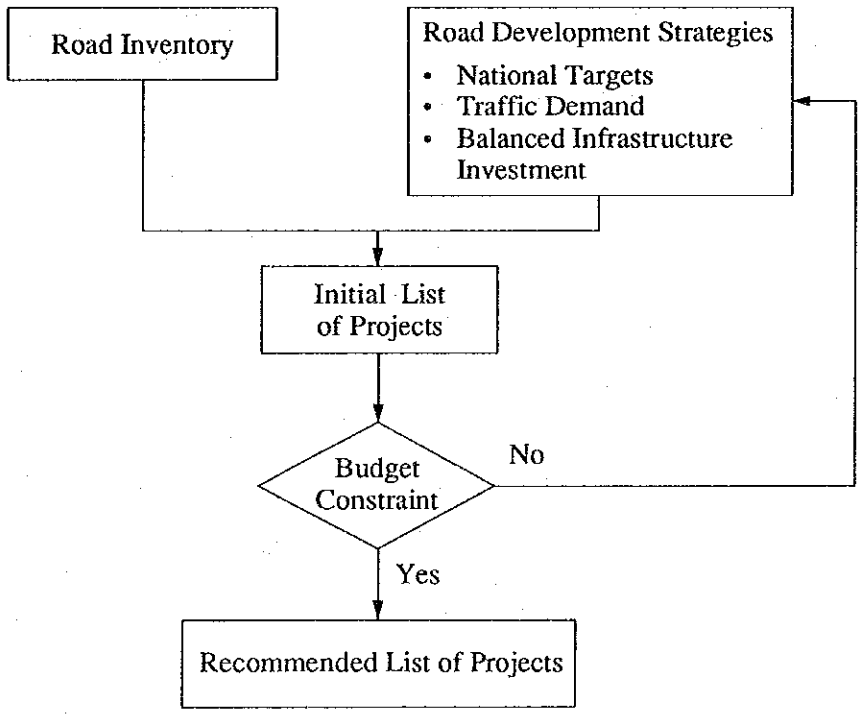


Figure 4.4.7 Selection of Project List

The recommended list of road projects for the Master Plan up to 2010 is shown in Table 4.4.6.

4.4.9 Short-Term Development Projects

(1) Selection of Short-Term Development Projects

Short-term development projects have been selected from among all the listed projects, based on the following criteria:

- Inter-province traffic demand in the year 2000 expected to be more than 8,000 pcu/day on the segment considered,
- Present road traffic capacity can not accommodate the traffic demand expected in the year 2000,
- Bridge bearing capacities presently limited to 10 tons, in the case of bridges on National Roads.

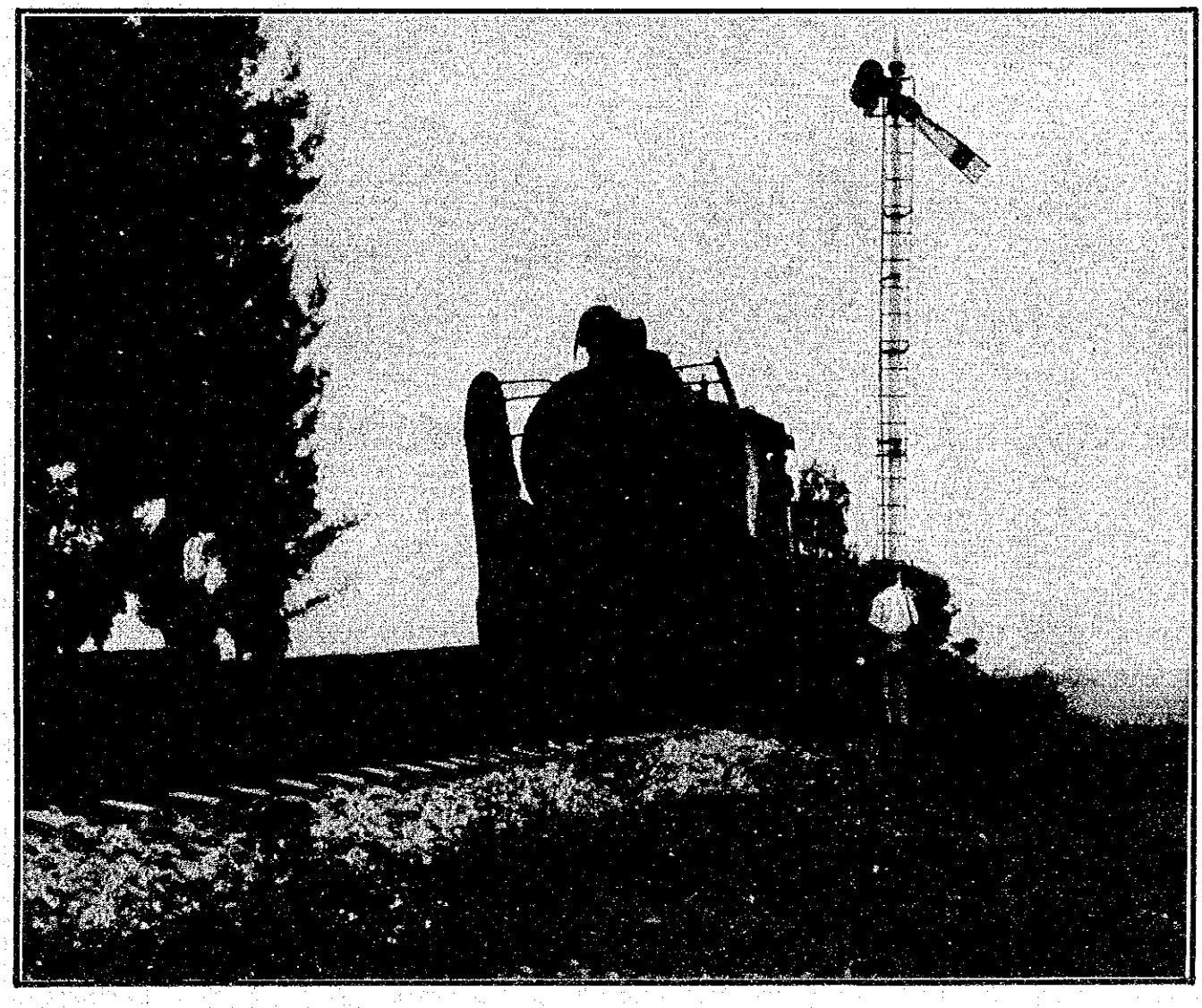
It is also assumed that about 1,100 million US$ from the National Budget will be invested in the road transport sector during the period from 1994 to 2000.

(2) Profiles of Short-Term Development Projects

The profiles of the following short term development projects are tabulated in Chapter 1 of Volume 3.

1) RD-1 Improvement of N.R. No. 1 from Bac Giang to Ha Nam
2) RD-3 Improvement of N.R. No. 2 from Phu Lo to Tuyen Quang
3) RD-6 Improvement of N.R. No. 5 (Committed)
4) RD-9 Improvement of N.R. No. 18 from Chi Linh to Hong Gai
5) RD-12 Improvement of N.R. No. 70 from Dau Lo to Lao Cai
6) RD-16 Improvement of N.R. No. 379 from Ba Khe to Thai Nguyen
7) RD-17 Urgent Bridge Improvement and Reconstruction of National Roads
8) RD-18 Urgent Bridge Improvement and Construction of Rural Roads
9) RD-19 Rehabilitation of National Roads in the Red River Delta Area
10) RD-21 Improvement and Rehabilitation of Rural Roads in the Northern Part of Vietnam
11) RD-22 Training Center and Procurement of Road Maintenance Equipment

Chapter 5 Railway Transport



CHAPTER 5 RAILWAY TRANSPORT

5.1 INTRODUCTION

5.1.1 Contribution of Railways to Development of the Northern Part of Vietnam

Current per capita GDP in the Northern Part of Vietnam is now 67 % of the national average, and an increase to 90 % is targeted for the year 2010. Substantive infrastructural investment is essential as a precondition for the anticipated growth process which will be concentrated in the Red River Delta. The following plans for railway improvement in the Red River Delta shall receive consideration as one of the main components of that growth-supporting infrastructural development. Location of railways are shown in Figure 5.1.1.

- Development in the Red River Delta will generate a large passenger transport demand between Ha Noi and Hai Phong. 'Time value' will also rise, and, as a result, the demand for fast train operations will increase. Preparations for fast and frequent passenger train operations between Ha Noi and Hai Phong are recommended.

- Growing urbanization of Ha Noi is forecast, as well as increasing migration into the capital city. A demand for public mass transport already exists in urban Ha Noi. Railways must play a role in commuter transport by utilizing their existing rolling stock and facilities.

- There is a proposal for a port development plan for Cai Lan now under study. Since most cargo coming in through this port would be destined for Ha Noi and the Red River Delta, railway would be the most suitable means of transport, with possible establishment of an inland depot in Ha Noi. An inland depot is defined as a freight terminal railway station combined with a customhouse and freight inspection. A study should be prepared on integrating the Cai Lan Line with the proposed Cai Lan Port development plan.

- Transport of coal, cement, construction materials and other bulk cargo will increase with the development of the economy. VNR should concentrate its freight transport efforts on bulk cargo and containers.

5.1.2 Stimulating Economic Development in the North Mountain and Midland Region

Without intervention, the gap in economic development between the North Mountain and Midland Region and the Red River Delta would be forecast to increase. Sociopolitical considerations, however, require economic growth of the North Mountain and Midland Region to keep pace with national economic growth. This requires improvement of the quality and efficiency of railway

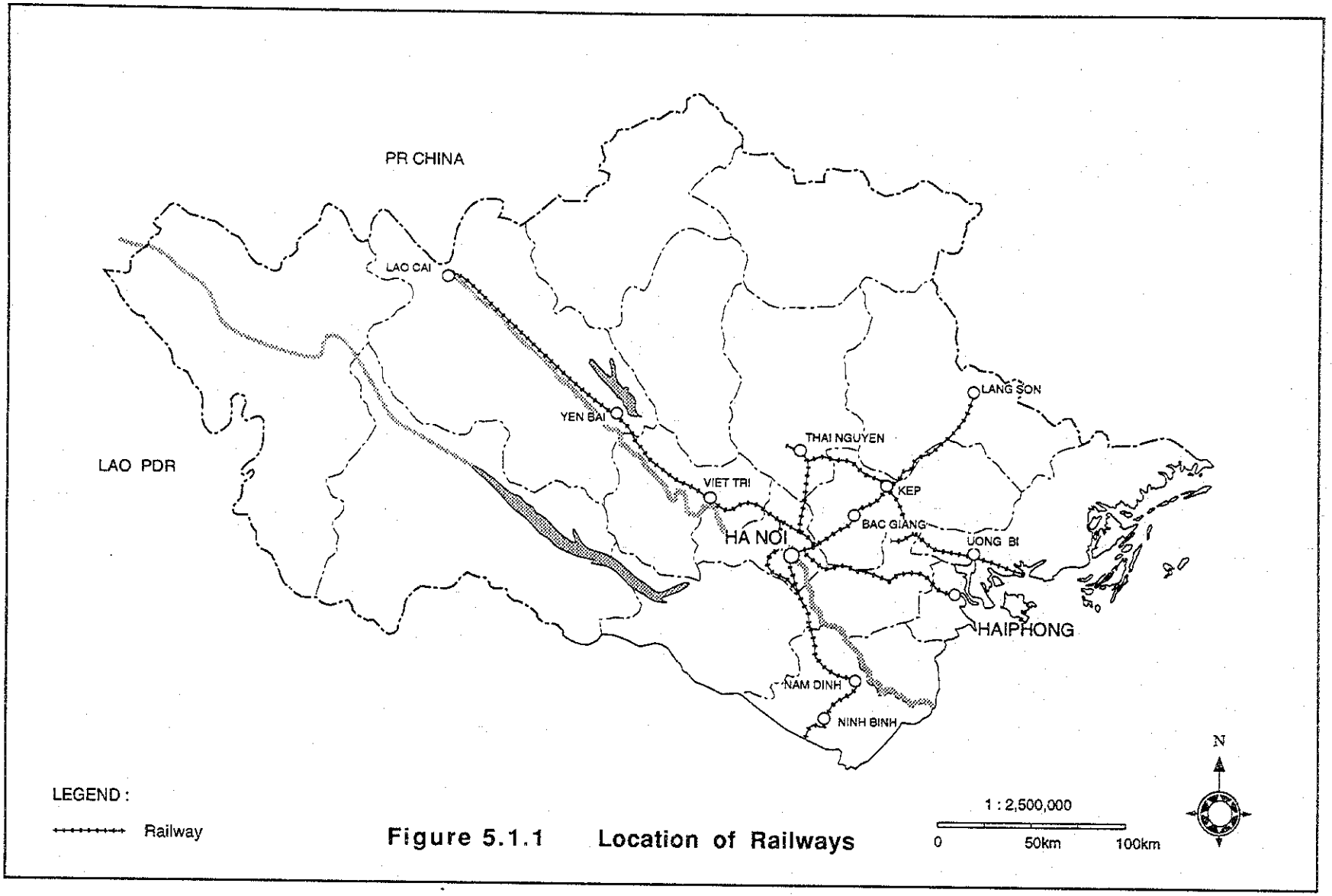


Figure 5.1.1 Location of Railways

services in this subregion. Since the road network along the Lao Cai Line is not adequately developed, railway transport services should be improved, particularly in the case of positive development of trade with PR China. Current and anticipated future passenger and freight transport demand on the Dong Dang Line is too limited for a commercially - oriented railway operation.

5.1.3 International Transport

Diplomatic negotiations to reopen international transport between Vietnam and PR China are underway. Railway facilities for border connections have already been prepared. VNR currently expects an intergovernmental agreement which would have a favorable effect on railway transport demand and investment. Political imponderables render demand forecasting for international transport extremely difficult. Tentative demand forecasts for the Lao Cai and Dong Dang corridors are as follows:

(1) Lao Cai Corridor: Yunnan Province authorities announced in July 1993 in Ha Noi that 10 million tons of transit cargo annually, including several million tons by rail transport, will come from PR China to Hai Phong. However, there are many technical problems in transporting such a large amount of cargo. Information from PR China Railways (according to JICA experts in Beijing) reveals that utilization of the line from Kunming to Hai Phong is planned until the completion of a new line from Kunming to Nanning by 1997. Neither double tracking nor a change of gauge from MG to StG are planned for the line between Kunming and Lao Cai. Only one-way transit cargo from PR China to Hai Phong is anticipated. PR China Railways assumes they will contribute an annual demand of around one million tons over the Lao Cai line, which will drop below one million tons after the completion of their own new line in 1997. As a consequence of the wide gap in demand forecasts, depending on whether this demand from China materializes, two corresponding scenarios will be prepared.

(2) Dong Dang Corridor: Freight demand is assumed to be several hundred thousand tons at most, due to competing modes of transport including sea transport. The Dong Dang Line has sufficient track capacity and StG locomotives for the level of demand anticipated.

5.1.4 Management Improvements

VNR has been facing dramatic changes in adjusting to the ongoing transformation process of the Vietnamese economy. Administrative and technical reforms are essential for VNR to meet additional demands. At present VNR's head office has not sufficient capability to be more successful in strengthening privatized management. Additional manpower qualified to form strategy groups and to strengthen technological development of railway operations is urgently required. VNR and the enterprises under its umbrella are now authorized to operate as independent economic entities. They must thus eliminate overstaffing or be subsized for the payroll of unnecessary manpower.

Responsibilities for railway operations should be separated from those for infrastructural assets, because public investment in infrastructural assets is still a prerequisite for development of an adequate future railway network.

5.2 DEMAND FORECAST

Referring to Chapter 4 of Volume 4, existing and forecast domestic demand for passenger and cargo railway transport are as follows:

Items	Unit	Amount			Average Annual Change (%)	
		1991	2000	2010	1991 - 2000	2000 - 2010
Passengers	Persons (000)	6,429.9	8,206.7	13,458.8	2.2	5.1
Rail Cargo	Tons (000)	1,987.7	3,851.6	9,452.4	6.3	9.9

Railway transport demand is estimated by applying the inter-zone trips method, and plotted along the railway network (Figures 5.2.1 and 5.2.2). Railway transport demand is broken down by the following railway sections:

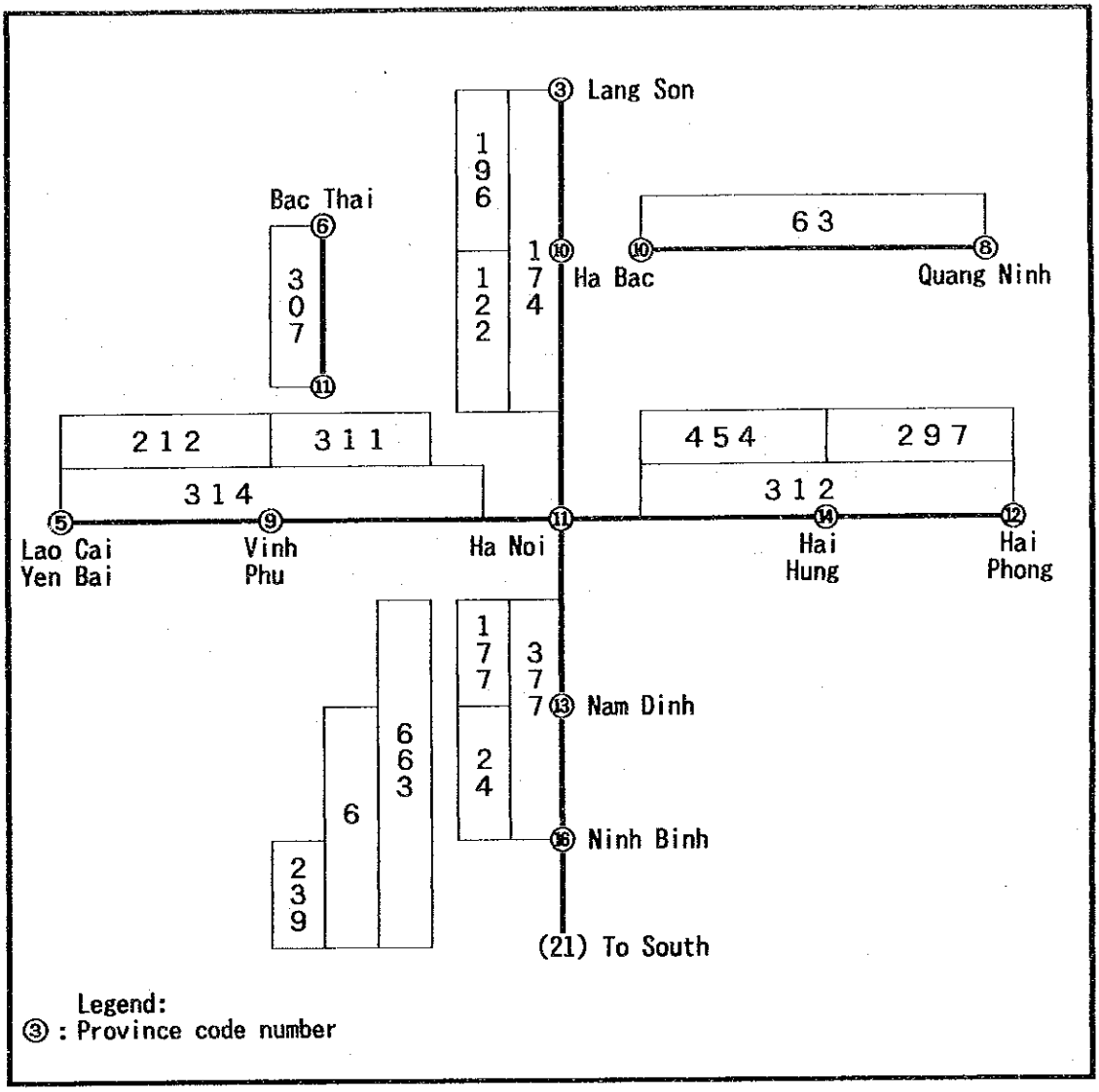
Railway Section	Passengers (persons/day, one-way)			Freight (000 tons/year, one-way)		
	1992	2000	2010	1992	2000	2010
Ha Noi - Hai Phong	1,030	2,100	3,600	200	331	849
Ha Noi - Lao Cai	1,030	1,710	2,800	167	369	947
Ha Noi - Dong Dang	750	940	1,530	76	234	600
Ha Noi - Cai Lan	120	170	280	244	351	902
Ha Noi - Thai Nguyen	560	840	1,370	57	84	215
Ha Noi - Ninh Binh*	1,230	1,520	2,500	133	206	530
Ha Noi - to South**	1,300	1,830	3,000	373	809	2,071

N.B.: A projected development project to produce one million tons of cement in Quang Ninh has not been included.

* : Transport within the Northern part of Vietnam.

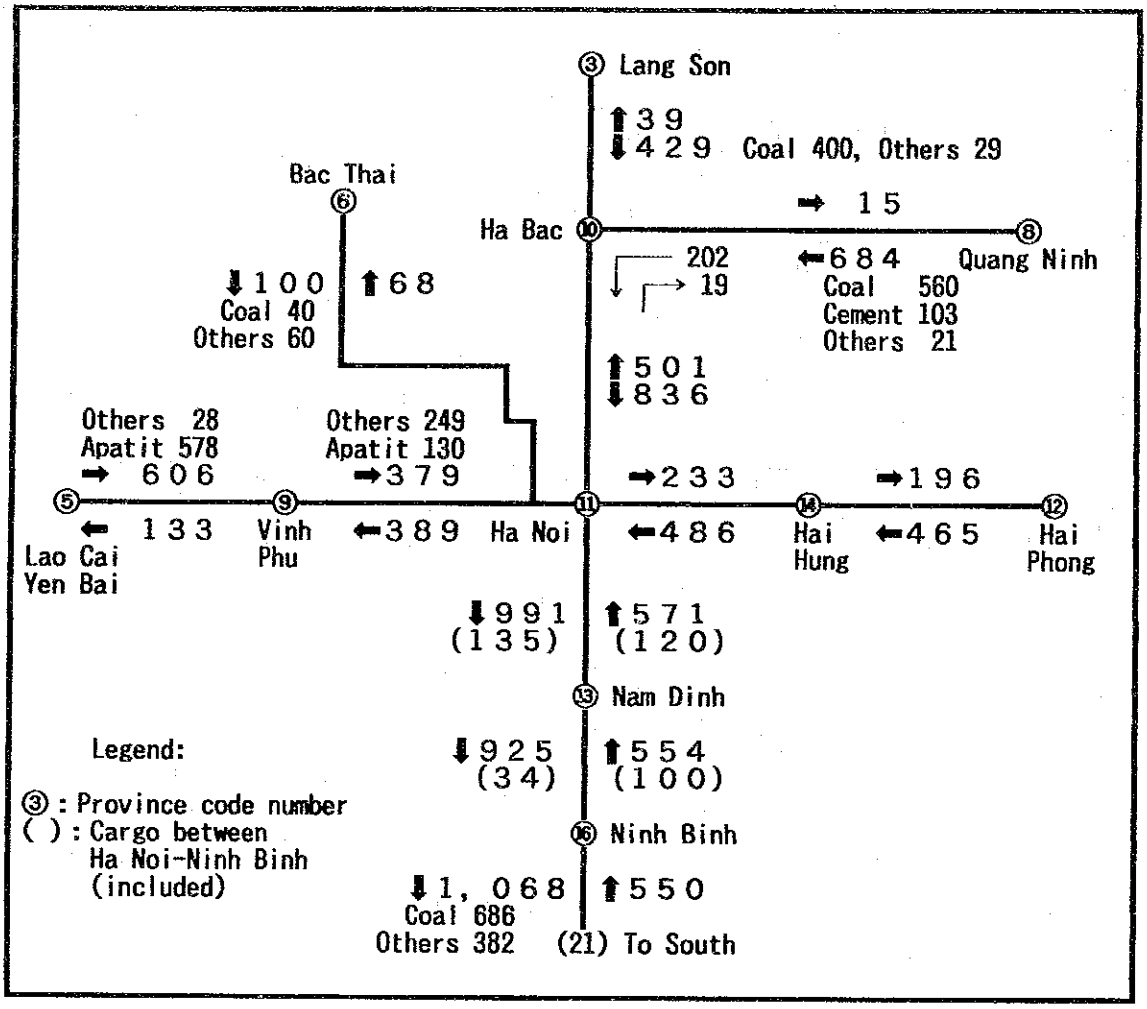
**: Transport to the Central and Southern parts of Vietnam.

The number of trains to be operated on each line has been estimated as shown in Figure 5.2.3 according to the transport demand shown in Figure 5.2.1 and Figure 5.2.2.



(Unit: 1,000 persons/day/one way)

Figure 5.2.1 Railway Passenger Transport Demand Forecast for the Year 2000



(Unit: 1,000 ton/year)

Figure 5.2.2 Railway Freight Transport Demand Forecast for the Year 2000

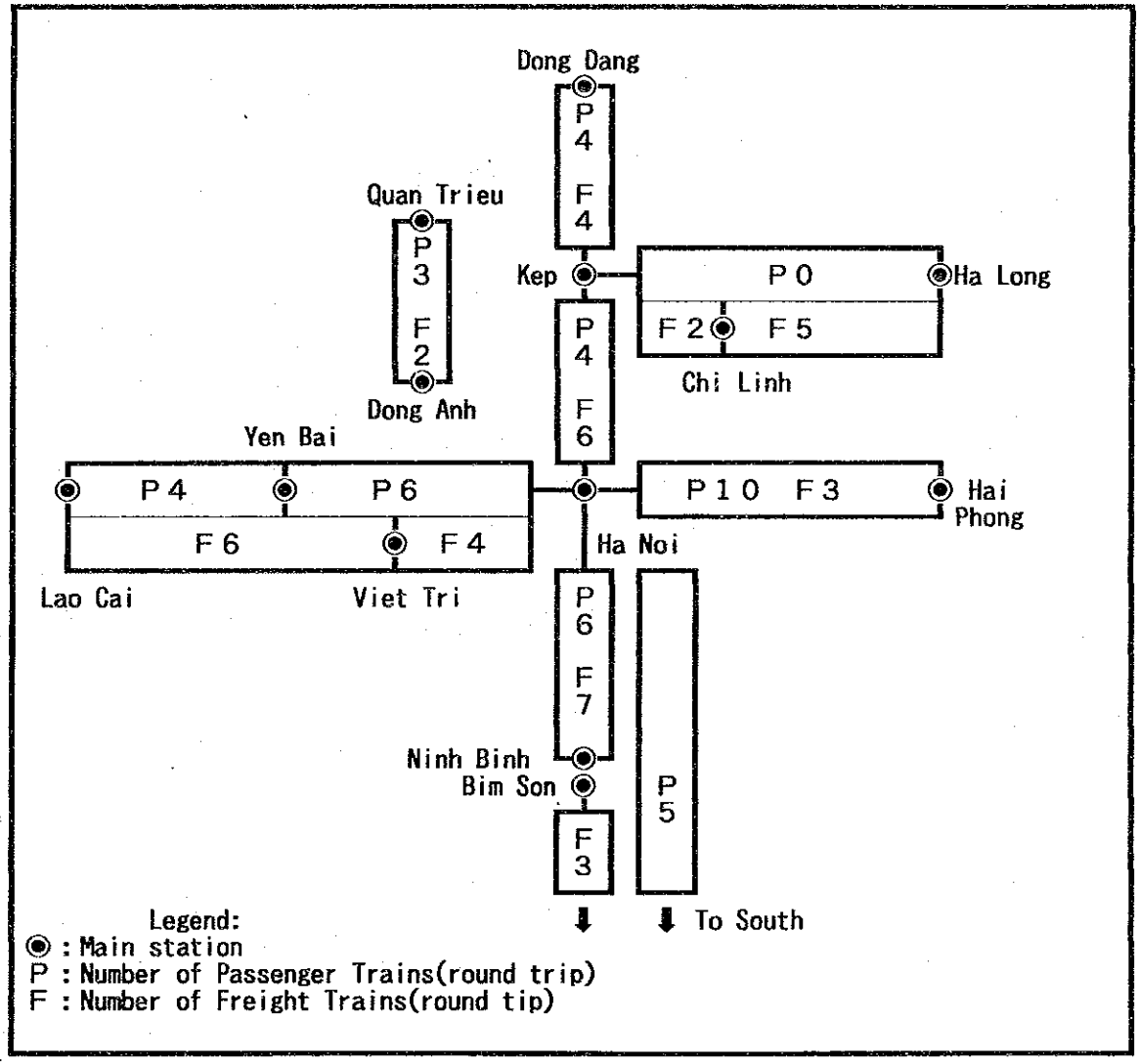


Figure 5.2.3 Forecast Number of Passenger and Freight Trains in 2000

5.3 RAILWAY TRANSPORT DEVELOPMENT STRATEGY

5.3.1 Role and Function of Railways

Vietnam's economy is estimated to grow more than four-fold by the year 2010. Economic development requires the expansion and upgrading of transport infrastructure.

The advantages of railway passenger transport are mass transport, safety, on-time operations, low energy consumption and effective environmental preservation. Attractive passenger services include moderate ticket rates, speed, frequency and pleasant accommodations. The minimum frequency of passenger transport requires 5 round trips a day with a 3 to 5 car set. A moderate frequency level requires 8 daily round trips. A minimum daily passenger volume of 1,000 persons traveling in one direction is required. If this minimum volume cannot be met, bus transport is recommended.

The advantages of railway freight transport are mass transport of heavy freight, protection against the damage of freight, on-time operations, low energy consumption and effective environmental preservation. Large lots of freight with a fixed origin and destination are profitable for railways, whereas small lots of freight are better carried by road.

5.3.2 Railway Rehabilitation

With the assistance of socialist countries under the previously planned economy, VNR has substantially invested in new railway lines, locomotives and track development. Current urgent challenges facing VNR are managerial and operational reforms corresponding to the dramatic changes of the economic system, as well as improvement of maintenance and renovation of facilities.

(1) Organization

Almost all railway works were executed under the direct control of VNR in the past. Now VNR and its enterprises have been successfully transformed into autonomous entities. Autonomous management still requires strengthening through adequate training and technological development. There are also still many obstacles and problems, so it is recommended to strengthen the strategy groups, technology development department and training system in the head office of VNR in order to enable them to be more successful in devising countermeasures for the obstacles and in promoting management privatization. The separation of the respective responsibilities for railway operations and infrastructure, mentioned in Section 5.1.4 is to be accomplished by assigning railway operations to autonomous Unions, while infrastructure should be managed by an "Infrastructure Holding Organization". Idle facilities, infrastructure and employees are to be dealt with by a newly established "Settlement organization".

(2) Financial Status

As discussed in detail in Volume 4, VNR's total revenue and costs after depreciation and before taxes are currently balanced, however, depreciation is insufficient to finance necessary new investments and rehabilitation works for the deteriorated rolling stock and facilities. Therefore, Government subsidies and investment are necessary. On the other hand, in so far as possible, the Government should require railways to compete with road transport on an equal footing. In this respect, the operation of railways should follow an independent profit system supported by the "users pay" rule. It is reasonable for the Government to invest in an "Infrastructure Holding Organization" that has state-owned facilities, but it is contrary to independent profit accountability to hold redundant employees within VNR. Redundant employees should be taken care of by the "Settlement Organization".

(3) Employment

The following measures requiring little investment, are recommended to reduce manpower and to eliminate redundant positions:

- Review of regulations, rules and manuals to eliminate unnecessary and inefficient work.

- Review of train operation diagrams taking into consideration the number of trains to be operated, suitable length of block sections, necessary intervals of signaling stations, necessity of train operation at night, and re-assignment of drivers, conductors and station staff.

Investments to reduce manpower by modernizing or mechanizing railway operations should be planned in the next stage. To cut one employee, Japanese National Railways had invested an amount equivalent to a 10-year salary. Investment projects planned in the future should also include upgrading of productivity. Expenditures required to accomplish these objectives, with due regard for the welfare of displaced workers, will include not only acquisition of machinery but also costs of re-training and relocating personnel.

(4) Freight Marketing

Since bulk cargo is the main and most profitable business, VNR needs to focus its marketing promotion on bulk cargo operations. This requires cooperation with customers in saving distribution costs such as loading and unloading, as well as transport to warehouses and storage in them. Freight operation stations handling only small lots of freight should be closed. The resulting income loss of 10 to 15 % would be less than compensated in cost savings. The remaining stations should be equipped with better loading and unloading facilities.

(5) Locomotives

It is very difficult to buy new locomotives before the year 2005, in view of the limited financial resources and the existence of projects of higher priority. Steam locomotives should continue to be used until it is feasible to acquire an all-diesel locomotive fleet adequate for realizing the planned train operation, because VNR has the technology and facilities for steam engine maintenance. Repair and maintenance facilities should be improved in order to extend the life span of existing locomotives.

There are certain problems in continuing use of current D4H and steam locomotives. Fuel consumption of the D4H is twice that of other diesel locomotives, although when a new locomotive is purchased with a soft loan, VNR must repay 3 million US$ over a period of 30 years per locomotive.

Another problem is that as presently mined, coal in Vietnam is not suitable for steam locomotives, so VNR has been importing coal costing 2 million US$ every year from abroad.

Japanese National Railways had used up to 2 million tons 'pitch briquettes' for steam locomotives in peak years in the 1950s and 1960s. The highest class of pitch briquette was made of Hong Gai coal imported from Vietnam, that has over 7,600 kcal/kg and was used for the express trains of the highest speed between Tokyo and Osaka. VNR should introduce this simple technology in order to save foreign currency annually amounting to 2 million US$.

(6) Passenger Cars and Freight Wagons

Passenger cars need to be in reasonable condition in order to attract more passengers. Renovation of express passenger cars should be urgently implemented; but current floor frames, bogies and couplers could be further used. The existing freight wagons should be modified to meet changing demand, since the type of commodities transported is likely to change.

(7) Rolling Stock Workshop and Depots

VNR has a sufficient quantity of rolling stock, but the capacity of the rolling stock workshop and depots require urgent upgrading as follows:

- Because a large number of locomotives should be overhauled in order to extend their life span, the Gia Lam Workshop needs to be equipped with overhaul facilities.

- Renovation of the 130 passenger cars within the study area requires top priority. Both Gia Lam Workshop and Hai Phong Depot require an upgrading of their capacity and technology to renovate passenger cars.

The capacity to manufacture spare D4H parts should be developed, since the Russian manufacturer of D4H locomotives has stopped production. Otherwise, cannibalization would have to begin within 3 years.

(8) Track Maintenance

Track maintenance is presently executed by staff walking along the tracks looking for irregularities in alignment, a practice which would become inefficient as general demand for labor rises relative to labor supply. In the longer-term future, the track maintenance system may need to be upgraded from purely manual work to sophisticated equipment. Since about 60% of track maintenance work is said to derive from rail joints, later on the present 12.5m long rails would function better if welded into 37.5m long rails.

(9) Bridge Maintenance

Bridge repair and replacement costs are estimated at US$2 billion (UNDP report). Limited budget allocations for bridges should be used efficiently and according to scientific data. It should be borne in mind that one of the merits of steel structures is the possibility to repair or replace individual structural members without replacing the entire bridge. Japanese railways have established an inspection system to estimate the strength of bridges, a repair theory and manuals. It is urgently recommended to inspect and estimate the strength of existing bridges. The order of priority for repair or replacement should be derived scientifically. The Long Bien Bridge in Ha Noi seems to require replacement, however, detailed analysis is necessary prior to making a final decision on this and designing a replacement.

(10) Signals and Telecommunications

A through review of train operation diagrams should precede the design of a signaling-system upgrading program. The length suitable for block sections, or the necessary interval of signaling stations, needs to be studied. A master plan for signaling should be undertaken.

An 'engine block' system is recommended for lines with only a few trains running. An engine block describes a section of track where only one locomotive is allowed to enter. For example, the section between Kep and Ha Long is a block section where the block signal equipment is located only at Kep Station. A study on management information systems is necessary prior to the modernization of telecommunications. A demand forecast of the quantity and quality of communications is needed to plan the scale of telephone equipment.

5.3.3 Development of Inland Depots

There are several freight operation stations around Ha Noi, but their functional features including loading and unloading facilities are very poor. They should be integrated into a Freight Distribution Center (FDC) in Ha Noi with capabilities for reloading from the road to and from MG and StG, and Inland Depots as defined in Section 5.1.1.

There are two alternatives for FDC location; one is Yen Vien freight station and the other is a new location on the Ha Noi West Ring Line. Yen Vien is a junction of MG and StG, but land to develop there is limited. At the West Ring location, it is easier to construct an FDC. The location of the FDC will be decided in a separate Ha Noi development plan.

There is a port development plan for Cai Lan. It will be inaugurated around the year 2005 and be in full operation by 2010. Most of the cargo will be destined for Ha Noi and the Red River Delta.

5.3.4 Promotion of International Transport

(1) Lao Cai Corridor

Since transit cargo from PR China is likely to decline after 1997, major investments in the Lao Cai Line would not be justified to accommodate those additional loads, for only a few years, but during that period, this transit cargo is likely to generate substantial income for VNR. Sociopolitical conditions require that a share of this income should directly benefit economic development in Lao Cai and Yen Bai provinces. Since two different demand forecasts exist, the following two scenarios are prepared:

- Scenario 1: Transit cargo from PR China of one million tons per year.

  8 round-trip freight trains will transport 1 million tons of cargo. It is possible to pull an 800-ton train with existing locomotives. The track conditions between Lao Cai and Viet Tri require triple-headed D4H locomotives, whereas one steam locomotive would be sufficient between Viet Tri and Hai Phong. The full utilization of the track capacity between Viet Tri and Lao Cai would require the installation of a tokenless signal. About 500 freight cars need to be renovated.

  VNR's strategy should be to renovate the existing diesel and steam locomotives and the cars to a high degree of quality and to fully utilize them. Investment in new locomotives and cars is thus not necessary.

- Scenario 2: Transit cargo from PR China is carried up to the limited of the current railway capacity, which is 2 million tons per year.

16 round-trip freight trains will transport 2 million tons of cargo. Insufficient track capacity between Lao Cai and Viet Tri, and fully utilized track capacity between Viet Tri and Hai Phong, would make it necessary to speed up trains and to modernize signaling. New locomotives equivalent to the D12E and 500 additional new freight cars would therefore be necessary.

(2) Dong Dang Corridor

Demand forecast for freight can be assumed to reach several hundred thousand tons at most, whereas the volume of passengers between the two countries largely depends on government policies. Dong Dang Line has a sufficient track capacity and StG locomotives to meet the anticipated demand.

It is recommended to borrow PR China Railway cars. Efficient loading and unloading facilities are necessary at Dong Dang and Yen Vien stations as well as Ha Noi FDC in order to save on the cost of renting cars. The rental fee for a freight car is US$18 per day for Mongolian Railways. It would be recommended for VNR to operate its own passenger cars in the case that tariff rules between PR China and Mongolia/Russia railways are applied. In any case high-quality passenger cars and services are essential.

5.3.5 Promotion of Passenger Transport

The passenger transport business is a profitable business for Japanese and Asian railways and has developed and expanded in transport volume and income.

Fast and frequent train operations, pleasant accommodations and feeder services are essential for passenger transport services. VNR presently lacks these passenger services. Arranging fast train operations includes not only the speed of the train itself, but access/egress time and waiting time as well. The following measures are recommended:

- D4H locomotives should be improved. Two D4H should be coupled as one locomotive.
- Passenger trains should be operated in units smaller than the present 8 to 10 cars in order to increase frequency.
- Feeder services, such as bus transport, should be linked to train schedules.
- Improved accommodations in passenger cars are urgently required to attract more passengers.

There are four kinds of passenger transport targets:

(1) Inter-city Transport between Agglomeration Centers: Large passenger transport demand between Ha Noi and Hai Phong will be generated along

with development of the Red River Delta. There is sufficient passenger demand for various transport services to compete with one another. It is recommended that fast and frequent passenger train operations between Ha Noi and Hai Phong be planned.

(2) Urban Transport in Ha Noi: There is already a demand for public mass transport in the Ha Noi urban area. Railways need to play their role in commuter transport, utilizing their existing rolling stock and facilities. It would be possible to operate commuter trains in Ha Noi by using underutilized locomotives, passenger cars and employees. Passenger cars could be modified to transport commuters with bicycles and motorbikes. Raising the level of platforms to the level of the car's floor is necessary to accommodate them. Long-distance trains should not arrive or leave during peak hours.

(3) Inter-city Transport in the North Mountain and Midland Region: Railway services and efficiency need to be improved as a contribution to the development of the North Mountain and Midland Region.

- Lao Cai Line: As a consequence of the insufficient road network along the Lao Cai Line, a substantial passenger volume for railway transport should be anticipated, and rail passenger services should be expanded. The scope for expansion will largely be determined by the volume of transit cargo to be transported from Kunming to Hai Phong Port.

- Dong Dang Line: Current and future passenger and freight transport demand is too low to manage the railway enterprise. Moreover, improvements of the road along the line are planned by 2000.

(4) Unprofitable Lines: Sections such as the Thai Nguyen, Luu Xa - Kep and Na Duong lines with only one daily round trip should be closed from the viewpoint of viability under an independent profit system. But actually, regional people and factories want to continue train operation on these lines, and so, VNR will be forced to adopt a second alternative, splitting them off from VNR to be managed by a "third sector" combining some elements of both public and private-sector management. The third sector will be supported by central and regional governments and by companies that use railways.

Passenger trains should cease operation on the Ha Long and Ha Noi West Ring lines because they are inefficient in terms of the staff required for the limited passenger traffic. Signaling facilities and turnouts in these lines should be de-activated and signal-men should be removed in order to minimize the operation and maintenance cost. However it is recommended that a daily or weekly freight train should still be operated, because if there were no train, the facilities would deteriorate rapidly. There are also development plans for the line, anticipating that new modernized signaling and turnout facilities will be installed by future projects.

5.3.6 Gauge Selection

The gauge issue is not only a technical problem but also a political and international relations issue. The following technical and political contexts are considered in the study on the gauge:

- Standard gauge has many advantages including heavy axle load (StG 19 ton, MG 14 ton), larger construction gauge, stability of train operations because of broader width between rails, capability for high speed train operation (160 km/h in StG equivalent technology compared with 120 km/h in MG), long and heavy freight train traction (3,000 ton in StG, 1,000 ton in MG). Therefore, it is better not to change the standard gauge to MG.
- It is not feasible economically to change the meter gauge to StG.
- MxG will need to be changed to MG or StG in the course of the improvement of Cai Lan Line, and a consideration for the future is that MxG should be phased out by the time. It may become appropriate to introduce mechanized track maintenance. It is expected that in the future, Vietnam will not have need for passage of both MG and StG rolling stock over the same track sections, because StG will be needed only for the connections from China as far as Ha Noi.
- Vietnam is a buffer zone between China and ASEAN economic circles, therefore, it is inevitable to have both gauges. Eastern regions of Vietnam need to connect with China's gauge, and southern parts with ASEAN railways in the future.

However, it must be recognized that now is not the time to decide the gauge issue, because there are many pending projects not yet defined, which have bearing on the gauge problem: international transport via Dong Dang, Cai Lan port transport, inland depot in Ha Noi, replacement of Long Bien bridge, and Ha Noi urban transport study.

5.4 RAILWAY TRANSPORT DEVELOPMENT PLAN

5.4.1 Facility Plans by Railway Line

(1) Inter-city Passenger Transport between Ha Noi and Hai Phong

Trains composed of 4 diesel rail cars with a capacity of approximately 240 persons could operate at two-hour intervals. Trains pulled by an improved D4H with renovated passenger cars could be also operated in the morning and evening. As a result, the interval of trains in peak time would be one hour. Traveling time of the diesel railcar trains between Ha Noi and Hai Phong could decrease from two and a half hours at present to one hour and 40 minutes at a maximum speed of 80 km/h and without improvements of the Long Bien Bridge.

The alternatives for the diesel rail car set are illustrated in Figure 5.4.1, and Figure 5.4.2 shows the train diagram between Ha Noi and Hai Phong in 1998. With improvements of the Long Bien Bridge, it would be one hour and 20 minutes with a maximum speed of 100 km/h. Train intervals will decrease as the number of passengers increases. All train seats should be reserved seats composed of executive class (higher than 1st class) and 1st class (soft seats at present) cars with air conditioning. The project could be inaugurated around 1998, when living standards in the Red River Delta will have significantly increased. The trains pulled by D4H are composed of 1st class and 2nd class (hard seat at present) carriages.

As the number of trains and reserved seats increase, the establishment of an improved reservation system will become essential.

The stations of Ha Noi, Hai Duong and Hai Phong could be renovated as follows:

- One platform at each station should be raised to the height of the new cars' floor.
- Bicycle and motorbike parking space should be provided at the stations, because sufficient feeder services will not yet be ready.
- Waiting rooms should be renovated, and restaurants and shopping places installed.

As the cycle of track maintenance become shorter and more frequent, 12.5m long rails should be welded into longer rails. Safety at level crossings is very important. Guard and alarm equipment should be installed at level crossings and bridges jointly used by road and railway. Fences should be installed in Ha Noi and Hai Phong.

Train operation at a speed of 100 km/h requires replacement of track components because the existing light weight rail (43 kg/m), non-elastic fastening and 2-block concrete sleepers are not suitable for fast train operations. For these reasons a speed of 100 km/h is not attainable at this moment.

Freight operations should only be handled at the freight stations of Hai Phong, Hai Duong and Ha Noi. The improvement of passenger transport between Ha Noi and Hai Phong should be given high priority.

Purchase of new diesel rail cars, establishment of a ticket reservation system, upgrading of main stations, improvement and maintenance of tracks, installation of fences in Ha Noi and Hai Phong, and improvement of safety facilities are all therefore required.

(2) Ha Noi - Ninh Binh Line

Passenger trains could operate at two-hour intervals with improved D4Hs and renovated passenger cars. Freight operations should be restricted to Nam Dinh and Ninh Binh stations.

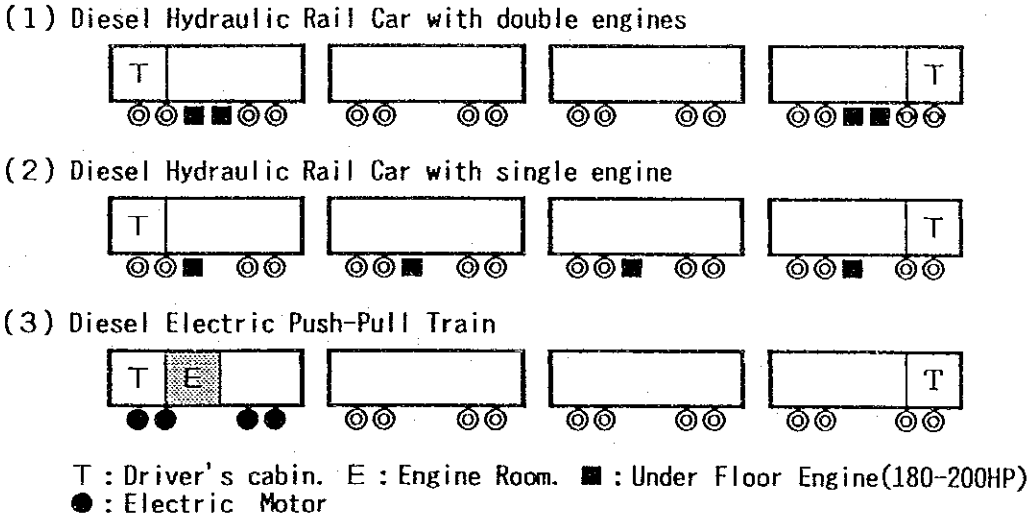


Figure 5.4.1 Alternatives for Diesel Rail Car Set

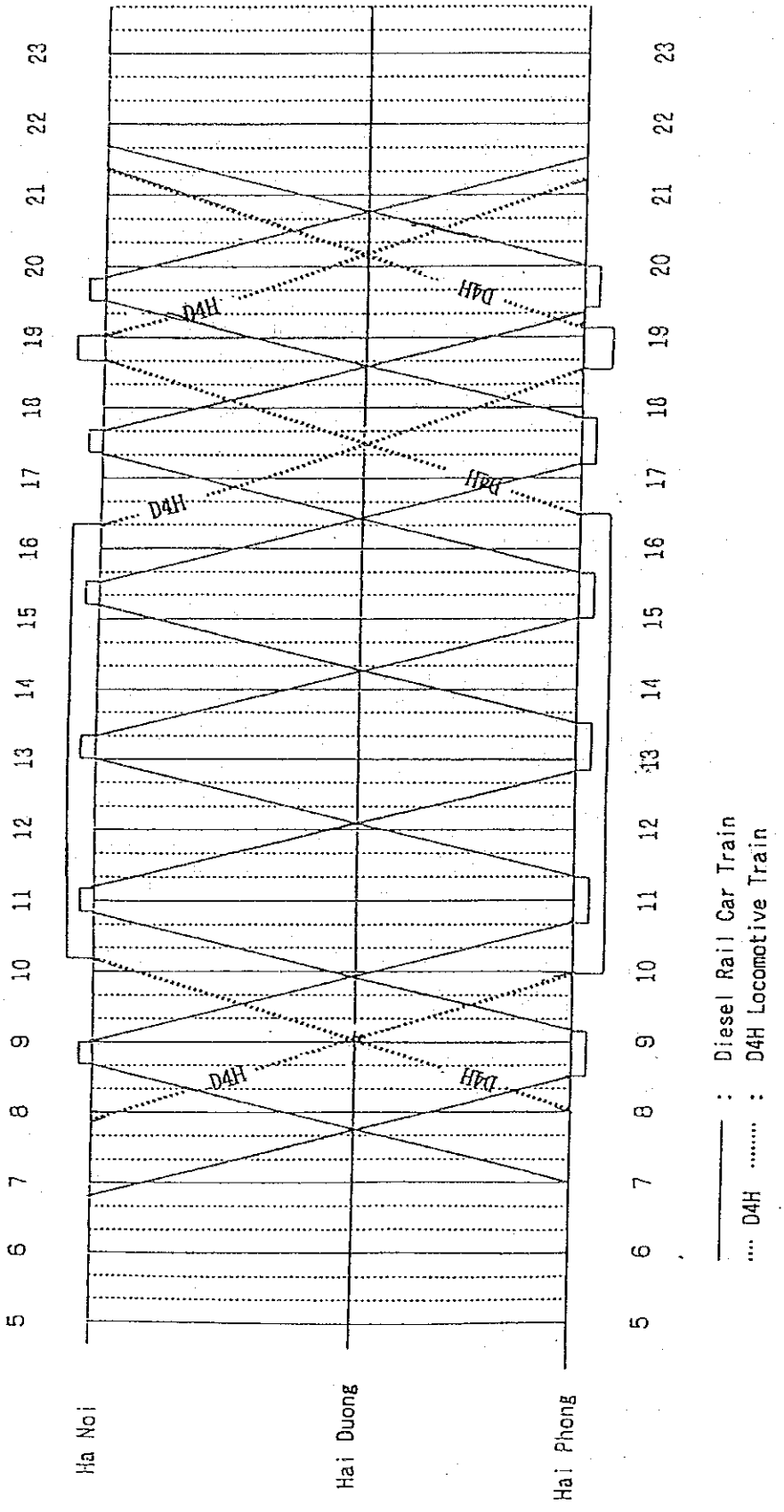


Figure 5.4.2 Train Diagram between Ha Noi and Hai Phong in 1998

(3) Ha Noi - Lao Cai Line

Passenger trains could operate at two-hour intervals with improved doubled D4H's and renovated passenger cars composed of 5 cars instead of the present 8 cars. A night train composed of 8 cars could include sleeping cars. According to the experience of Japanese National Railways, when traveling time is 6 hours, about half of the passengers prefer night trains. Consequently, VNR needs to offer comfortable night trains to and from Lao Cai.

There are freight operation stations equipped with loading and unloading facilities in Viet Tri, Yen Bai and Lao Cai. As there are no approach roads, the need to carry small units of cargo between Yen Bai and Lao Cai requires reconsideration. Since international demand for apatite is uncertain, VNR's strategy group needs to assess the agricultural situation, the domestic demand for fertilizer and apatite, and the probability of apatite exports. There are iron and copper ore in Lao Cai Province. As these are also international commodities, it is again necessary to take the international market into consideration when drafting production and transport plans. As mentioned earlier, the volume of future transit cargo from PR China will have a significant impact on the degree of upgrading necessary on the Ha Noi - Lao Cai Line.

(4) Ha Noi - Dong Dang Line

Present and future demand for passenger and freight railway transport is not sufficient to sustain railway operations. Moreover, roads from Ha Noi to Lang Son will be improved by 2000 and will accelerate the reduction in railway customers. However, the government has already invested in this railway line in anticipation of international rail transport. Demand for freight carriage is assumed to be several hundred thousand tons and for passenger trains one or two round trips a day.

(5) Ha Noi - Cai Lan Line

When an inland depot may be established at Ha Noi, container transport by rail from the proposed Cai Lan Port would be the most suitable means of transport if that port is developed. The railway track between Ha Noi and Cai Lan has a standard gauge track with an axle load of 19 tons. This means that double-decker loading of containers on a car is possible. A locomotive of 2000 HP pulls 2,000 tons of freight cars. Trains could be loaded with 104 TEU (Twenty Feet Container Equivalent Units) in 3 hours directly from ships. Ship containers could be loaded on 5 freight trains leaving for Ha Noi FDC one by one at three-hour intervals, thus moving more than 500 TEU in 15 hours.

Improvement of facilities and tracks should be completed by around 2005, and transport by the new system should likely commence after 2005 and be in full operation by 2010. A study on rail transport to and from Cai Lan Port should be completed by 2000.

A daily round trip passenger train is currently operating at a loss, its operation should therefore cease. If there are sufficient tourists at the Ha Long resort area after 2005, express passenger trains could be operated. A train could run from Ha Noi to Ha Long in less than two hours.

Freight demand at Cai Lan Port is dependent of industrial development in its hinterland. Therefore freight demand is a subject of change according to a scale of industrial development plan and its implementation progress.

5.4.2 Operational Improvement

(1) Improvement of Track Maintenance

Improvement of track maintenance is of particular urgency for the Ha Noi - Hai Phong and the Ha Noi - Lao Cai lines. The track maintenance system needs to be changed as follows:

- To execute scientific maintenance work by using a track measuring car.
- To eliminate heavy labor by using ballast hopper wagons, ballast cleaning machines and rail handling equipment.
- To reduce track maintenance work by welding 12.5m rails into longer, 37.5m rails and adding more ballast.
- To raise productivity by using additional tools, equipment and machinery, including hand tampers.

(2) Improvement of Rolling Stock Workshop and Depots

The Gia Lam Workshop in Ha Noi is the only workshop for heavy repair of rolling stock in Vietnam. It was renovated by Poland to overhaul steam locomotives, passenger coaches and freight cars as well as to manufacture new cars for both passengers and freight. However, it lacks high-grade machines and advanced technology.

Gia Lam Workshop has assumed autonomous operation and constitutes one of the few heavy industries in the Northern part of Vietnam. Based on a demand forecast for rolling stock and an assessment of facilities and technologies to be improved, the workshop likely requires additional equipment with the following functions and capacity:

- Upgrading of passenger car repair and overhaul.
- Overhaul of diesel locomotives.
- Manufacture of spare parts for D4H locomotives.

- Upgrading or manufacturing of high-quality freight cars for international transport.
- Future assembly of new diesel locomotives.
- Future manufacture of steel track materials, equipment and machinery.
- Probable manufacture of steel bridge beams and members.

The other locomotive and passenger car depots at Ha Noi, Yen Bai and Hai Phong also require an upgrading of capacity.

(3) Replacement of Long Bien Bridge

Long Bien Bridge was bombed and restored with temporary beams and piers. It is said that the life span of the bridge will only last until 2000 due to the low quality of materials and corrosion of temporary piers. The speed and load on the bridge are restricted to 15 km/h and 12 ton/axle, respectively. Temporary repairs of the bridge are still necessary because the reconstruction will likely be delayed.

There are many problems to be resolved before a replacement plan is settled on:

- Existing caisson piers should be inspected as the first step, because the issue of whether caissons continue to be used or not, will govern other features of the reconstruction design.
- The clearance between the water level and the underside of the beams may need to be increased by 3 m. The necessity of doing so must be studied in cooperation with the inland water transport survey.
- A request has been made for grade separation at Ha Noi station, which influences planning for the track section approaching Long Bien bridge. On the other hand, local authorities have called for closure of Long Bien bridge and Ha Noi central station for reasons of other urban planning considerations. If it is intended to continue using Ha Noi station as a central station, more study should be performed especially on the bridge rehabilitation, and on the requirements of urban commuter service in general as well as the specific role of rail transport.
- The bridge is a historical one, so the design of a new bridge requires consideration of the historical heritage.
- Upper structures on the Ha Noi side will be constructed of concrete beams to reduce noise.
- A study to plan the replacement works is required.

Consequently, a long-term study will need to consider not only construction but also inspection and maintenance of the bridge, city planning and preservation of the view.

5.4.3 Railway Management and Organization

(1) Organization

VNR's privatized management needs to be strengthened as follows:

- Organizing strategy groups to develop targets, strategies and programs to cope with the dramatic economic changes taking place.
- Recruiting additional qualified manpower to plan, implement and evaluate projects, and to introduce new technologies.
- Training of employees, especially managers and supervisors.

A consulting service will be required to reconstruct the management system and organization from the viewpoint expressed above. The following issues should also be studied to separate responsibilities for railway operations from those for administration of infrastructural assets.

- To let an "Infrastructure Holding Organization" execute heavy repair and reconstruction
- To let a "Railway Settlement Organization" handle idle facilities, infrastructure and employees

(2) Improvement of the Education and Training System

Manpower needs to be trained for new management tasks, including the introduction of new technologies. Since the demand for qualified engineers and technicians in Vietnam will increase, VNR should develop in-house training programmes related to the required engineering skills. Furthermore, vocational training is required for redundant staff so as to prepare them for new assignments.

Current training facilities are very poor. The government has approved establishment of a new railway education and training center at Gia Lam with a budget of 8 billion Dong. Construction work commenced in 1993, but the allocated budget is actually insufficient to establish a new education and training center. The following training and education are considered to be necessary. However, VNR also lacks both the financial resources and the technical capabilities to execute such training and education programs:

- Management Training: Short-term training of approximately 2,000 managers in Ha Noi.

- College Education: 200 selected students with high school degrees will be educated for 2 years at the new education and training center at Gia Lam.

- Vocational Training: About 200 engineers and technicians will be annually trained in modern technologies introduced by VNR. About 800 workers a year will undergo vocational training.

(3) Establishment of a Management Information System

A computerized accounting system for profit/loss and cash flow accounts, as well as other business activity reports, needs to be developed as an on-site computer network. Freight information for customers, performance data broken down by railway line and department, and other strategic management data need to be constantly updated and accessible as an essential prerequisite for efficient railway operations. Computerization and telecommunication improvements are necessary in order to integrate all data into a Management Information System (MIS). The establishment of the MIS should be preceded by a review of regulations and rules in all fields of VNR.

5.4.4 Rolling Stock Upgrading

(1) Locomotives

New locomotives shall not be procured before 2005. The life span of existing diesel and steam locomotives needs to be extended through improved maintenance and the eventual replacement of engines. Since the international price of a D12E equivalent locomotive currently totals 1.5 to 2 million US$, the future replacement of locomotives will constitute a serious financial problem. Two D4H's could be coupled to make one composite locomotive of greater power and multiple-unit control equipment could be installed to allow operation by a single driver. A doubled D4H would have 800 HP. As traction power increases, running speed, acceleration and speed on gradients increase. The maximum speed of such an improved D4H could be around 70 km/h taking in consideration existing track structure and maintenance.

(2) Passenger Cars

Renovation of debilitated passenger cars should be undertaken urgently. Because of the maximum speed of passenger trains being around 70 km/h after improvement of D4H locomotives, existing car frames, bogies and couplers can and should be used again. The accommodations in cars should be designed according to future living standards because cars have a life span of over 20 years.

(3) Freight Cars

Reduced unloading costs and shorter turnaround time for bulk cargo are necessary, and hopper cars are therefore recommended. Apatite transport requires roofed cars but open cars are presently used. New types of cars are therefore necessary, and existing cars should be modified. About half of the cars have plane bearings, which should gradually be replaced with roller bearings.

5.4.5 Cost Estimates

(1) Basis of Cost Estimates

Project costs for the selected projects are estimated on the basis of the following items:

- Construction cost including procurement cost
- Engineering cost including detailed design and supervision
- Physical contingency
- Land acquisition and compensation costs

Unit construction costs are estimated based on the unit costs in the UNDP report "National Transportation Sector Review", considering the costs of construction works carried out in nearby countries such as Thailand, Philippines and Indonesia. The costs are estimated at 1993 prices.

(2) Components of the Costs

The costs mentioned above are split into foreign currency and local currency portions, with an exchange rate of 1US$ = 10,800 Dong. The main items of each portion are as follows:

1) Foreign Currency

- Imported materials and machinery (CIF price)
- Remuneration of expatriates

2) Local Currency

- Local materials
- Equipment existing in Vietnam
- Remuneration of local personnel
- Overhead of local firms
- Management and maintenance costs of equipment
- Compensation costs for land
- Taxes and duties

(3) Project Cost

The estimated costs for the selected projects are summarized in Table 5.4.1, and the details of the costs for each short-term project are listed in Chapter 1 of Volume 3.

5.4.6 Short-Term Development Projects

As described in the previous section, short-term development projects are listed as following:

1) RW-1 Ha Noi - Hai Phong Line Passenger Transport Improvement

2) RW-2 Establishment of a New Railway Education and Training Center

3) RW-3 Gia Lam Workshop and Rolling Stock Depots Improvement

4) RW-4 Long Bien Bridge Replacement and Repair of Other Bridges

5) RW-5 International Transport by Railways

6) RW-6 Establishment of Management Information System and Telephone Improvement

7) RW-7 Renovation of Rolling Stock

8) RW-8 Ha Noi Urban Transport by Railways

9) RW-9 Strengthen of Freight Transport

There is a possibility that priority of RW-10 will be lifted upwards and included in the list of short-term development projects according to a scale of industrial development plan in the hinterland of Cai Lan Port.

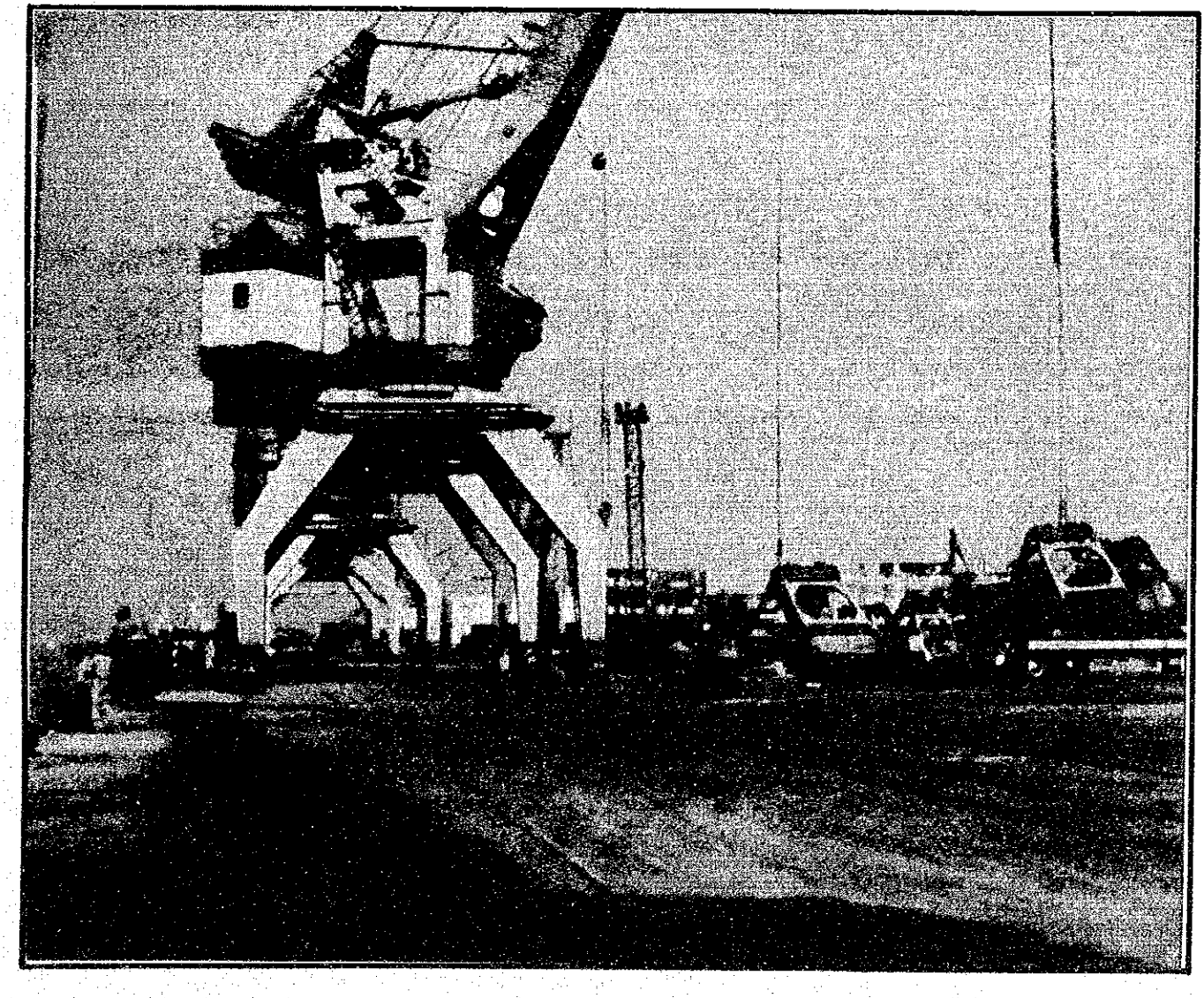
Table 5.4.1 Cost Estimates of Railway Projects

Unit: million US$, 1US$ = 10,800 Dg, F/P: Foreign portion, L/P: Local portion

Code	No.	Project Item	by 2000			2001 - 2005			2006 - 2010			Grand Total			% of F/P
			F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	
RW	1	Ha Noi - Hai Phong Line Passenger Transport Improvement	18.6	2.8	21.4	10.0	0.0	10.0				28.6	2.8	31.4	91
RW	2	Establishment of a New Railway Education & Training Center	7.8	2.0	9.8							7.8	2.0	9.8	80
RW	3	Gia Lam Workshop and Rolling Stock Depots Improvement	32.0	3.3	35.3							32.0	3.3	35.3	91
RW	4	Long Bien Bridge Replacement and Repair of Other Bridges	8.3	0.8	9.1	59.0	25.8	84.8	30.0	10.0	40.0	97.3	36.6	133.9	73
RW	5	International Transport by Railways	55.4	8.8	64.2	5.0	0.0	5.0				60.4	8.8	69.2	87
RW	6	Establishment of Management Information System and Telephone Improvement	8.8	0.8	9.6							8.8	0.8	9.6	92
RW	7	Renovation of Rolling Stock	22.5	4.0	26.5	24.0	3.9	27.9				46.5	7.9	54.4	85
RW	8	Ha Noi Urban Transport by Railways	9.4	3.6	13.0	37.2	18.3	55.5	31.6	5.8	37.4	78.2	27.7	105.9	74
RW	9	Strengthen of Freight Transport	16.0	8.9	24.9	6.0	4.0	10.0				22.0	12.9	34.9	63
RW	10	Cai Lan Port Cargo Transport by Rail and Ha Noi Land Port Construction				15.6	17.4	33.0	82.0	17.8	99.8	97.6	35.2	132.8	73
RW	11	Modernization of Signaling				8.0	2.0	10.0	30.0	4.0	34.0	38.0	6.0	44.0	86
RW	12	Replacement of Diesel Locomotives							174.0	26.8	200.8	174.0	26.8	200.8	87
		Total	178.8	35.0	213.8	164.8	71.4	236.2	347.6	64.4	412.0	691.2	170.8	862.0	80
			F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	%

Note: RW-1 The feasibility study on Ha Noi - Hai Phong Line is being undertaken by a British firm, and will be completed by September 1994.

Chapter 6 Port and Sea Transport



CHAPTER 6 PORT AND SEA TRANSPORT

6.1 INTRODUCTION

It is essential to develop a large-scale deep sea port with high efficiency for the Northern Part of Vietnam to realize its socio-economic development. The construction of a new deep seaport is required for the following reasons:

- The demand for general cargo-throughput will surpass the capacity of existing ports in the near future.
- Large vessels cannot call at Hai Phong Port due to the shallowness of the entrance channel.
- Containerization will rapidly progress, calling for a high-efficiency container terminal.

Hai Phong Port plays an important role for economic and industrial development of Vietnam, so an upgrading of its capacity is urgently required so as to use its full potential.

In order to accept the cargo throughput exceeding the maximum capacity of Hai Phong Port, it is necessary to develop a new port. Cai Lan is at present one candidate site to develop a new port. The feasibility study for a deep seaport at Cai Lan must pay particular attention both to the imperative of environmental preservation of Ha Long Bay, a unique natural area and a very valuable asset for tourism, and to the comparative economics of the longer land transport between the port and the Ha Noi Metropolitan Region. Location of these ports are shown in Figure 6.1.1.

6.2 DEMAND FORECAST

6.2.1 Forecast Methodology

(1) General Cargo

Since almost 100 % of general cargo-throughput within the Study area is handled by Hai Phong Port, the cargo-throughput forecast for the target years is based on Hai Phong Port data.

The total cargo-throughput forecast is based on the correlation between cargo-throughput and an economic index, GDP, as illustrated in Figure 6.2.1. The forecasts for individual commodity groups are calculated either according to production and export targets provided by VINAMARINE, or by trend extrapolation. The projected breakdown into domestic and international general cargo, as well as the estimated share of international bulk cargo, are calculated by trend extrapolation.

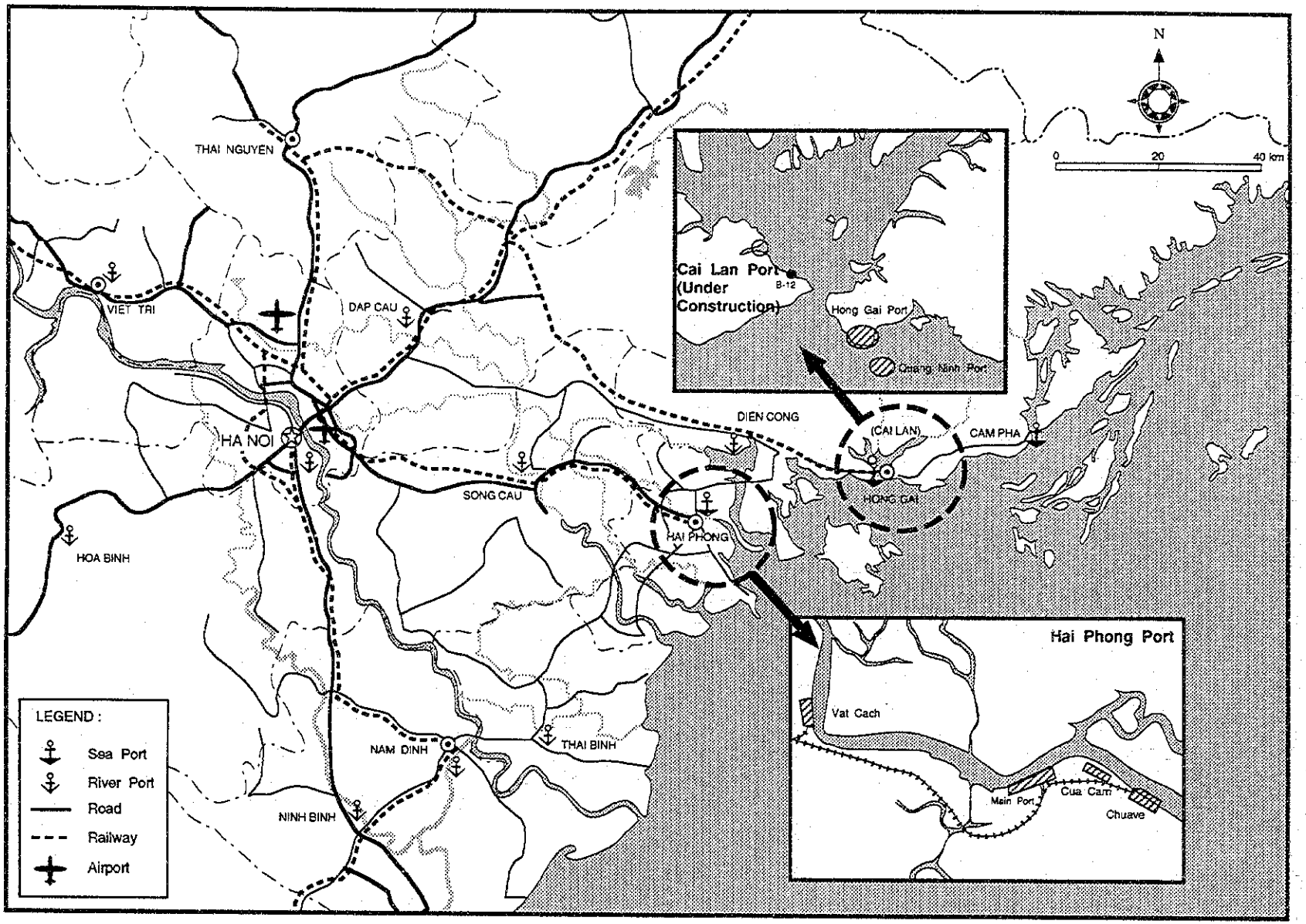


Figure 6.2.1 Location of Hai Phong and Cai Lan Port

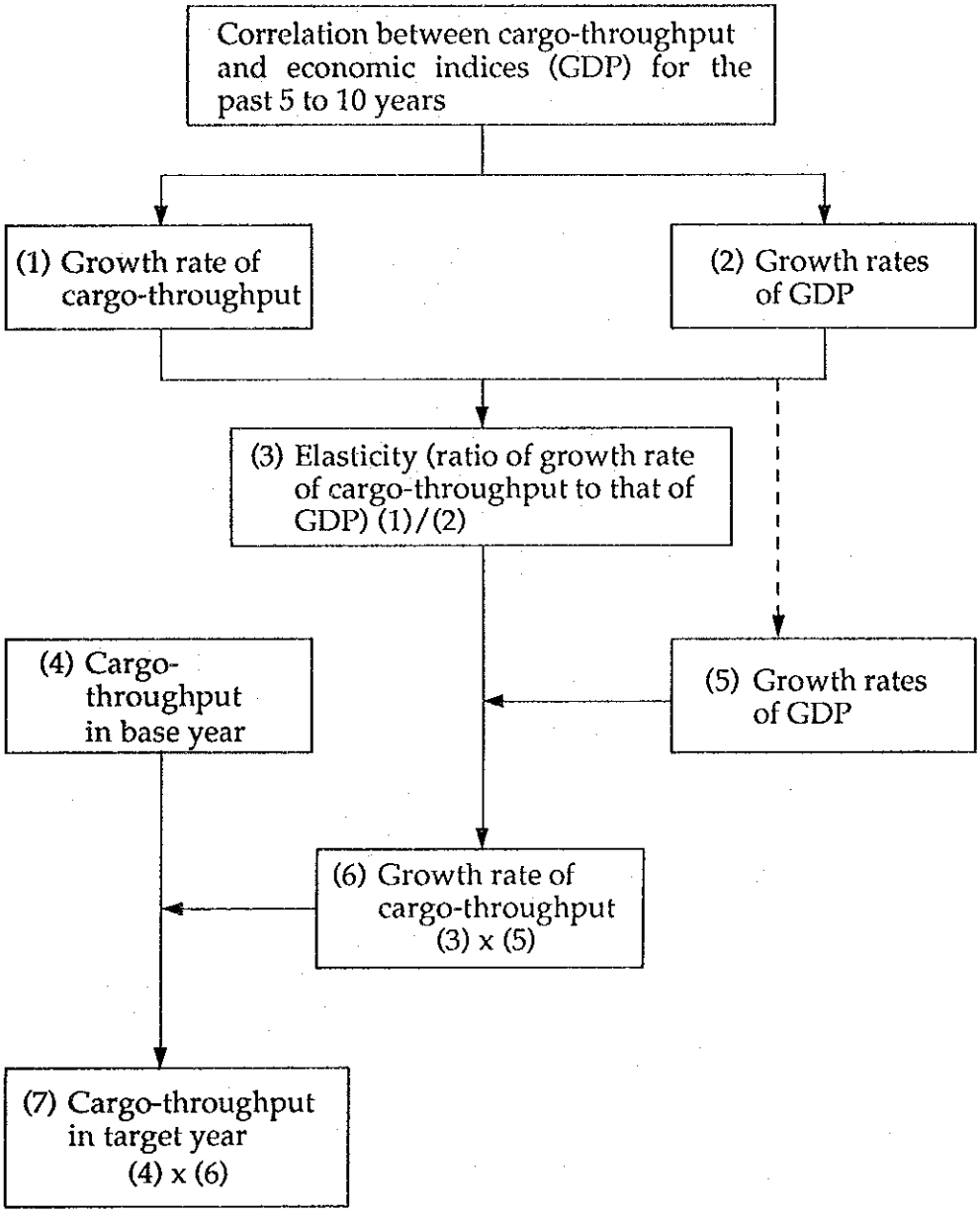


Figure 6.2.2 Forecast Methodology for Total Cargo-Throughput

(2) Container Cargo

Container cargo is estimated by multiplying the general cargo-throughput (excluding bulk cargo) by the assumed containerization ratio.

(3) Coal and Oil

Coal and oil are handled by special-use ports owned by the coal and oil state enterprises. Their demand forecasts are adopted by the Study.

6.2.2 Results of the Demand Forecast

The elasticities of cargo-throughput to GDP is 1.00. According to the 7th National Congress in 1991 (see Strategy for Socioeconomic Stabilization and Development up to the year 2000), GDP is projected to grow during the period from 1990 to 2000 at an annual rate of 7.5 %. General cargo-throughput in the year 2000 is forecast at 5.9 million tons. The annual GDP growth rate for the period from 2000 to 2010 is set at 10.0 % by the Study Team. Total general-cargo throughput in the year 2010 is estimated at 15.2 million tons.

International general cargo, excluding bulk cargo, is estimated at 2.3 million tons in 2000 and 6.4 million tons in 2010. The international containerization ratio is estimated to reach 65 % by 2000 and 80 % by 2010. Container cargo is thus estimated at 1.5 million tons in 2000 and 5.1 million tons in 2010. Total cargo-throughput forecast for all major seaports in the Northern part of Vietnam is summarized in Table 6.2.1.

Table 6.2.1 Total Cargo-Throughput Forecast in the Study Area

(Unit: thousand tons)

Type of Cargo	Year 1993	Year 2000	Year 2010
Coal	3,000	5,000	7,000
Oil	700	1,000	2,000
General Cargo:	2,980	5,900	15,200
• Container	402	1,500	5,100
• Conventional	1,973	3,200	6,600
• Bulk	605	1,200	3,500
Total Cargo	6,680	11,900	24,200
Annual Growth Rate	7.2 % (1990 to 2000)		7.4 % (2000 to 2010)

6.3 PORT AND SEA TRANSPORT DEVELOPMENT STRATEGY

6.3.1 Role and Function of Port and Sea Transport

Port and sea transport has an advantage in transport of heavy and bulky cargoes. Seaports function as bases for coastal and overseas freight transport handling a great variety of commodities. Thus development of seaports is vital for supporting economic and industrial development in the Northern Part of Vietnam.

6.3.2 Fundamental Concept for Developing Sea Ports

A fundamental concept for port development in the Northern Part of Vietnam was established as follows;

(1) Development of a large scale sea port, which is designed to function efficiently and integrated with other ports, is essential for a socio-economic development in the Northern Part of Vietnam.

(2) Hai Phong Port has played a role of hub port in the northern Vietnam and accumulated a wide range of port facilities with skilled port workers and supporting industries.

This is the reason why this port should maintain its function and be utilized to its full capacity, and why a rehabilitation and/or replacement of the deteriorated facilities and the outworn equipment are urgently needed.

(3) However, excessive freight demand handled at Hai Phong Port are expected in the future since this port has a physical constraint in expanding its handling capacity. Thus new port construction is necessary to absorb the excessive demand at Hai Phong Port.

(4) In searching the best site of a new deep sea port in the Northern Part of Vietnam, no ideal site was found. However Cai Lan was selected as the best possible site, where industrial development plan is envisaged.

In expanding Cai Lan Port, it is necessary to commence the civil works at the possible early stage to absorb the excessive demand at Hai Phong Port prior to an expected time of its saturation, and the stage construction plan should be prepared.

(5) It should be paid attention that Ha Long Bay and its surrounding area are areas inherited with the most beautiful scenery and precious natural environment, and one of the most attractive spots for the tourism. If the development of this area deteriorates its natural environment, its damage will not be compensated by any pecuniary return.

Thus, it is necessary to prepare an port development plan with a sufficient attention to an environmental preservation, and the Government should take an appropriate action not to regret the loss of precious natural heritage in the future.

(6) Hai Phong Port and Cai Lan Port should be functioned to supplement each other under the integrated management and operation framework as well as provision of sufficient transport and communication facilities between the two ports.

6.3.3 Improvement of Hai Phong Port

(1) Hai Phong Port will continue to play an important role for economic and industrial development of Vietnam, in general, and of the Study area, in particular. Its potential capacity is currently limited by both shallow depth of the entrance channel and outdated port facilities. An upgrading of its capacity is urgently required so as to use its full potential which is based on the following advantages;

- It is strategically located close to the Ha Noi Metropolitan Region and well connected by road and railway.
- Both port functions and businesses related to port activities are well developed.
- A large number of population and employment have been supported by the port activities.
- Its hinterland will be rapidly reaching a high level of industrialization.
- Experience and know-how concerning port management and operation have been established here for a long time.

(2) It is forecast that containerization will progress at a high growth rate in the future.

To be prepared for handling container cargo, it is indispensable to have a long background of experience in terminal operation, and a comprehensive system for performing all aspects of cargo handling. For these reasons the container cargo had better be concentrated and handled mainly in Hai Phong Port.

But if containerization is accelerated beyond the estimated rate, and if larger vessels call at the port within the project period, a new port would be developed for a container base port.

6.3.4 Necessity of a New Deep Sea Port

Hai Phong Port is limited for expansion of the capacity due to its natural condition. Consequently there is need for development of a new deep sea port after the improvement of Hai Phong Port to its maximum capacity, for the following two reasons:

(1) General-cargo throughput is forecast to be 15 million tons in 2010, whereas the present and future capacity of the existing Hai Phong Port (after port upgrading) is limited to 5 million tons presently, and 8 million tons as a future maximum. Cargo-throughput will thus exceed not only the present capacity of Hai Phong Port, but also the maximum capacity which can be developed at Hai Phong in the future.

In order to accommodate this cargo-throughput demand which surpasses the attainable capacity of Hai Phong Port, it is necessary to develop more new port facilities at another location.

(2) Vessels above 10,000 DWT cannot now call at Hai Phong Port with full cargo due to shallow, 6-meter water depth at the port entrance. This presently bars many ships, and there is a clear future trend toward larger cargo vessels. Figure 6.3.1 provides an analysis of the size of bulk carrier vessels calling at Hai Phong Port in 1992. It reveals that the average size of bulk cargo vessels is more than 9,000 DWT.

In order to accept the larger vessels with full cargo, intensive dredging work would have to be repeatedly done at Hai Phong because of its rapid siltation rate. It would be preferable to develop a new port elsewhere, if an appropriate site having sufficient natural water depth could be found.

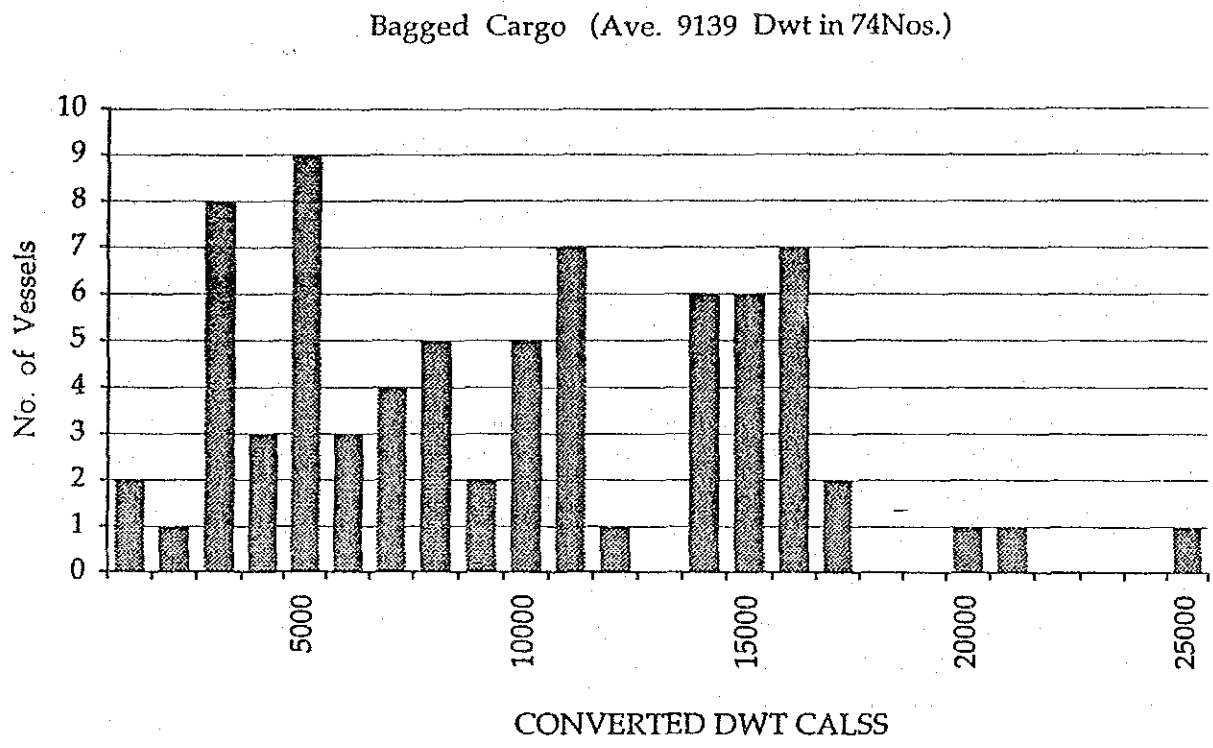
6.3.5 Possible Sites for Developing a New Deep Sea Port

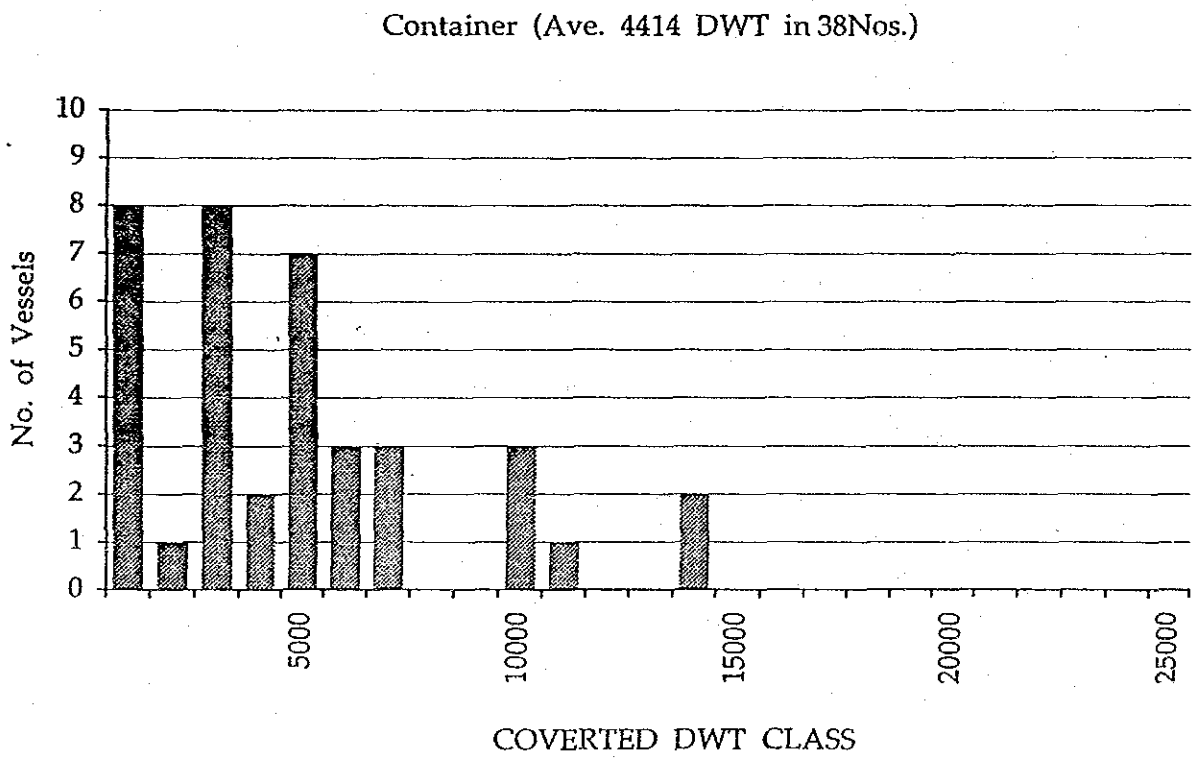
The coastal area of the Northern Part of Vietnam has been investigated to find an adequate site for developing a new deep sea port. The coastline is divided roughly into the Red River Delta area and the Ha Long Bay area.

(1) In the Red River Delta area, the following sites were examined for their suitability as candidate sites to construct a new deep sea port.

Ninh Binh Port : existing river port (the Day River), 50 km up-stream from the river-mouth, water depth is -5 ~ -8 m.

Dinh Vu Island : located at the entrance of Hai Phong Port, facing the entrance channel, with a land area of 1,200 ha designated for an Export Processing Zone (EPZ).





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

Figure 6.3.1 Size of Vessels Calling at Hai Phong Port: 1992

The water depth in this coastal area is very shallow in general, often only 10 meters depth at a point 10 kilometers out from the coast line. Furthermore, siltation by fine soil and sand carried by the Red River is so heavy that it seems to be very difficult to open a new deep navigation channel and to maintain it in good condition.

(2) In the Ha Long Bay Area, the following sites were examined.

Cam Pha Port : coal export port, 40 km north-east of Hon Gai, water depth is -9 m.

Cai Lan Port : located in Cua Luc Bay, an entrance channel has been dredged to a water depth of -6 to -7 meters. One berth with a depth of -9 m was completed by the end of 1993.

Cam Pha Port is far from the developed urban area, and the land transportation conditions in its hinter-land are undeveloped.

Although an ideal site for developing a new deep sea port has not been found, Cai Lan was selected as a best alternative at this stage of investigation.

The reasons are;

- Its geographical position, social and economic conditions are prominent.
- Industrialization is progressing in its hinterland.
- The sea condition with respect to waves and water depth is fairly good.
- The port can be managed and operated under the control of VINAMARINE together with the existing Quang Ninh Port.

In the case of developing Cai Lan as a new deep sea port, the construction work had better get started in an early stage, taking the saturation in the capacity of Hai Phong Port into account.

6.3.6 Items to be taken into Consideration in Studying Possible Development of the Cai Lan Port

Ha Long Bay, where Cai Lan is located, is a very important coastal area in the Northern Part of Vietnam with the beautiful scenery and superior natural environment. It must be recognized that if some harmful damage were given to its natural condition to the unrecoverable extent, the loss should be immense and fatal. Therefore, it is very important to establish not only a comprehensive regional development plan but also an implementation plan for environmental protection.

In studying development of a new deep sea port at Cai Lan, the following items should be taken into consideration.

(1) The proposed Cai Lan Port locates at the inner water area of Ha Long Bay. It is considered essential to undertake an in-depth environmental impact study when making a decision on further development of the port.

(2) In order to prevent an unharmonized development of the region, it is urgently required to establish a comprehensive plan for the regional development, giving full weight to the need for conservation of the natural environment.

    If the new berths are constructed here, this new port development should be restricted to the interior of Cua Luc Bay. Areas outside of Cua Luc Bay, facing Ha Long Bay's larger expanse, should be reserved for tourist activities and nature conservation.

(3) The dredging work necessary for a navigation channel, anchorage and turning basin at this site should be investigated carefully, based on a sufficiently intensive site survey of the water depth, bottom condition, and erosion conditions in the upland catchment area surrounding Cua Luc Bay, as well as environmental considerations. The proper viewpoint is to determine without pre-judgment, whether or not the benefit of possible port development will outweigh the total costs of port construction and operation.

6.3.7 Development of the Other Sea Ports

There exist other three major sea ports in the Study Area - Cam Pha Port, Hon Gai Port and B-12 Port. These ports are special use port for coal export and oil import, and are managed by the state-owned enterprises. Each enterprise has its own plan of the production and also has a plan for improvement and development of its port facility. The development plan of each port is presented in the Subsection 6.4.3.

6.3.8 Port Management and Operation

Apart from the expansion and rehabilitation of port facilities, an improvement of port management and operation is urgently required. Procedures need to be simplified, port information systems require computerization and port functions, particularly the operation of the container terminal in Hai Phong Port, should be subcontracted or managed by the private sector. Efficient, commercially-oriented port management and operation require that as many functions as appropriate are undertaken by the private sector.

It is recommended that both the Hai Phong Port and Cai Lan Port fulfill their function as effectively as possible by cooperating each other. They should not function as an individual single port. To realize this, it is necessary to develop

transportation and communication facilities between the two ports but also to introduce an efficient port management and operation system.

6.3.9 Expansion of Shipping Fleet

The present level of the shipping fleet under the Vietnamese Flag is largely insufficient for both ocean-going and coastal shipping. Demand for cargo shipping will greatly increase with economic growth. In order to seize these business opportunities, it is necessary to expand and upgrade the ocean going and coastal shipping fleets.

6.4 PORT AND SEA TRANSPORT DEVELOPMENT PLAN

6.4.1 Hai Phong Port Development Plan

(1) Cargo Throughput

In order to utilize Hai Phong Port to its maximum capacity, the cargo throughput is estimated to develop as follows;

in the year 2000	-	approximately 5 million tons (including 1.5 million tons of containers)
in the year 2010	-	approximately 8.2 million tons (including 4.5 million tons of containers)

(2) Development Concept

In order to cope with the anticipated rapid increase of the cargo throughput and the concentration of container cargoes, the following concept is recommended;

- To dredge the entrance channel to a sufficient water depth for vessels up to 10,000 DWT
- To rehabilitate and improve the yard, buildings, cargo handling equipment and machinery as well as other old facilities
- To improve and modernize the container terminal, not only in its physical facilities, but also in operation, including introduction of computer systems
- To construct new berths in accordance with the growth of the cargo throughput, especially of container cargo

(3) Major Development Activities

The scheduling of port development activities is recommended as follows;

	Activities until 2000	Activities between 2000 and 2010
Berth	-	construction of two container berths in Chuave
Yard	rehabilitation and expansion of warehouse, construction of CFS, etc.	construction of the new container yard
Equipment	renovation and procurement of mobile cranes, yard chassis, tractors, top-lifters, fork-lifts, etc.	equipment for the new container terminal
Entrance Channel	dredging of the navigation channel to -6 meters depth	

In accordance with the port development, especially the concentration of container cargo transportation, the access road connection to urban areas should be improved.

6.4.2 Cai Lan Port Proposed Development Plan

(1) Cargo Throughput

Cargo throughput (demand) exceeding the capacity of Hai Phong Port, particularly the bulk cargoes transported by larger size vessels, should be handled in Cai Lan Port. The cargo throughput is estimated as the following;

in the year 2000 - approximately 1 million tons

in the year 2010 - approximately 6.3 million tons (including 0.6 million tons of containers)

Cargo demand is a shift of change according to a scale of port-related industrial development plan in the hinterland and its implementation progress.

(2) Development Concept

Sufficient water depth and land availability for port expansion are the main advantages of the proposed Cai Lan Port. Its present disadvantages are insufficient transport connection with the Ha Noi Metropolitan Region, and the undeveloped hinterland. Noteworthy also is the essential requirement for environment preservation of Ha Long Bay as the primary area having unique tourism potential within the entire Study area. The development concept for Cai Lan Port is recommended as follows:

- To construct berths with sufficient water depth

- To construct an adequate-scale, high-efficiency seaport with a modernized operation system and a sufficient yard area
- To connect the port with the road and railway networks

If containerization is accelerated beyond the capacity of the improved Hai Phong Port, and if the larger container vessels should require to call at a Port in Northern Vietnam in the project period extending until the year 2010, a new container terminal could be developed in the proposed Cai Lan Port.

(3) Major Development Activities

If implemented, the scheduling of the new deep seaport capacity development activities are recommended as follows;

	Activities until 2000	Activities between 2000 and 2010
Berth	construction of 2 ~ 3 berths (-9 m)	construction of 8 ~ 9 berths (-9 ~ -12 m)
Yard	yard area of 100 thousand m^2	yard area of 370 thousand m^2
Equipment	mobile crane, fork-lift, bulldozer, etc. are required	same as until 2000
Building	construction of port office, warehouse, workshop, etc.	same as until 2000
Dredging	dredging of navigation channel, anchorage, turning - basin (-9 m)	same as until 2000 (-9 ~ -12 m)
Connection with land transport	connection with Route No. 18 and Cai Lan railway line	

(4) Environmental Consideration

Environmental conservation should be taken into consideration for developing the new deep seaport in Cai Lan. In order to prevent grave damage to the natural environment, the following counter-measures should be carried out;

- To establish a comprehensive plan for the regional development and the conservation of the natural environment
- To undertake an in-depth environmental impact study when making a decision to construct the new berths here
- To examine carefully muddiness caused by the dredging work

Then, if it is decided to proceed with a port:

- To start the construction work at an early stage of the project period, taking the saturation in the capacity of Hai Phong Port into account
- To put the port management under VINAMARINE as a public port

6.4.3 Special-Use Ports Development Plan

Special-use ports are managed by state-owned enterprises which have the following port development plans;

- Cam Pha Port; Construction of an anchorage for vessels up to 50,000 DWT along the entrance channel, and dredging of the channel for 50,000 DWT vessels.
- Hong Gai Port; Construction of an anchorage for vessels up to 25,000 DWT in front of the present berth.
- B-12 Port; Replacement of the present mooring facility by five buoys with a fixed-type berthing structure.

6.4.4 Tourism Development Plan

Cai Lan is located near the tourist activity center of the Ha Long Bay area. Bai Chai and Hon Gay have considerable potential to be developed as centers of tourist activity. The outside of the Cua Luc Bay area should be considered as a potential site to develop a tourist area, including a tourist base port for cruising in Ha Long Bay, for example.

6.4.5 Navigation Aids System

According to the possible increase in the number and size of the vessels entering the proposed Cai Lan Port, congestion of the vessel traffic at the entrance channel may occur, and preventive measures should be taken. The navigation aid system, such as lighthouse and navigation buoys, should be fully developed for the navigation channel by the time it is opened.

6.4.6 Port Management and Operation Improvement Plan

(1) Apart from the expansion and rehabilitation of port facilities, an improvement of port management and operation is urgently required.

Procedures need to be simplified, and port information systems require computerization. Some port functions, particularly the operation of the container terminal, should be subcontracted or managed by the private sector. Efficient, commercially oriented port management and operation require that as many port operations functions as possible are undertaken by the private sector.

(2) For the port management and operation of Hai Phong Port, the following items are recommended;

- Mass handling methods are recommended for quay side cargo handling operation in place of the existing handling system which produces very low efficiency by direct loading (or unloading) of cargo from or to trucks or freight cars.
- The cargo volume through the port is expected to increase, therefore good new equipment should be procured. Efficiency of the terminal operation depends on equipment availability. So, suitable training should be given to the future managers as well as to equipment operators and maintenance workers.
- A computer management network is recommended at the container terminal, to enhance delivery.
- The existing port working offices are scattered throughout the port area. The offices that can be moved should be consolidated in one quarter for better communications and integrated management.

6.4.7 Sea Transport Development Plan

(1) VINAMARINE has its own plan for increasing their fleet's tonnage in accordance with the increase of the cargo transportation.

By this plan, the additional tonnage to be procured until the year 2000 is as follows;

(thousand DWT)

	1991 ~ 1995	1996 ~ 2000
Additional Tonnage	450	740
- Crude Oil Tankers	150	200
- Dry Cargo Vessels	300	540
- (including Container Ships)	(65)	(55)

Source; "Object for Maritime Development, 1993, VINAMARINE"

(2) As the economic and industrial development of Vietnam progresses, not only the international cargo transportation will increase, but also the domestic transportation between the North, the Central region and the South. Water transportation has advantages in transportation cost and in saving of energy. Development of the transportation system by coastal routes should be considered, including such features as the development of ports and of vessels for long distance car-ferry transportation.

(3) The relation between the port and the ship is just same as that between the merchant and the customer. In order for the port to attract more ships and to offer better service in terms of high efficiency cargo handling and smooth

cargo transportation in the port area, it is advisable to separate the management bodies of the port business and the shipping business.

As for the shipping business, it can be recommended to introduce privatization of this sector which is now managed by the central government. The shipping business is managed by the private sector under free-market-economy principles generally in the world, and it is necessary to strengthen the shipping business in Vietnam in order to compete with shipping enterprises of foreign countries.

(4) In the future, the cargo throughput will greatly increase and the number and size of vessels also will increase.

A situation might arise in the future that Hai Phong Port and Cai Lan Port could not be adapted to this situation, because of the insufficient water depth of both of these ports.

It is advisable to start investigation now to identify and examine an adequate site to develop a deeper-water and larger-scale port.

6.4.8 Cost Estimates

The estimated costs for the selected projects are summarized in Table 6.4.1, and the details of the costs for each short-term project are listed in Chapter 1 of Volume 3.

6.4.9 Short-Term Development Projects

As described in the previous section, short-term development projects are listed as following:

1) PS-1 Hai Phong Port Urgent Rehabilitation

2) PS-3 Cai Lan Port Development

3) PS-4 Study for Developing New Deep Entrance Channel in Hai Phong Port

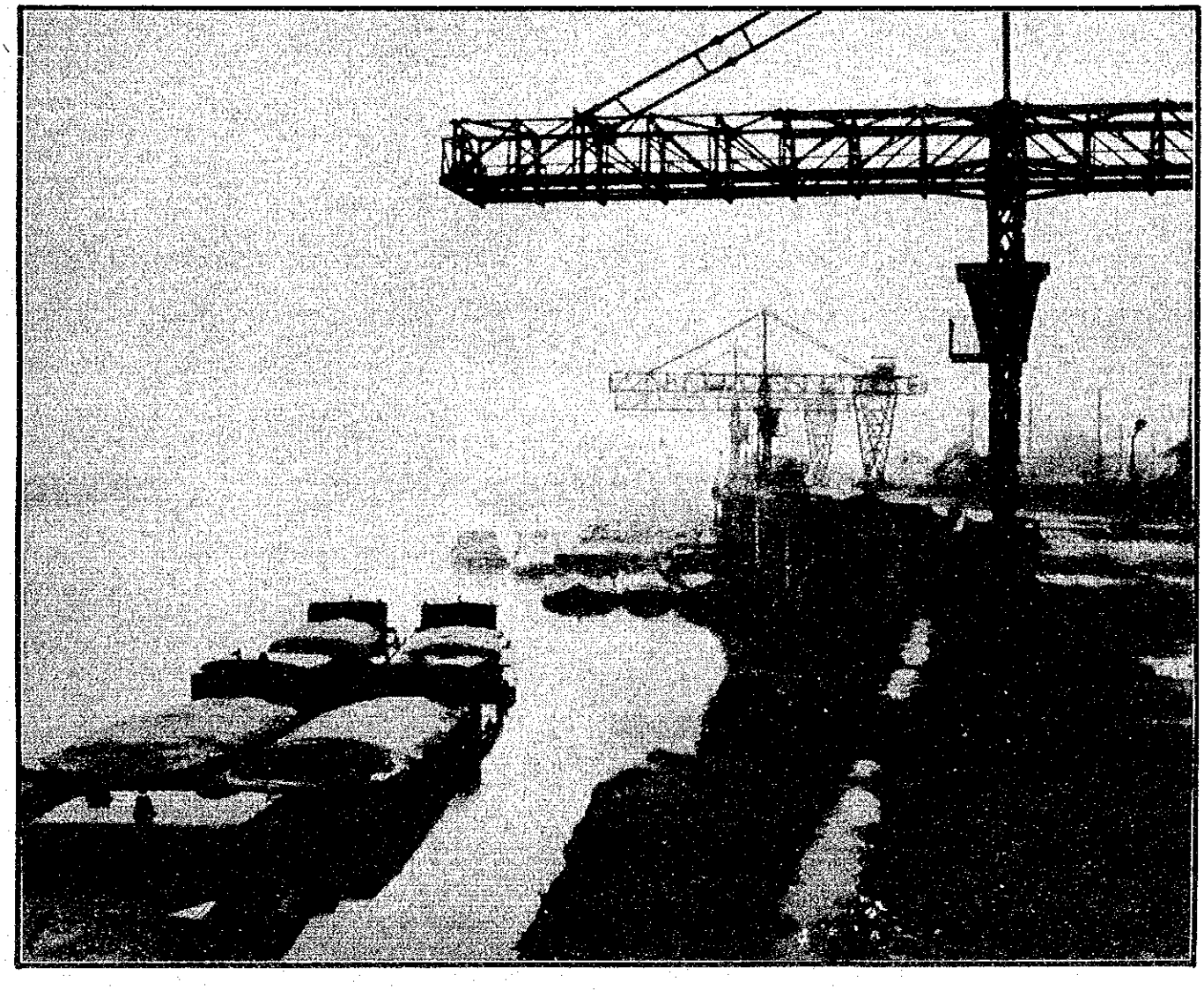
Table 6.4.1 Cost Estimates of Port Projects

Unit: million US$, 1US$ = 10,800 Dg, F/P: Foreign portion, L/P: Local portion

Code	No.	Project Item	by 2000			2001 - 2005			2006 - 2010			Grand Total			% of F/P
			F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	
PS	1	Hai Phong Port Urgent Rehabilitation	108	37	145							108	37	145	74
PS	2	Hai Phong Port Development				23	12	35				23	12	35	66
PS	3	Cai Lan Port Development including - Installation of Buoys and Construction of Light-House - Removing and Reconstruction of B-12 Oil Terminal	114	52	166	95	52	147	92	44	136	301	148	449	67
PS	4	Study for developing New Deep Entrance Channel in Hai Phong Port	2	1	3	2	1	3				4	2	6	67
		Total	224	90	314	120	65	185	92	44	136	436	199	635	69
			F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	%

Note: PS-1 Hai Phong Port Urgent Rehabilitation was completed and the loan for implementation was committed by OECF.
PS-3 The feasibility study is being undertaken by JICA.

Chapter 7 Inland Waterway Transport



CHAPTER 7 INLAND WATERWAY TRANSPORT

7.1 INTRODUCTION

The future potential for inland waterway transport in the Northern part of Vietnam is limited to the transport of bulk cargo, such as coal and construction materials. The main comparative cost advantage of waterway transport is in the coal transport which directly connects coal ports with coal-intensive power plants and cement production plants. Inland waterway transport capacity needs to be upgraded in order to capture the transport market for coal and other construction materials in a market-oriented economy. It will certainly lose its share in the transport market for general cargo.

7.2 DEMAND FORECAST

Table 7.2.1 gives the inland waterway transport demand forecast for coal and peat, cement and construction materials for 2000 and 2010 in the Study area. Total demand forecast for 2000 amounts to between 13.5 and 14.5 million tons annually, and for 2010 the corresponding range is between 22 and 28 million tons. Coal and peat will account for roughly half of all cargo. This forecast takes into account the large thermal power plant planned in Quang Ninh Province for the year 2010 (Vietnam Energy Sector Investment and Policy Review, IBRD, June 1993).

Table 7.2.1 Inland Waterway Transport Demand Forecast in the Study Area

(unit : million tons)

Type of Cargo	Year 2000	Year 2010
Coal & Peat	5	8 to 10
Construction Materials	3.5	5 to 7
Cement	4	5 to 7
Others	1	4
Total	13.5	22 to 28

7.3 INLAND WATERWAY TRANSPORT DEVELOPMENT STRATEGY

7.3.1 Role and Function of Inland Waterway Transport

Based on the current situation of inland waterways and the demand forecast for this mode, inland waterway transport will be specialized in transport of coal and construction materials. The following development strategies are recommended:

- River ports will be specialized to handle bulk cargo, particularly coal and construction materials. Selected river ports could further specialize to handle only one single commodity.

- River port facilities and inland waterway fleets need to be upgraded and modernized in order to meet future demand.

- Development of construction materials-related industries in the vicinity of river ports should be encouraged.

- Both the dredging and navigation aids systems require rehabilitation.

7.3.2 Inland Waterway Development and Rehabilitation

Priority for rehabilitation should be directed to the inland waterway routes with the greatest transport capacity, particularly the Quang Ninh - Pha Lai and Quang Ninh - Ninh Binh routes. In order to cope with growing freight volumes and larger vessels, the construction of groyne is a feasible approach to secure the required water depth through control of both siltation and erosion, as well as protection of river banks against floods. The main inland waterway routes to be operating in the Study area by the target year 2010 are illustrated in Figure 7.3.1. Classification of waterway is shown in Table 7.3.1.

It will be important to shorten transport routes, especially the Quang Ninh - Ninh Binh Route. The coastal route would be about 60 km shorter compared to the one along the Luoc River. It would require a new canal between the Ninh Co and Day rivers. The opening of this coastal route will likely have a positive impact on the coastal-river fleet which links the Northern part of Vietnam with the Southern part of Vietnam.

Suitable vessel types and sizes need to be identified to meet transport demand and natural conditions of the inland waterways. Almost the entire inland waterway fleet is superannuated. For example, the River Transport Company No. 1, which is one of the large units under IWB, presently utilizes only 70 % of its barges and 50 % of its tug-boats. New equipment and technology need to be introduced in ship repair plants so as to create a competitive inland waterway fleet.

7.3.3 Inland Waterway Management

Inland waterways will be divided into 6 levels according to technical classification and future transport capacity, as recommended in Table 7.3.1. Inland waterway classification is required for river transport planning and rehabilitation. All measurements (width, depth and curvature) should be taken at minimum water levels expected to prevail with the frequency of 95 % in the dry season.

It will be necessary to set up dredging and navigation aids systems with a sufficient annual budget on the three main routes. This includes markers, buoys, signals and beacons. A night navigation aids system for large-scale coal transport will be necessary until 2010 on the two main routes, Quang Ninh - Hai Phong - Pha Lai and Quang Ninh - Hai Phong - Ninh Binh (via coastal route and Day river).

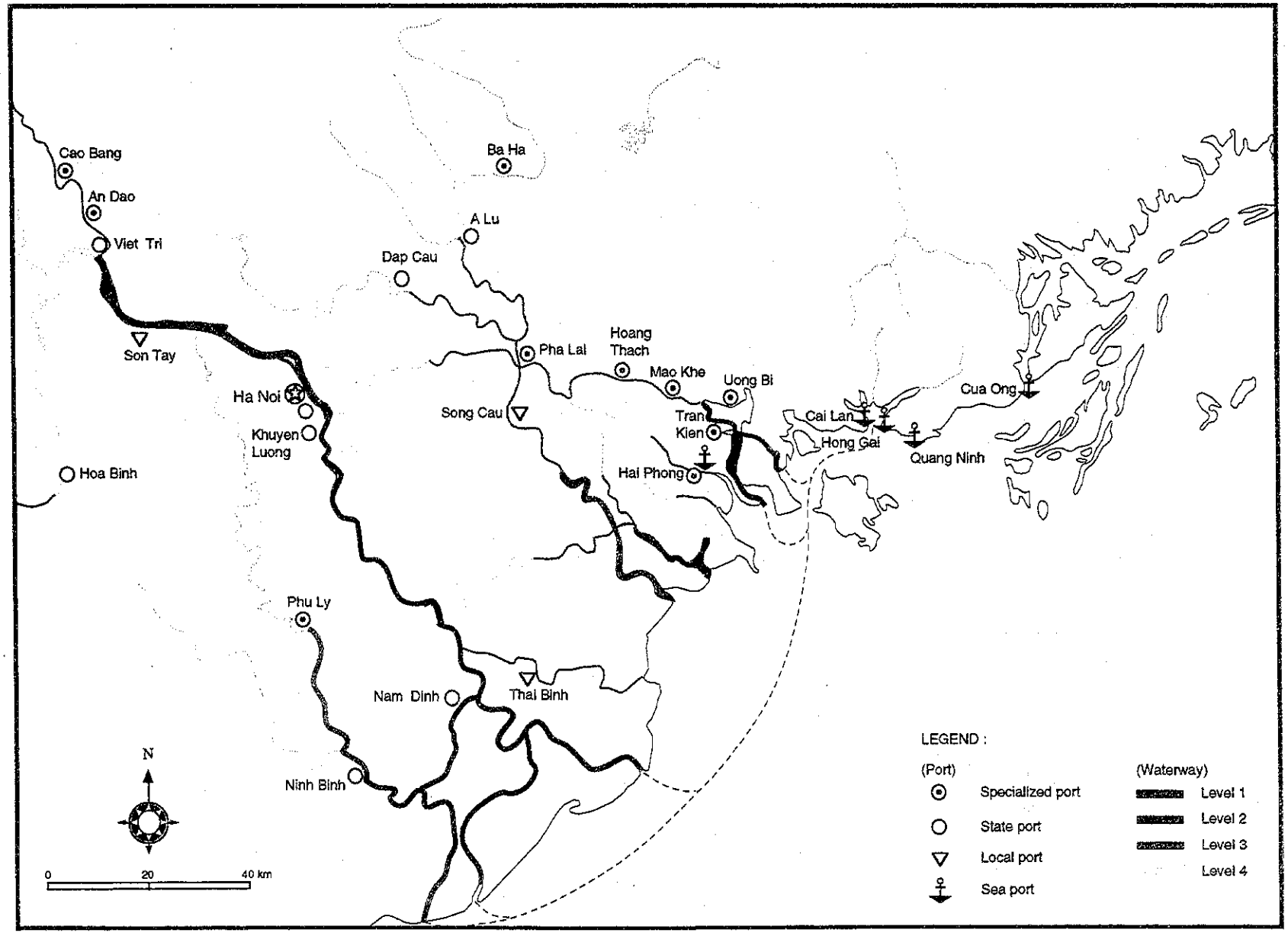


Figure 7.3.1 Location of Inland Waterways in 2010

Table 7.3.1 Technical Classification of Inland Waterways

Level	Waterway Size						Construction size (in meters)			
	Natural river		Canal		Curvature	Length (km)	Bridge			Air clearance of power lines
	Water depth	Bottom width	Water depth	Bottom width			Span		Clearance	
							River	Canal		
I.	>3.0	>90	>4.0	>50	>700	201	80	50	10	12
II.	2.0 - 3.0	70 - 90	3.0 - 4.0	40 - 50	500 - 700	299	60	40	9	11
III.	1.5 - 2.0	50 - 70	2.5 - 3.0	30 - 50	300 - 500	383	50	30	7	9
IV.	1.2 - 1.5	30 - 50	2.0 - 2.5	20 - 30	200 - 300	362	40	25	6 (5)	8
V.	1.0 - 1.2	20 - 30	1.2 - 2.0	10 - 20	100 - 200	480	25	20	3.5	8
VI.	<1.0	10 - 20	<1.2	10	60 - 150	399	15	10	2.5	8

Note : Value ( ) can be used with the approval of official agencies.
Source : MOTC

7.3.4 Development of River Ports

River ports are classified into three types as follows:

- Specialized River Ports

  These ports directly handle commodities for large plants, such as thermal power plants and cement production plants. Though these ports are constructed and managed by the plants, they are controlled by IWB. Authorization to construct and use a specialized port must be obtained from MOTC and other ministries, conforming to prescribed regulations.

- State-owned River Ports

  These ports are directly financed and managed by IWB. They should become specialized to transport mainly coal and construction materials.

- Local River Ports

  These ports are under the administrative management of local governments. The provincial transport departments and sections also take a part in management activities in order to maintain technical regulations concerning inland waterway transport.

It is necessary to draft regulations for the establishment of private river ports. The establishment of construction material centers is recommended in order to effectively utilize the currently underutilized port areas, by leasing lots to port related industries, such as concrete products plants, asphalt plants and so forth. The development of necessary infrastructure for these construction material centers, such as water supply, sewerage, electricity and road access, is also required. Last, but not least, a consistent privatization strategy remains to be formulated for the operation of both river ports and inland waterway fleets. IWB needs to gradually privatize its sections, starting with its transport section.

7.4 INLAND WATERWAY TRANSPORT DEVELOPMENT PLAN

7.4.1 Inland Waterway Development

Development of inland waterways in the Study area should concentrate on the Quang Ninh - Pha Lai and Quang Ninh - Ninh Binh routes. Both routes are currently classified as level 2, 3 and 4. The Quang Ninh - Pha Lai route needs to be upgraded to level 1 and 2, which mainly requires the dredging of four shallows in the Mao Khe River and two shallows in the Kinh Thay River, enlargement of the curvature of the Keo River and the removal of rocks from the stream bed in one part of Mao Khe River. The Quang Ninh - Ninh Binh route requires dredging of the mouth of the Day River, so as to make the coastal route from Quang Ninh operable, and construction of a stone-soil groyne by 2010, to regulate the current flow.

The route from Pha Lai to Ha Noi by way of the Duong River is another important route connecting Ha Noi with Hai Phong and Quang Ninh. This route is at level 4 and 5 at present; however, navigation requires a minimum level of 3 and 4. It would be necessary to regulate the current flow with dredging, deepening the entrance and cutting off the curvature.

Construction of a new canal about 500 m in length connecting the Ninh Co River with the Day River, for the coastal route from Quang Ninh to Ninh Binh through the Ninh Co estuary, may become necessary if the coastal route is to be developed as the main route from Quang Ninh to Ninh Binh.

7.4.2 Inland Waterway Fleet

Repair and replacement of substandard barges and tug-boats which are used in the main three inland waterways, are urgently required. When improvement of the level of inland waterways is completed, the size of barges will likely increase from the present 200-to-400-ton class, up to the 600-ton class.

7.4.3 Navigation Aids System

The navigation aids system for the three main inland waterways requires urgent rehabilitation. Moreover, the two main inland waterway routes for coal transport from Quang Ninh to Pha Lai and from Quang Ninh to Ninh Binh (via the coastal route) require a nighttime navigation aids system after the year 2010.

A system of central control of waterway traffic by communication networks, established navigation aids systems and hydrological observation systems, should be placed in operation from the year 2010 onward.

7.4.4 River Port Development

In the main State-owned River Ports, Hanoi, Ninh Binh and Viet Tri, rehabilitation of port facilities and equipment is urgently required. The new Ninh Phu Port requires the construction of berths and handling equipment for coastal-river ships of 1,000 DWT and barges of 400 to 800 tons. The Viet Tri Port requires reconstruction of port facilities and new handling equipment. The construction of a new Hoa Binh Port upstream of Hoa Binh Dam, and some ports in the Hoa Binh lake, may become necessary due to transport and transit freight between the North Mountain and Midland Region and the Red River Delta.

7.4.5 Port Management and Operation

Legislation for a policy of deregulation of the inland waterway transport market is urgently required in order to create the necessary incentives for private investments. This includes a market-oriented transport fare system and the gradual privatization of various sections of IWB.

7.4.6 Cost Estimates

The estimated costs for the selected projects are summarized in Table 7.4.1, and the details of the costs for each short-term project are listed in Chapter 1 of Volume 3.

7.4.7 Short-Term Development Projects

As described in the previous section, short-term development projects are listed as following:

1) IW-1 Ninh Binh Port Rehabilitation and Extension
2) IW-2 Ha Noi and Viet Tri Port Improvement
3) IW-3 The Main Waterway Dredging and Rearrangement
4) IW-4 Groyne Test Construction and Hydrologic Survey
5) IW-5 Navigation Aids System Rearrangement

Table 7.4.1 Cost Estimates of Inland Waterway Projects

Unit: million US$, 1US$ = 10,800 Dg, F/P: Foreign portion, L/P: Local portion

Code	No.	Project Name	by 2000			2001 - 2005			2006 - 2010			Grand Total			% of F/P
			F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	
IW	1	Ninh Binh Port Rehabilitation and Extension	11.3	6.3	17.6	5.5	3	8.5	5.5	3	8.5	22.3	12.3	34.6	
IW	2	Ha Noi and Viet Tri Port Improvement	23	7	30	7	3	10	7	3	10	37	13	50	
IW	3	The Main Waterway Dredging and Rearrangement	3.9	3.7	7.6	0.8	0.7	1.5	0.8	0.7	1.5	5.5	5.1	10.6	
IW	4	Groyne Test Construction and Hydrologic Survey	0.04	0.14	0.18	0.11	0.35	0.46	0.11	0.35	0.46	0.26	0.84	1.1	
IW	5	Navigation Aids System Rearrangement	0.18	0.59	0.77							0.18	0.59	0.77	
		Total	38.42	17.73	56.15	13.41	7.05	20.46	13.41	7.05	20.46	65.24	31.83	97.07	
			F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	F/P	L/P	Total	%