Appendices

APPENDIX 4-A: STRUCTURE OF ASSIGNMENT MODEL

1. Outline Methodology

Traffic assignment was conducted separately for passenger and cargo. Since passenger demand was split by the modal split model into each mode, i.e., car, bus, rail, inland waterway, and air, OD matrices were loaded onto the network of each mode by the traffic assignment model. In this assignment, large impedance was given to the links of other modes than the assigned mode so that traffic is not loaded onto the links of other modes. However, the links for transfer and access/egress were assumed to be road links.

In the case of cargo, the following two methods were adopted.

- Base Case (the same modal shares as at present for each OD pair)
- Economic Case (assignment to least-cost path in terms of economic cost)

The former was assigned to the network in the same manner as passenger traffic assignment because OD matrix can be easily estimated by mode due to its definition.

However, OD matrix by mode is one of the outputs of traffic assignment in the latter case while OD matrices by cargo type (13 items) are the input to the traffic assignment model. Namely, minimum-cost path is identified by OD pair and by cargo type, and the cargo volume is assigned to the path(s) depending on the share of each mode determined by the economic cost of path(s) of each mode [1]. The method to determine this share is two-fold:

- Most Economical Case: 100% assignment to the least-cost path (mode).
- Economic Case: Modal share of each mode is determined in inverse proportion to the economic cost.

$$R_m = C_m^{-a} \Big/ \sum_i C_i^{-a}$$

Where: R_m: Share of mode m

C_m: Transport cost of mode m

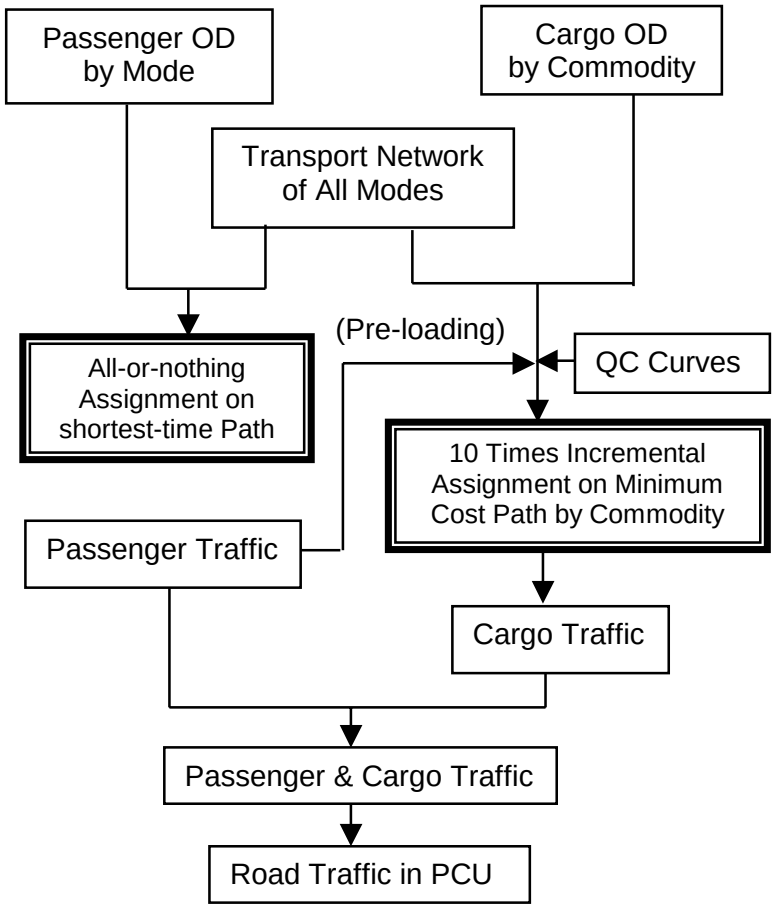
a: parameter (1.0 ~ 1.2 based on the present situation)

The former brings about unrealistic results as it takes only one mode for each OD pair. However, this analysis shows clearly the theoretical limit transport cost could be lowered. It is also useful to know how far are the recommended modal shares from the theoretical limit. In addition, the former is the same as the latter if the parameter (a) is set at infinite.

[1] Economic cost of a specific mode is defined when the length of the link of the mode is not less than 50% of the total route length. Feeder/distributor mode is automatically determined taking into account the transport cost calculated by the QC curves (explained later). Loading/unloading/transshipment cost between modes is incorporated in the model by adding “transshipment link” at the transshipment points.

The cargo volume was loaded onto the network by incremental assignment (10% x 10times) In order to reflect the transport cost which may change depending on the transport volume in the process of assignment, Volume-Cost Curves (QC Curves) were developed as described below. Passenger loadings were pre-loaded onto the network prior to the cargo assignment. The entire process is shown in Figure 4.A.1.

Figure 4.A.1
Procedure of Cargo Traffic Assignment for Economic Case



2. Volume-Cost Curves (QC Curves)

The Volume-Cost Curves (QC Curves) are one of the “costs” includes operating cost, maintenance cost and infrastructure cost. The operating cost is further broken down into operating cost of transport equipment, loading/unloading cost (including transshipment) and cargo time cost.

The QC Curves were developed for cargo assignment of the Economic Case in order to determine the ideal modal balance in terms of economic transport cost. Thus traffic assignment is conducted beyond the capacity of transport system by assuming automatically the development of new infrastructure (beyond the capacity, transport cost includes the cost for new infrastructure). The assumptions are as follows:

(1) For Road: When present capacity is reached, rehabilitation, if needed, is first conducted, then widening is done by 2 lanes.
(2) For Railway: When present single-track capacity is reached, signal is improved and station intervals are shortened to attain the maximum single-track capacity, then double tracking and electrification are conducted.
(3) For Port, Airport: Gradual capacity expansion is assumed based on the estimated transport unit cost, since there is no fixed unit for expansion unlike road and railway.

The QC Curves are presented in Figure 4.A.2 in comparison with QV Curves (Speed-Flow Curves).

The benefit of infrastructure development can be expected over a long period, and therefore the cost should be annualized and converted into daily figures. The following formulate was used:

$$R = r\,(1+r)^n / ((1 + r)^n - 1) / 365 = 0.126/365$$

Where R:Factor for conversion of infrastructure cost into daily cost.
n: Project life (30years)
r: Discount rate (12%)

The cost of infrastructure development is shared by the total traffic volume. Thus this cost gradually decreases as traffic volume grows. The maintenance cost was estimated in a similar manner. Cargo time cost was estimated as an interest cost (12% p.a.) during transport time

3. Basic Data for QC Curves

For assignment, it is required to input the co-ordinates of nodes and links as well as the characteristics of each link which are typically composed of four characteristics, i.e., link length, average capacity, travel speed and travel cost.

(1) Capacity

In order to determine the road traffic capacity, the methodology developed by the Indonesian Highway Capacity Manual (IHCM). According to IHCM, road capacity is calculated by the following formula:

$$C = C0 \times FCw \times FCsp \times FCmc \times FCsf$$

Where: C = Capacity (PCU/hr),
C0 = Base capacity in ideal conditions (PCU/hr),
FCw = Adjustiment factor for carriageway width,
FCsp = Adjustiment factor for directional split,
FCmc = Adjustment factor for motorcycle traffic,
FCsf = Adjustment factor for side friction

Base Capacity: Base capacity (C0) was assumed as follows.

Terrain type	Base Capacity (PCU/hr)	Definition
Flat	3,100	Generally less than 5 % gradient
Hilly	2,900	Normally within 4 % to 8 % gradient
Mountainous	2,500	Frequent steep sections often reaching 10 % gradient

Adjustment for Carriageway Width: Adjustment factor (FCw) for carriageway width (FCw) for two-lane undivided road is shown in the following table. In the actual application, "effective width" was understood to be equal to pavement width for paved roads in the absence of accurate road inventory. For unpaved roads, "effective width" was assumed to be less than 5 m.

Effective Width	FCw
<5m	0.69
5m	0.81
6m	0.91
7m	1.00
8m	1.08
9m	1.15
12m	1.27

Source: IHCM

Adjustment for Directional Split: The adjustment factor for directional split (FCsp) depends on the directional split of the traffic as shown in the following table. In fact, however, most of the road links fall in the category of "60-40", judging from the results of VITRANSS traffic counts.

Directional split (%)	FCsp
50-50	1.00
55-45	0.97
60-40	0.94
65-35	0.91
70-30	0.88

Source:IHCM

Adjustment for Motorcycle Traffic: According to the IHCM, the adjustment factor for motorcycle traffic (FCmc) is based on the motorcycle ratio as follows.

$$FCmc = 1 - Qmc/Qc$$

Where, QCmc = Motorcycle flow (PCU/hr) = 0.25 x Motorcycle flow (MC/hr)
Qc = Sum of flow for all motor vehicle types expressed in PCU/hr

When this formula is applied to the results of VITRANSS traffic counts (39 stations), FCmc was calculated at 0.662 to 0.935 with an average of 0.820. The stations near HCMC tend to show lower values. In this study, the average was used to the entire network because traffic data is not available for all road links and the traffic mix changes quickly depending on the situation of road development and traffic demand. The PCU values used in this study are shown in the next page.

Vehicle Type	PCU	Vehicle Type	PCU
Bicycle	0.50	Light truck	1.00
Motorcycle	0.25	Medium truck	2.00
Car	1.00	Heavy truck	2.50
Minibus	1.50	Articulated truck	3.00
Large bus	2.00	Others	1.00

Source: IHCM

Adjustment for Side Friction: Adjustment factor for side friction (FCsf) is based on roadside activities and shoulder width. For two-lane undivided roads, this factor is as shown in the following table.

Typical conditions	Side friction Class	Shoulder Width			
		<0.5m	1.0m	1.5m	>2m
Rural, agriculture or undeveloped, no activities	Very low	0.96	0.98	1.00	1.03
Rural, some roadside building & activities	Low	0.90	0.92	0.95	0.99
Village, residential activities	Medium	0.83	0.86	0.90	0.96
Village, some market activities	High	0.76	0.80	0.85	0.93
Almost urban market/business activities	Very High	0.70	0.74	0.80	0.90

Source: IHCM

However, judging from the fact that side friction is usually large on Vietnamese roads (e.g. nonmotorized vehicles, farmer's activities), it was assumed that road shoulder is always less than 0.5 m regardless of the actual width. As a result, the hourly capacity of a 2-lane undivided road is summarized as follows.

Table 4.A.1
Hourly Capacity of 2-land Undivided Road

(PCU/hr)

	Side Friction	Pavement Width						
		<5m	5m	6m	7m	8m	9m	12m
Flat	Rural, no activity	1,583	1,858	2,087	2,294	2,477	2,638	2,913
	Rural, some activity	1,484	1,742	1,957	2,151	2,323	2,473	2,731
	Village, residential	1,368	1,606	1,805	1,983	2,142	2,281	2,519
	Village, some commercial	1,253	1,471	1,653	1,816	1,961	2,088	2,306
	Urban	1,154	1,355	1,522	1,673	1,806	1,924	2,124
Hilly	Rural, no activity	1,481	1,738	1,953	2,146	2,318	2,468	2,725
	Rural, some activity	1,388	1,630	1,831	2,012	2,173	2,314	2,555
	Village, residential	1,280	1,503	1,688	1,855	2,004	2,134	2,356
	Village, some commercial	1,172	1,376	1,546	1,699	1,835	1,954	2,158
	Urban	1,080	1,267	1,424	1,565	1,690	1,799	1,987
Mount-ainous	Rural, no activity	1,276	1,498	1,683	1,850	1,998	2,217	2,349
	Rural, some activity	1,197	1,405	1,578	1,734	1,873	1,994	2,203
	Village, residential	1,104	1,296	1,455	1,599	1,727	1,839	2,031
	Village, some commercial	1,011	1,186	1,333	1,465	1,582	1,684	1,860
	Urban	931	1,093	1,227	1,349	1,457	1,551	1,713

Capacity per Day: Based on the VITRANSS traffic counts(39 stations), the peak hour ratio(against 24-hour traffic for both directions in terms of PCUs, excluding motorcycle and non-motorized transport) varies depending on the survey station from 5.0% to 11.9% with typical values between 8 and 9%. Assuming a peak hour ratio at 8.5%, which is the same as the French study, the hourly capacity can be converted into daily capacity as shown in the following table.

Table 4.A.2
Daily Capacity of 2-land Undivided Road

(PCU/day)

	Side Friction	Pavement Width						
		<5m	5m	6m	7m	8m	9m	12m
Flat	Rural, no activity	18,624	21,859	24,553	26,998	29,141	31,035	34,271
	Rural, some activity	17,459	20,494	23,024	25,306	27,329	29,094	32,129
	Village, residential	16,094	18,894	21,235	23,329	25,200	26,835	29,635
	Village, some commercial	14,741	17,306	19,447	21,365	23,071	24,565	27,129
	Urban	13,576	15,941	17,906	19,682	21,247	22,635	24,988
Hilly	Rural, no activity	17,424	20,447	22.976	25,247	27,271	29,035	32,059
	Rural, some activity	16,329	19,176	21,541	23,671	25,565	27,224	30,059
	Village, residential	15,059	17,682	19,859	21,824	23,576	25,106	27,718
	Village, some commercial	13,788	16,188	18,188	19,988	21,588	22,988	25,388
	Urban	12,706	14,906	16,753	18,412	19,882	21,165	23,376
Mount-ainous	Rural, no activity	15,012	17,624	19,800	21,765	23,506	25,024	27,635
	Rural, some activity	14,082	16,529	18,565	20,400	22,035	23,459	25,918
	Village, residential	12,988	15,247	17,118	18,812	20,318	21,635	23,894
	Village, some commercial	11,894	13,953	15,682	17,235	18,612	19,812	21,882
	Urban	10,953	12,859	14,435	15,871	17,141	18,247	20,153

When a 2-lane road is widened to a 4-lane road, it is assumed that the capacity increases by its base capacity without multiplying any adjustment factors.

Adjustment for Road Surface Condition: Beside above factors, capacity strongly depends on a road surface condition[2]. So, it was adjusted by the following factors.

(%)

Good	Fair	Poor	Very Poor
100	80	50	30

Adjustment for Interprovincial Traffic: The road capacity calculated above was further adjusted considering the capacity reduction due to local traffic. For interprovincial traffic, availability of road capacity was assumed as follows:

Rural, no activity	70%
Rural, some activity	60%
Village, residential	50%
Village, some commercial	40%
Urban	30%

[2] According to the IRI(International Roughness Index), road surface condition is defined as follows. It is applied to VITRANSS.

Road surface	Road condition	Range of IRI (m/km)	Average IRI (m/km)
Paved	Good	0-4	3
	Fair	4-8	6
	Poor	8-10	9
	Very Poor	>10	12
Unpaved	Good	5-9	7
	Fair	9-11	10
	Poor	11-15	14
	Very Poor	>15	17

(2) Travel Speed

Based on factors such as no. of lanes, terrain type and surface condition, travel speed is assumed as follows.

Table 4.A.3
Travel Speed

Cate-gory	Lanes	Designed Speed (kph)1)			Surface Condition			
		Flat	Hilly	Mountainous	Good	Fair	Poor	Very poor
1	4x3.75(m)	120	105	90	100	80	50	30
2	2x3.75	100	90	80	100	80	50	30
3	2x3.5	80	70	60	100	80	50	30
4	2x3.0	60	50	40	100	80	50	30
5	1x3.5	40	35	25	100	80	50	30
6	1x3.0	25	20	15	100	80	50	30

Note: 1) Vietnam Design Standards (TCVN 4054-85), slightly modified.

(3) Travel Cost

Travel cost is summarized as follows (for details, it may be recommendable to refer to VITRANSS Technical Report, “Transport Cost”).

Economic Operating Cost: The economic cost of passenger and freight transport was assumed as follows.

Table 4.A.4
Economic Operating Cost

Mode	Passenger transport (VND/passenger-km)	Cargo Transport (VND/ton-km)	Loading/unloading and other mobilization charge (VND/ton)
Car	264	-	-
Bus	94	-	-
Truck	-	546	55,000
Inland Waterway	48-66	138-223	104,000
Railway	209	263	91,000
Coastal Shipping	-	84	199,000

For road traffic, running speed varies depending on the volume/capacity ratio, and the running speed influences the operating cost considerably. In this study, the following adjustment factors were assumed.

Vehicle Type	Speed (km/hr)						
	15	20	30	40	50	60	70
Passenger Car	2.61	1.80	1.45	1.24	1.10	1.00	1.02
Bus	1.92	1.49	1.29	1.16	1.07	1.00	1.00
Truck	2.01	1.53	1.31	1.17	1.07	1.00	1.00

Source: Transport Master Plan for the Central Region for Vietnam (1998), French ODA

Economic Infrastructure and Maintenance Cost: Economic infrastructure and maintenance cost was assumed as follows.

Table 4.A.5
Road Infrastructure and Maintenance Cost

(VND million/km/year)

Terrain	Construction Cost[1/]	Maintenance Cost	Total
Flat	801(283)	86	887
Hilly	947(283)	86	1,033
Mountainous	1,092(283)	86	1,178
Highly mountainous	1,125(217)	86	1,211
Bridge	34,693	86	34,779

Note: 1/ Annualized at 12% for 30 years.
2/ Figures in parenthesis show pavement cost.

Table 4.A.6
Railway Infrastructure and Maintenance Cost

Investment	Economic Cost (VND billion/km)	Annualized Economic Cost (VND million/km)[1/]
New single Tracking	22.40	2,483
Double Tracking	11.20	1,241
Station	0.43	48
Electrification	11.20	1,241
Communication Facilities Improvement	0.64	71
Maintenance	-	258

Note: 1/ At 12% for 30 years

Table 4.A.7
Port Infrastructure and Maintenance Cost

	Construction Cost	Equipment Cost	Maintenance Cost	Operation Cost
Annualized Economic Cost(VND 000/ton)	39.9	7.9	3.6	3.6

Note: At 12% for 30 years.

Passenger and Cargo Time Cost: As for passenger time cost, passenger time cost was determined by an income approach as shown in the following table.

Table 4.A.8
Passenger Time Cost[1/]

(VND/hr)

	1999	Low Case		High Case	
		2010	2020	2010	2020
Average Income	3,180[2)]	5,097	7,691	5,757	9,558
Growth rate of Per Capita(%/y)	4.0	4.0	4.2	5.0	5.2
Passenger Time Cost					
-for bus, railway and inland water	3,180	5,097	7,691	45,757	9,558
-for car and air	6,360	10,194	15,382	11,514	19,116
Economic Passenger Time Cost					
-for bus, railway and inland water	960	1,539	2,323	1,739	2,887
-for car and air	1,921	3,079	4,645	3,477	5,773

Note: 1/ Passenger time cost by income approach.
2/ Average of state sector employee under local government (assuming 160 working hours/month)

Cargo time cost can be quantified as an interest cost during transport. In this study, it was assumed as follows:

Cargo	Assumed Value (VND million/ton)	Cargo Time Cost (VND/hour/ton)
1.paddy and food crop	3.0	41
2.sugar/sugarcane	7.1	97
3.wood/forestry	0.6	8
4.steel	5.6	77
5.construction materials	0.2	3
6.cement	0.7	10
7.fertilizer	3.0	41
8.coal	0.4	5
9.petroleum products	4.5	62
10.industrial crop	3.5	48
11.manufacturing Goods	28.0	384
12.fishery Products	20.0	274
13.animal meat	20.0	274

Note:1/ assumes an interest rate of 12%/year.

4. Target Case

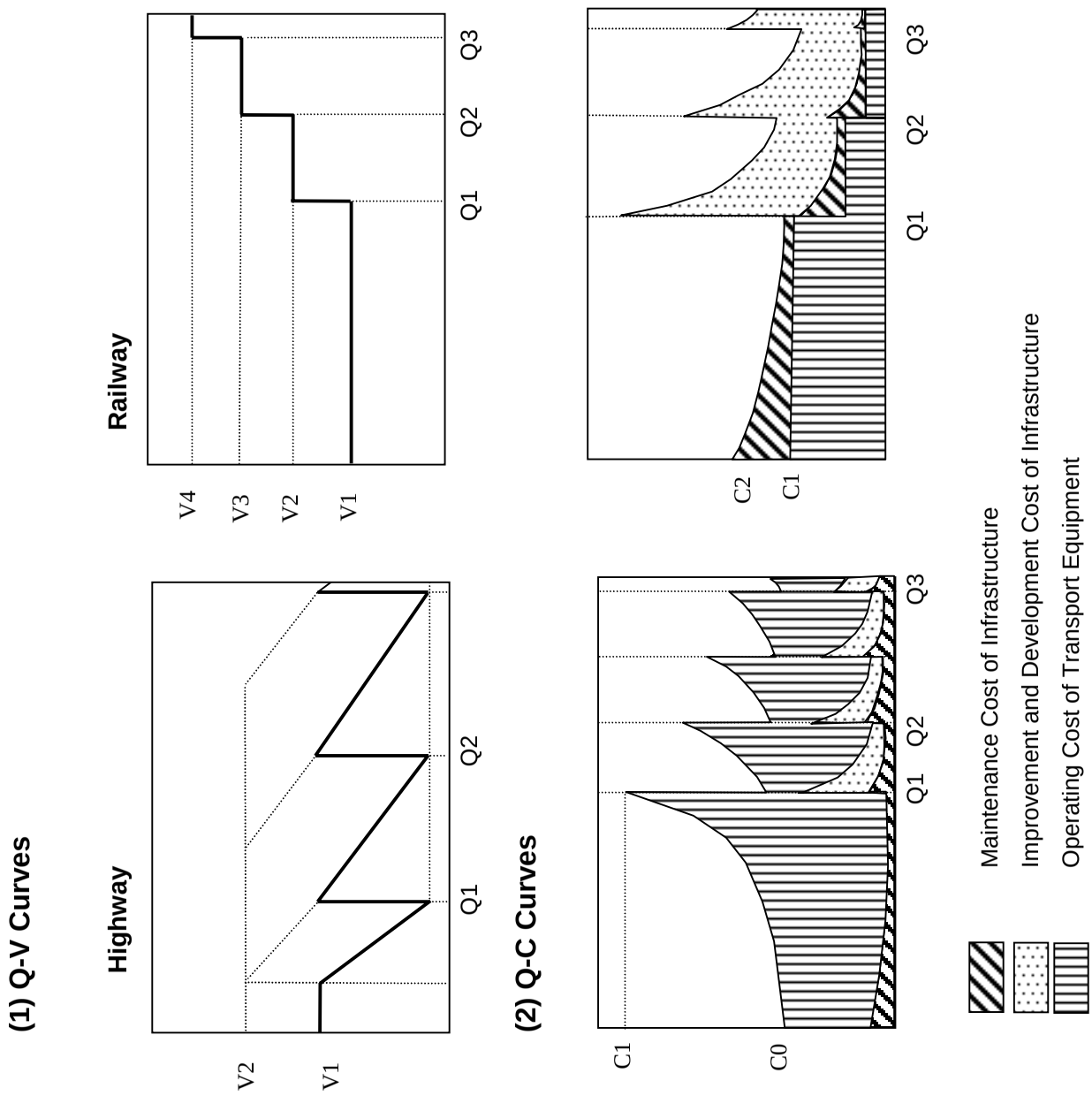
In relation to cargo traffic assignment, Base Case, Economic Case and Most Economic Case were compared and analyzed. Base Case is considered the most realistic as its assumes the same modal shares as at present. However, its transport cost is significantly higher than the Economic Case. As a basis of long-term transport plan, the Economic Case should be pursued as a target. However, in the transition period to the market economy, it will take a long time to materialize the target case in the absence of effective tools to orientate the transport market towards the economically desirable direction. In this context, VITRANSS assumed the target case to be:

Target Case = 2/3 of Base Case + 1/3 of Economic Case in 2010 [3]
1/2 of Base Case + 1/2 of Economic Case in 2020 [3]

The equations above were used for loadings of each link to calculate transport cost and modal shares.

[3] A significant difference between Base Case and Economic Case is the modal shares of road and coastal shipping. In the former case, the road is dominant reflecting the current trend, whereas in the latter case coastal shipping is considered more advantageous from economic viewpoint. Therefore, it is considered that a realistic modal policy is to target a balance between two cases.

Figure 4.A.2
General Partner of Q-V and Q-C Curves by Mode



APPENDIX 4-B : CORRIDOR ANALYSIS

Table 4-B.1
Outline of Transport Demand by Corridor[1/]

	Name	Transport Demand per Day						No. of Road Lanes*		
		1999		2010		2020		Existing in 1999	Additionally required by 2010	Additionally required by 2020
		Pass. (No.)	Cargo (ton)	Pass. (No.)	Cargo (ton)	Pass. (No.)	Cargo (ton)			
1	North-South Coastal Corridor (Hanoi/HCMC)	24,500-33,600	28,100-32,600	58,000-72,300	82,800-123,500	109,100-135,600	134,000-178,000	2	1.8 - 3.8	4.9 - 7.2
2	North South Upland Corridor (Ha Tay – R15 – R14 - HCMC)	6,800	2,500	11,100	1,200-8,000	18,700	14,600	1-2	0-1	0
3	Hanoi – Hai Phong – Quang Ninh Corridor	52,600	45,900	132,600	70,700	261,200	95,700	6	0	0
4	Hanoi – Ninh Binh/Nam Dinh Corridor	72,000	37,200	131,000	79,000	237,900	132,700	2	2.3	6.9
5	Haiphong – Ninh Binh/Nam Dinh Corridor	3,200	13,800	3,600	12,600	4,900	21,000	2	0	0
6	Lao Cai – Lang Son – Quang Ninh Corridor	120	230	240	270	300	300	1-2	0-1	0
7	Lao Cai – Son La – Ha Tay Corridor	4,400	1,400	5,000	3,400	7,000	5,000	1-2	0-1	0
8	Quang Ninh – China Corridor	700	190	1,500	500	2,700	700	2	0	0
9	Hanoi – Lang Son – China Corridor	17,600	5,400	19,600	6,200	28,800	14,000	2	0	0
10	Hanoi – Cao Bang Corridor	700	200	900	220	1100	600	1-2	0-1	0
11	Viet Tri – Ha Giang Corridor	3500	800	3900	1200	5100	2100	1-2	0-1	0
12	Hanoi – Lao Cai – China Corridor	4,100	3,800	5,100	4,900	7,500	13,100	2	0	0
13	Hanoi Dien Bien Phu – North Lao Corridor	1,900	500	2,200	1,700	3,200	3,600	1-2	0-1	0
14	Vinh – R8 – Lao/Vientiane Corridor	90	190	120	380	200	700	2	0	0
15	Vung Ang – R12 – Lao/ Thakhet Corridor	60	160	60	320	100	600	2	0	0
16	Dong Ha – R9 – Lao/ Savannakhet Corridor	130	360	170	500	300	1,200	2	0	0
17	Danang – R14B-14-40 – Lao/ Pakse Corridor	170	430	240	650	400	1,500	1-2	0-1	0
18	Hue – Danang – Hoi An Corridor	26,600	12,200	62,100	48,000	117,400	71,500	2	0.9	2.6
19	Qui Nhon – R19 – Central Cambodia Corridor	9,700	1,500	12,400	4,200	18,000	7,500	2	0	0
20	Central Highlands – Nha Trang Corridor	11,400	1,800	15,100	5,400	25,100	10,400	2	0	0
21	Nha Trang – Da Lat – HCMC Corridor	16,400	19,000	21,600	51,000	30,800	94,400	2	0.8	3.0
22	HCMC – Vung Tau Corridor	53,000	10,000	103,700	82,100	226,700	113,000	4	1.0	3.4
23	HCMC – Cambodia/ Phnom Penh Corridor	22,100	7,500	28,800	11,700	42,400	24,200	2	0	0
24	HCMC – Can Tho Corridor	77,200-114,400	24,100-27,700	139,400-199,900	70,000-76,000	236,900-327,500	110,000-120,900	2	2.5 - 3.4	5.5 - 6.9
25	Can Tho – Ca Mau Corridor	9,400	1,600	2,600	7,800	22,200	13,800	2	0	0
26	Can Tho – R91– Cambodia/ Sihanoukville Port Corridor	2,040	26,300	5,100	46,000	5,100	64,000	2	0	0.6
27	Cuu Long – Cambodia Corridor	4,000-9,400	920-4,200	8,400-15,400	5,000-11,300	13,300-22,200	12,400-25,300	2	0	0

1/ Major assumptions made in the analysis for the sake of discussions are as follows:
(a) Additional future demand will be met only by road.
(b) Transport demand by corridor is the average of traffic at a number of cross-sections set for each corridor (see Appendix 4-A).
(c) Transport demand is converted into traffic by assuming 1 PCU = 2 tons for cargo traffic and 1 PCU = 9.4 passengers (1999), 11.7 passengers (2010) and 13.2 passengers (2020) for passenger traffic. Capacity of a road lane is 10,000 PCU/day.

Figure 4-B.1
Location of Cross-sections Set for Traffic Analysis

1. Priority Corridors

1) North-South Coastal Corridor (Hanoi-HCMC)

The North-South Coastal Corridor can be considered the most important of the identified corridors. This corridor principally stretches in a 1,700-km long national backbone and facilitates all modes of transport including road, rail, air, and coastal shipping. This corridor is further connected to almost all other corridors including the core north-south corridor which makes possible national/regional integration. The corridor links the capital city of Hanoi, the largest economic hub that is HCMC and other major growth centers and urban areas including Danang, Hue, Cua Lo, Vung Ang, Dung Quat, Quy Nhon, Nha Trang, among others (see Figure 4-B.2).

In the 1990s, a concerted effort was made to rehabilitate dilapidated transport infrastructure. At present, goods and people can be efficiently and economically transported. However, service quality still needs improvement. The corridor's terrain is generally flat and relatively easy to develop. However, seasonal inundation occurs frequently in some sections, and there are steep slopes, faults and tidal marshes.

The corridor is strategically situated in the urbanized belt where urban and commercial activities are concentrated including national/international functions, and this ensures a large transport demand. However, resettlement and land acquisition may pose potential difficulties. The demand increase in the future is significant (see Table 4.4.2). While interprovincial passenger traffic will be mostly met by road and partly by rail, interprovincial freight traffic will be met by coastal shipping and road. Capacity constraints will be more visible along the corridor and estimated modal shares among road, rail and coastal shipping require a balanced development of these modes.

Air transport will play a significant role as the economy grows and diversifies, as income increases and tourism expands. Traffic increase will be in terms of both international and domestic passengers and cargoes.

Bottlenecks are expected to appear first in the vicinity of large urban areas where interprovincial traffic will mix with relatively heavy urban traffic. On the other hand, in rural areas, safety will be more of a concern.

The most important corridor issue is how to meet traffic demand in terms of efficiency and function, e.g., short (i.e. urban traffic) to long-distance trip, small to large consignment, scheduled or unscheduled operation, and economical to fast/comfortable services. A balanced modal split among road, rail and coastal shipping will be developed to cope with these transport requirements.

Figure 4-B.2
Profile of North-South Coastal Corridor (Hanoi – HCMC)

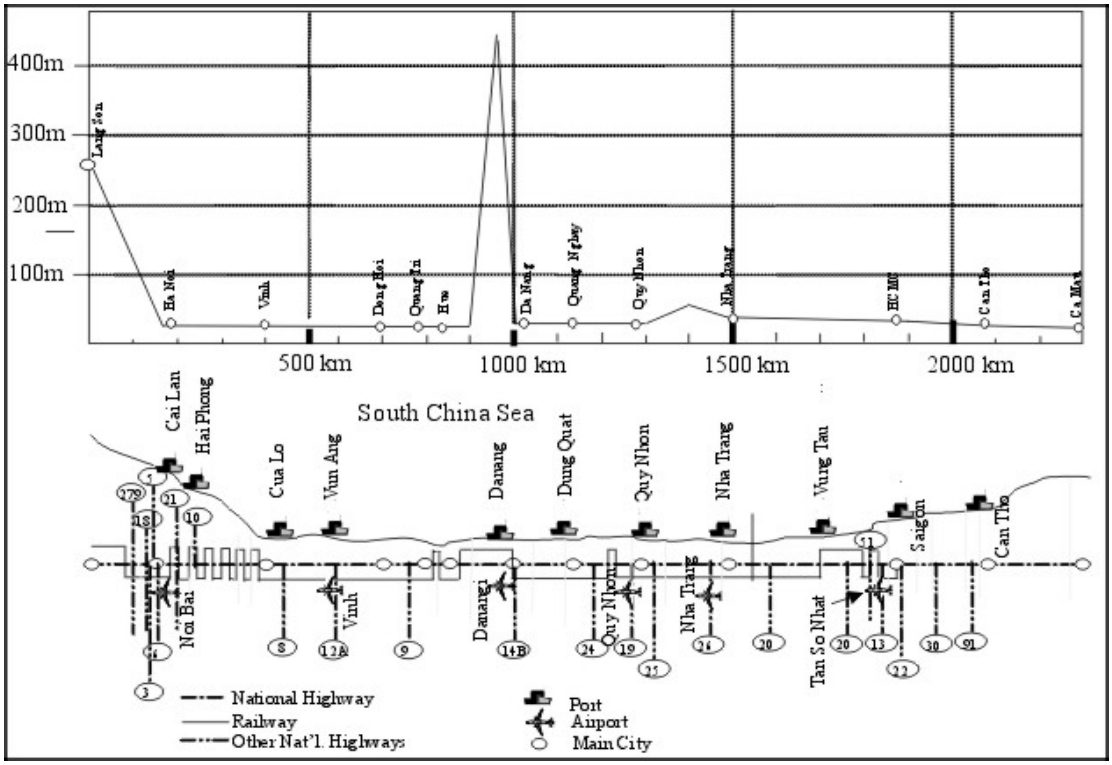


Table 4-B.2
Estimated Transport Demand along the Corridor

Transport Demand per Day						No. of Road Lanes		
1999		2010		2020		Existing in 1999	Additionally required by 2010	Additionally required by 2020
Pass. (No.)	Cargo (Ton)	Pass. (No.)	Cargo (Ton)	Pass. (No.)	Cargo (Ton)			
24,500-33,600	28,100-32,600	58,000-72,300	82,800-123,500	109,100-135,600	134,000-178,000	2	1.8-3.8	4.9-7.2

Modal share by corridor (%)

	1999			2010			2020		
	Road	Rail	Sea	Road	Rail	Sea	Road	Rail	Sea
Pass.	84	16	0	86	14	0	85	15	0
Cargo	37	3	60	42	6	52	40	12	48

2) Hanoi-Hai Phong-Quang Ninh Corridor

The corridor is currently serving mainly Hanoi-Hai Phong and is expected to support expanded activities in the region, particularly the Quang Ninh area, where the development of deep-sea port at Cai Lan is underway and economic development activities are to be expanded. The corridor is currently served by NH5, rail and IWT. Hai Phong port serves as the international gateway port in northern Vietnam. The planned development of Quang Ninh, NH18 and a railway line to Cai Lan will form part of the important components of the said corridor.

Considering the ongoing road improvement projects on NH5 and NH18, together with the existing railway and inland waterways, there will almost be no physical constraint along the corridor except crossing the wide rivers and shallow sea.

Along with the improvement in infrastructure, the corridor has locational advantage such as the concentration of population, industrial activities, tourism destinations, and transport infrastructure. However, an increase in urban transport may cause heavy inter-city traffic particularly on roads.

Although the corridor, including Quang Ninh, has sufficient capacity to accommodate the future traffic demand, it is expected that the Hanoi-Hai Phong corridor will be congested largely due to accelerating urbanization and increased local traffic. There is a need, therefore, to increase the capacity especially of deep-sea ports to alleviate this problem.

Table 4-B.3
Estimated Transport Demand along the Corridor

Transport Demand per Day (000)						No. of Road Lanes		
1999		2010		2020		Existing in 1999	Additionally required by 2010	Additionally required by 2020
52.6	45.9	132.6	70.7	261.2	95.7	6	0	0

Modal shares by corridor (%)

	1999			2010			2020		
	Road	Rail	IWT	Road	Rail	IWT	Road	Rail	IWT
Passenger	92	8	0	89	11	0	88	12	0
Cargo	34	13	53	39	18	43	43	23	34

3) Hanoi-Ninh Binh/Nam Dinh Corridor

This is a high-density transport corridor between the national capital and major industrial zones in northern Vietnam. It runs through semi-urbanized areas and forms part of the North-South Coastal Corridor. Linking with two other corridors, Hanoi-Hai Phong-Quang Ninh and Hai Phong-Nam Dinh/Ninh Binh, it creates a triangle that encloses the Red River delta core growth zone.

The corridor's terrain is flat and surrounded by rivers. The presence of the Day and Red rivers has facilitated the urbanization of Ninh Binh and the industrialization of Nam Dinh. The construction of a new canal, in addition to road and rail, is expected to strengthen the link between these two cities, which are being developed as satellite industrial cities of Hanoi. They possess strong economic ties with the national capital which can be reinforced if transport services are adequately provided.

The demand along this corridor is expected to grow significantly, requiring road expansion to be able to increase its capacity. This entails the difficult task of acquiring right-of-way and resettlement of affected parties. The potential role of rail transportation is significant here, while IWT's role will be more moderate (see Table 4-B.4).

Table 4-B.4
Estimated Transport Demand along the Corridor

Transport Demand per Day						No. of Road Lanes		
1999		2010		2020		Existing in 1999	Additionally required by 2010	Additionally required by 2020
Pass. (No.)	Cargo (Ton)	Pass. (No.)	Cargo (Ton)	Pass. (No.)	Cargo (Ton)			
72,000	37,200	131,000	79,000	237,900	132,700	2	2.3	6.9

Modal share by corridor (%)

	1999			2010			2020		
	Road	Rail	IWT	Road	Rail	IWT	Road	Rail	IWT
Passenger	84	16	0	81	19	0	76	22	1
Cargo	54	9	37	57	14	29	48	36	16

4) Hue-Danang-Hoi An Corridor

The corridor encompasses key urban areas of Danang and Hue in central Vietnam. The two cities, however, are not effectively connected due to the Hai Van Pass. Many tourist spots are located within the vicinity including Hoi An, My Son and Hue, three of four UNESCO World Heritage sites in Vietnam (the fourth is Ha Long Bay). Although the development in this area is yet insignificant relative to that of the north and south growth zone, the government is nevertheless committed to develop the corridor to promote progress in the central region.

The Hai Van Pass interrupts smooth traffic flow. The construction of the ODA-funded new Hai Van Pass tunnel will not only effectively link the two cities in the corridor but will promote integration of the north and south regions as well. Naturally, this will accelerate urbanization along the corridor and will generate substantial local traffic. Therefore, even with the new link, the threat of capacity constraint is great. New railway links through Hai Van Pass tunnel can be considered to minimize the threat. It will, at the same time, enhance the viability of rail transport service along the north-south coastal corridor.

Danang is expected to play a key role in the developing transport sector in central Vietnam. International shipping and air routes are expected to increase and the east-west land link between Lao PDR and Thailand will improve the position of Danang as a new economic hub in the region. Its rich cultural and natural resources can likewise contribute significantly to its development.

Table 4-B.5
Estimated Transport Demand along the Corridor

Transport Demand per Day						No. of Road Lanes		
1999		2010		2020		Existing in 1999	Additionally required by 2010	Additionally required by 2020
Pass. (No.)	Cargo (Ton)	Pass. (No.)	Cargo (Ton)	Pass. (No.)	Cargo (Ton)			
26,600	12,200	62,100	48,000	117,400	71,500	2	0.9	2.6

Modal share by corridor (%)

	1999		2010		2020	
	Road	Rail	Road	Rail	Road	Rail
Passenger	79	21	82	18	80	20
Cargo	88	12	84	16	71	29

5) Nha Trang-Da Lat-HCMC Corridor

The corridor has been growing fast, linking the largest consumption area of HCMC and the provinces of Dong Nai, Lam Dong and Khan Hoa which have strong agricultural, tourism and industrial potentials. The potential for tourism development include marine resorts around Nha Trang, a summer resort at Da Lat, and lakes, hot springs, waterfalls, and historic sites located along the route. The potential for agricultural development includes local vegetable and horticulture products which have large market shares in HCMC and even neighboring countries.

The only available mode of transport is road. However, the terrain is almost hilly or mountainous which makes road widening difficult especially in the mountainous sections. Considering the future growth of traffic demand, further expansion or improvement of design standards of roads should be duly considered prior to construction.

Table 4-B.6
Estimated Transport Demand along the Corridor

Transport Demand per Day						No. of Road Lanes		
1999		2010		2020		Existing in 1999	Additionally required by 2010	Additionally required by 2020
Pass. (No.)	Cargo. (Ton)	Pass. (No.)	Cargo (Ton)	Pass. (No.)	Cargo (Ton)			
16,400	19,400	21,600	51,000	30,800	94,400	2	0.8	3.0

6) HCMC-Vung Tau Corridor

This corridor is one of the most developed and urbanized areas with dense concentration of domestic and international industries. HCMC, Dong Nai and Ba Ria-Vung Tau have the highest per capita income in the country. With relatively well-provided infrastructure that support services and a large market, foreign direct investment in the area is most significant. Due to this, the corridor is getting congested with interprovincial, intra-provincial and suburban traffic.

Future increase in interprovincial transport demand is significant (see Table 4-B.7). The expansion of land transport capacity is largely dependent on the capacity of water transport in the corridor, which is also getting congested. Future development along the corridor is affected by two main factors. One is the location of deep-water gateway port whose function is currently met by Saigon Port group and two is the future regional development pattern along the corridor.

Major development constraints in this corridor are the numerous rivers and potential threat of ground subsidence due to heavy structures. With urbanization, land acquisition is sometimes difficult.

Table 4-B.7
Estimated Transport Demand along the Corridor

Transport Demand per Day						No. of Road Lanes		
1999		2010		2020		Existing in 1999	Additionally required by 2010	Additionally required by 2020
Pass. (No.)	Cargo (Ton)	Pass. (No.)	Cargo (Ton)	Pass. (No.)	Cargo (Ton)			
53,000	10,000	103,700	82,100	226,700	113,000	4	1.0	3.4

Modal shares by corridor (%)

	1999		2010		2020	
	Road	IWT	Road	IWT	Road	IWT
Passenger	97	3	98	2	98	2
Cargo	35	65	38	62	45	55

7) HCMC-Can Tho Corridor

This corridor is the most heavily trafficked corridor, linking HCMC and the core regional cities in Mekong delta such as My Tho and Can Tho. Capacity constraints on NH No. 1 are already visible and expected to worsen (see Table 4-B.8). The corridor has a good network of navigable inland waterways.

Table 4-B.8
Estimated Transport Demand along the Corridor

Transport Demand per Day						No. of Road Lanes		
1999		2010		2020		Existing in 1999	Additionally required by 2010	Additionally required by 2020
Pass (No.)	Cargo (Ton)	Pass (No.)	Cargo (Ton)	Pass (No.)	Cargo (Ton)			
77,200-114,400	24,100-27,700	139,400-199,900	70,000-76,000	236,900-327,500	110,000-120,900	2	2.5 – 3.4	5.5 – 6.9

Modal shares by corridor (%)

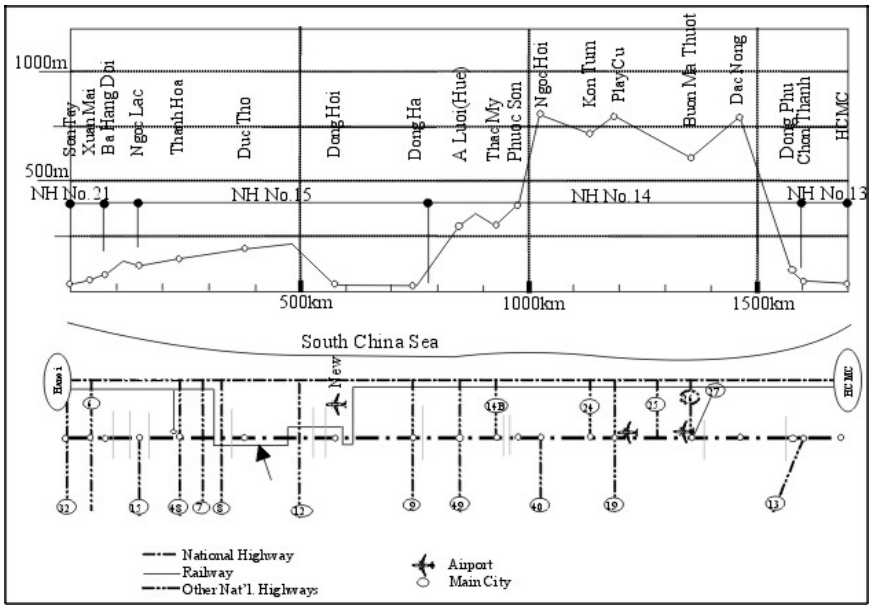
	1999			2010			2020		
	Road	Rail	IWT	Road	Rail	IWT	Road	Rail	IWT
Passenger	100	0	0	92	8	0	92	8	0
Cargo	71	0	29	82	5	13	79	11	11

2. Other Corridors

1) North-South Upland Corridor (Hanoi-HCMC)

This corridor will form the second north-south axis in the country, at the same time improve accessibility in the isolated hilly areas. The area's terrain is very hilly and steep and the existing road is often impassable particularly in the NH15 sections. Road construction/upgrading anticipates a number of difficulties such as the steep slope, landslides and environmental protection. The advantage of this corridor as a whole is the large potential of underdeveloped rural area for agriculture, tourism and off-farming activities. The NH14 section has a physical advantage since the section Danang-HCMC (896 km) is shorter than the parallel NH1 section (970 km), which would attract more traffic. Future interprovincial transport demand is moderate though varied by section.

Figure 4-B.3 Profile of North-South Upland Corridor



2) Hai Phong-Ninh Binh/Nam Dinh Corridor

The corridor is served by NH10 (about 150 km) and inland waterway. The terrain is flat. However, there are many wide rivers to cross and flood occurs frequently. Its advantages are its proximity to ports, industrial zones and urban centers, and well-developed waterway.

This corridor has a great potential to expand the growth zones in the north through its strategic integration with Hanoi-Hai Phong-Quang Ninh corridor and Hanoi-Ninh Binh/Nam Dinh corridor to form a large triangular corridor network. Potential traffic demand is large; the role of inland waterway is especially important.

3) Lao Cai-Lang Son-Quang Ninh Corridor

This is a road-only corridor linking rural provinces near the border with China. The terrain is highly mountainous for most of the sections with a number of faults. Difficulties expected during construction work are the prevention of landslides and encroachment on precious ecology. Its advantage is the large potential for rural/tourism development by providing minimum access to the rural population. The estimated future interprovincial transport demand is minimal, though the local traffic near growth centers is much more.

4) Lao Cai-Son La-Ha Tay Corridor

This is the western portion of preceding corridor and links rural provinces near the border with China and Lao PDR. The terrain is also highly mountainous for most of the sections. To prevent landslides and encroachment on precious ecology, necessary measures need to be implemented during construction work. Its advantage is the large potential for rural/tourism development by providing minimum access to the rural population. The estimated traffic demand is moderate.

5) Quang Ninh-China Corridor

This is a coastal corridor connecting Vietnam's international port area with the southernmost part of China. Cross-border movement of passenger and cargo is negligible at present due to institutional constraints. If these are removed, a number of Chinese tourists will visit Ha Long considering the current tourism boom in China. The potential of cross-border trade is large.

6) Hanoi-Lang Son-China Border

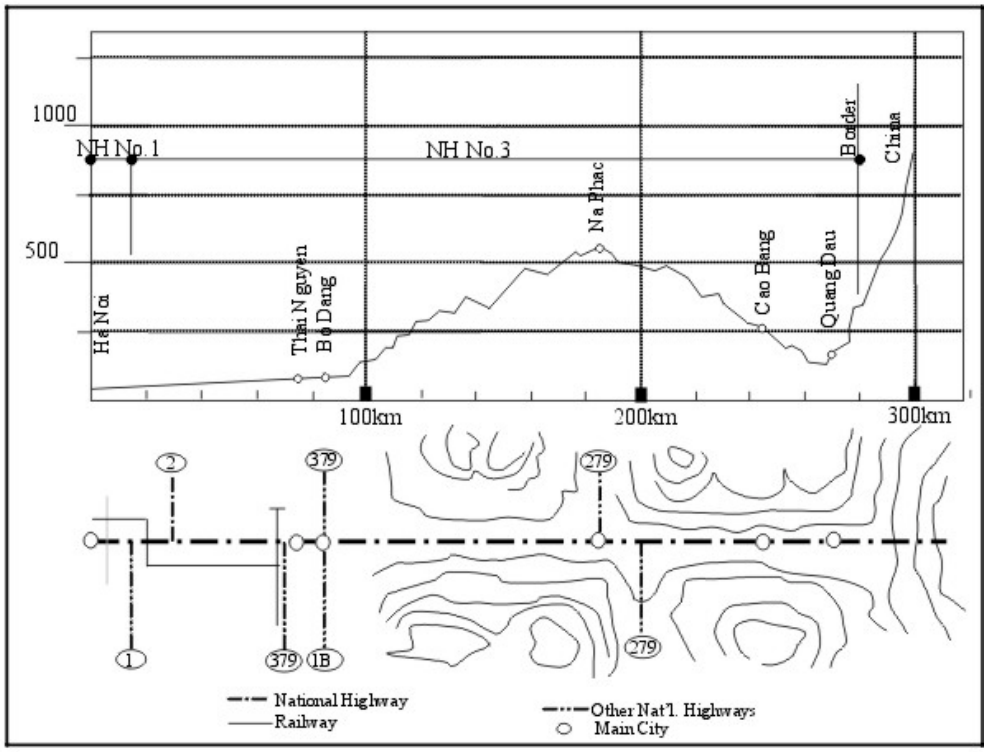
This is the traditional and shortest corridor linking Hanoi with China via NH1 and rail. The corridor serves Ha Bac and Lang Son provinces. Interprovincial traffic demand is moderately high and expected to grow in the future, though the growth is largely affected by Vietnam's cross-border transport arrangement with China.

No capacity constraints are expected in the near future except around the urbanized areas.

7) Hanoi-Cao Bang Corridor

The 300-km long road transport corridor is characterized with two sections: Hanoi-Thai Nguyen and Thai Nguyen-Cao Bang (see Figure 4-B.4). The former section is considerably urbanized, while the latter is in rural or isolated areas. Although interprovincial transport demand to/from the mountains is minimal the corridor needs to be improved to support further socio-economic development in the region.

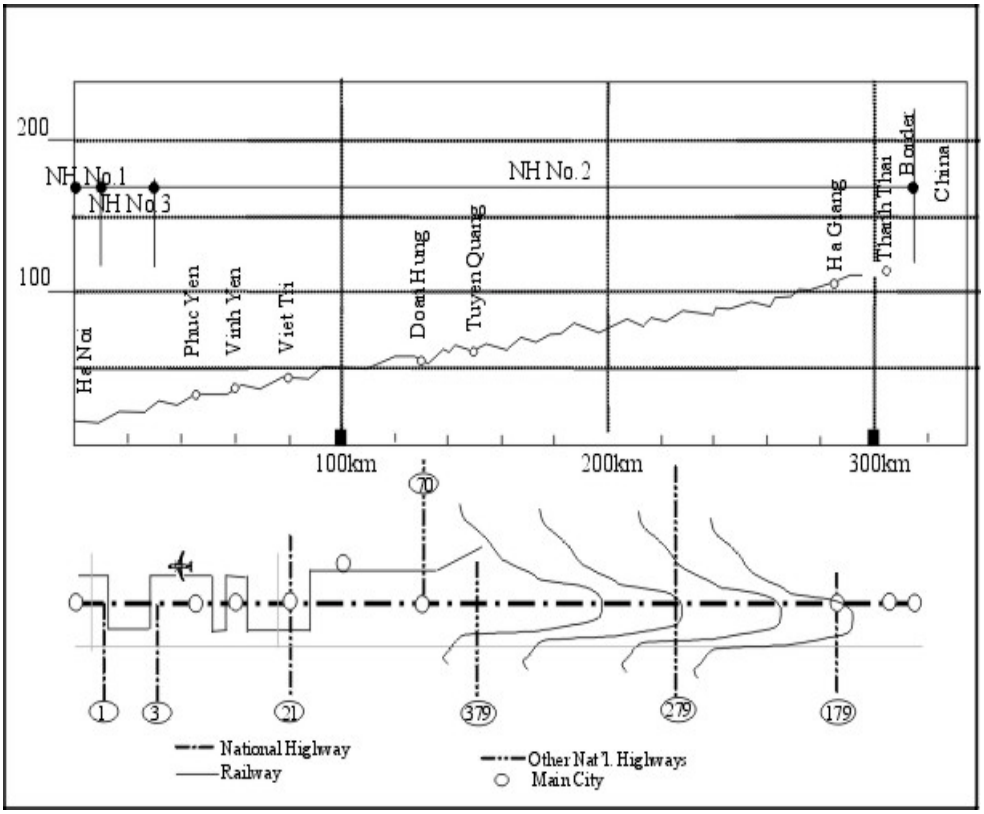
Figure 4-B.4
Profile of Hanoi-Cao Bang Corridor



8) Viet Tri-Ha Giang Corridor

This corridor, NH2, is 300 km long linking Viet Tri and Ha Giang via Phu Tho and Tuyen Quang provinces. It leads to Yun Nan province in China with gradually ascending alignment (see Figure 4-B.5). Although the altitude is not so high even at the border with China, the mountains along the road are steep and the valley is winding. In developing transport infrastructure, countermeasures should be taken to prevent landslides, soil erosion, ecological damage, and negative impacts on vulnerable people. The potential for rural and tourism development is considered to be high. Future demand is moderate, requiring a good two-lane road.

Figure 4-B.5
Profile of Viet Tri-Ha Giang Corridor



9) Hanoi-Lao Cai-China Corridor

This is a multimodal corridor extending from Hanoi to Yunnan, China, along the Red River, railway and NH70 with an approximate distance of 300 km (see Figure 4-B.6). Although the slope is not steep along the corridor, available land is scarce. The Red River is narrow in some sections and navigation becomes difficult frequently. The ADB has started the corridor development study. It is hoped that the potential of river transport could be identified. The largest advantage of this corridor is the linkage with China by road, rail and IWT. China is reportedly intent on standardizing rail gauge from 1,000 mm to 1,435 mm. Before this project is implemented (then, the direct rail linkage is lost between Hanoi and Kun Ming), the Government of Vietnam should discuss it with related authorities in China.

The estimated transport demand is moderately high and potential demand for rail is notable both for passenger and goods. Inland waterway is also important to some extent in goods transport.

Table 4-B.9
Estimated Transport Demand on the Corridor

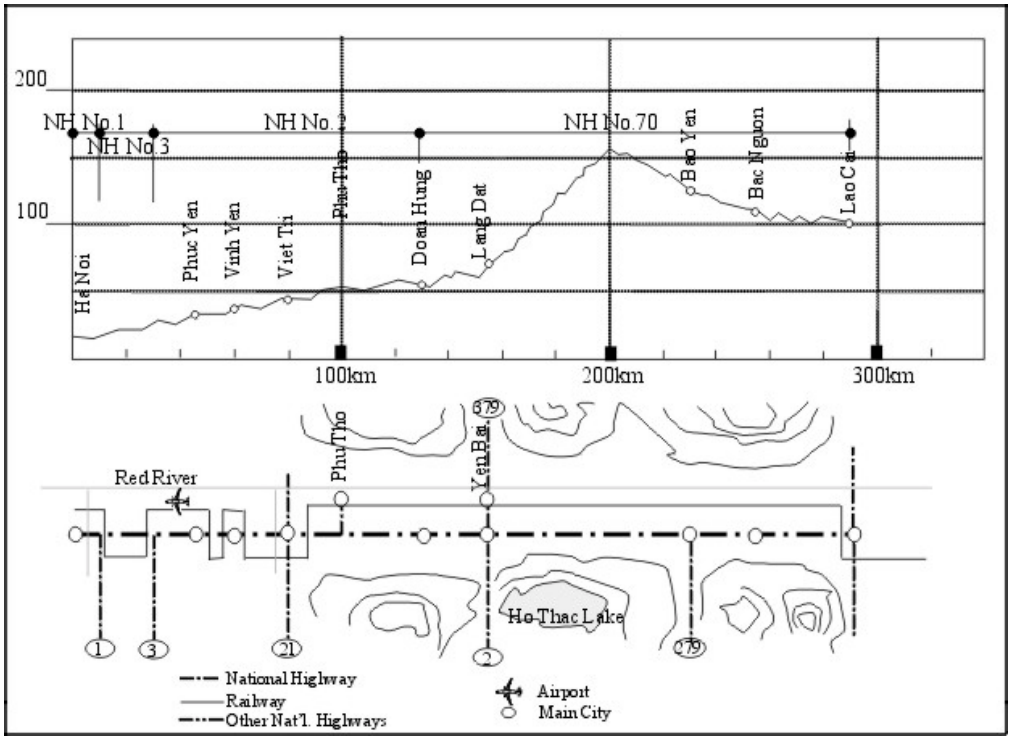
Outline of transport demand by corridor

Transport Demand per day						No. of Road Lanes		
1999		2010		2020		Existing in 1999	Additionally required by 2010	Additionally required by 2020
Pass (No.)	Cargo (Ton)	Pass (No.)	Cargo (Ton)	Pass (No.)	Cargo (Ton)			
4,100	3,800	5,100	4,900	7,500	13,100	2	0	0

Modal shares by corridor %

Year	1999			2010			2020		
Mode	Road	Rail	IWT	Road	Rail	IWT	Road	Rail	IWT
Pass.	60	40		52	48	0	50	50	0
Cargo	14	86		32	60	9	40	48	12

Figure 4-B.6
Profile of Hanoi-Lao Cai-China Corridor

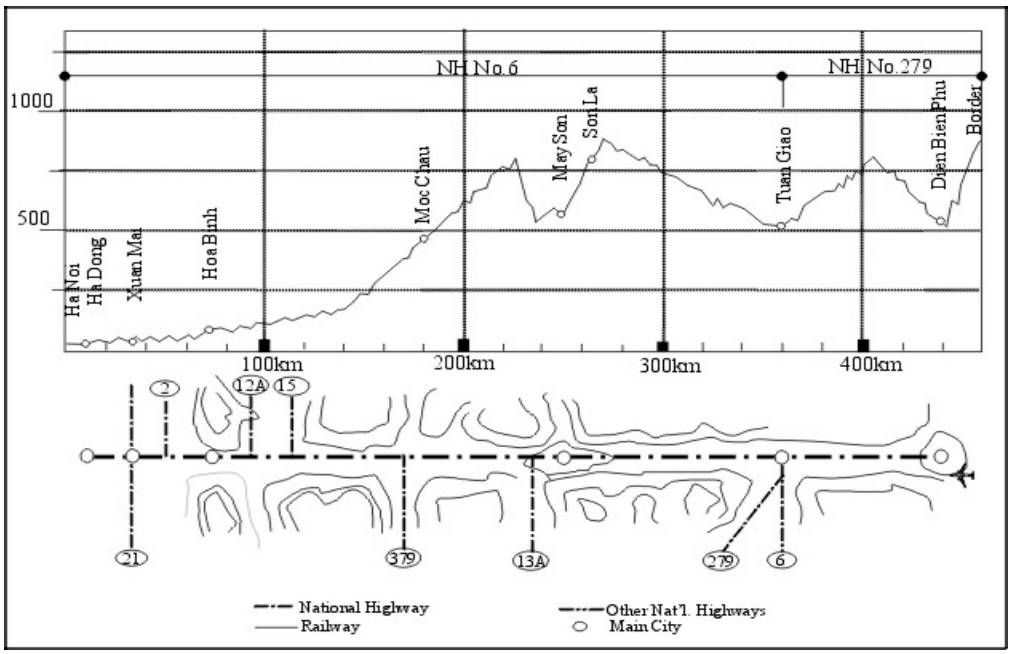


10) Hanoi-Dien Bien Phu-North Lao PDR Corridor

The corridor covers the provinces of Vinh Phuc, Phu Tho, Yen Bai, Lao Cai, Son La, and Lai Chau along NH2 and NH32 and further provides a link to Lao PDR (see Figure 4.4.7). The length of the mountain part of the corridor is about 200 km (Dien Bien Phu-Louang Phrabang), and most of the route is highly mountainous and scarcely populated. To prevent landslides, soil erosion and encroachment on ecologically precious flora and fauna, countermeasures need to be implemented

during construction work. Its opportunities lie in the potential for rural development, tourism and cross-border trade.

Figure 4-B.7
Profile of Hanoi-Dien Bien Phu-Lao PDR Corridor



11) Vinh-R8-Lao/Vientiane Corridor

This is one of the primary cross-border routes linking Cua Lo Port in Vinh with Vientiane, the capital of Lao PDR, and north-eastern Thailand. Similar to other cross-border routes, the terrain is highly mountainous at the border of Vietnam and Lao PDR. Although Cua Lo Port is intended to be a transshipment port for Lao's cargo, it requires dredging and other improvements, which are costly. The advantage of this route is the relatively short mountainous section and its proximity to Vientiane. The estimated transport demand is limited.

12) Vung Ang-R12-Lao/Tha Khet Corridor

This is one of the east-west corridors connecting Vietnam with Tha Khet, Lao PDR. The situation is similar to other corridors. Estimated traffic is limited.

13) Dong Ha-R9-Lao/Savanakhet Corridor

This is one of the east-west corridors connecting Vietnam with Savanakhet, Lao PDR. Although the terrain is mountainous at the Vietnam-Lao border, the topography is the most moderate of all. The road development project financed by ADB is ongoing. The ports located in Danang Bay will serve this corridor as transshipment ports.

14) Danang-R 14B-14-40-Lao/Pakse Corridor

This is another east-west corridor linking Vietnam with Pakse, Lao PDR. The terrain is mountainous at the border with Laos. The percentage of mountainous section is high compared to R9 corridor mentioned earlier. One of the advantages of this corridor is that the gateway ports are located in Danang Bay. The effect on rural development should not be neglected,
too.

15) Quy Nhon-R19-Central Cambodia Corridor

Another east-west corridor linking Quy Nhon with central Cambodia over the central highlands of Vietnam, it is one of the traditional primary cross-border routes between Vietnam and Cambodia linked by high-quality roads. The terrain of this route is mountainous within Vietnam. The route traverses rural areas with high potential for agricultural development. The Quy Nhon port and Plei Ku airport links this corridor with the national transport network.

16) Central Highlands-Nha Trang Corridor

This is a road corridor over the central highlands to promote agricultural development of the region. The terrain is hilly or mountainous though not steep. Attention should be paid to the flood-prone area along NH25. The advantage of this corridor is the vast cultivated area for industrial crops, relatively well-developed road and the Nha Trang Port.

17) Ho Chi Minh City-Cambodia/ Phnom Penh Corridor

This is one of the most important east-west corridors directly linking HCMC with the capital city of Cambodia, Phnom Penh. Although the terrain is flat, there are two major ferries on the Cambodia side. The ADB-financed Trans-Asia Highway Project aimed at upgrading the existing road is ongoing. Institutional arrangement needs to be improved to facilitate cross-border movement.

18) Can Tho-Ca Mau Corridor

This is the southernmost corridor of the country comprising road and IWT traversing the vast rice field in the Mekong delta. The ground is soft and a number of rivers exist. During the rainy season, rural access is sometimes lost due to poor road condition and insufficient clearance of bridges. The advantage of this corridor lies in its large potential for agriculture and fishery and in the well-developed water transport network.

19) Can Tho-R 9-Cambodia/Sihavoukville Port Corridor

Constraints and Opportunities: This is one of the secondary international corridors between Vietnam and Cambodia comprising road and IWT. The ground is soft and a number of rivers and canals exist. Rural access sometimes becomes difficult due to flooding. The border with Cambodia is closed for cross-border trade at present. However, the advantage of this corridor lies in the large potential for cross-border trade when the institutional barrier is removed.

Development Strategies: The objective is to promote rural development and cross-border trade between Vietnam and Cambodia by providing an all-weather transport corridor. Strategies include rehabilitation of existing transport infrastructure and improvement of roads and waterways.

20) Cuu Long-Cambodia Corridor

This is an international water transport corridor linking Vietnam with Cambodia. At present traffic volume is not significant due to the poor economic/social situation in Cambodia, prohibitive cross-border arrangements and the existence of Sihanoukville Port as a competitor. Information on river way conditions is not clear. However, the potential of this corridor is large because of the possibility to link Vietnam not only with Cambodia but also Lao PDR and Thailand via the Mekong river. It also has a number of feeder waterways inside Vietnam spreading all over the delta.

Appendix 4-C
Long List of Proposed Projects

Sector	Project No.	Project	Project Cost 2001- (M US$)
Road	*Primary Road Network Development Projects*		
	I. Trans-Nation North South Primary		
	1. National Highway No.1		
	H01	Highway Rehabilitation Project (Hanoi-Lang Son; 190km)	16.3
	H02	Highway Rehabilitation Project II (Vinh-Dong Ha; 100km)	23.7
	H03	2nd Road Development (Nha Trang-Quang Ngai; 600km)	81.5
	H04	Highway Rehabilitation Project III (Can Tho-Nam Can; 230km)	180.0
	H05	Bridge Rehabilitation Project - Phase I (435km)	16.2
	H06	Bridge Rehabilitation Project - Phase II (752km)	105.5
	H07	Hai Van Pass Tunnel (2 lanes, 14km)	225.9
	H08	My Thuan Bridge (1,535m)	15.9
	H09	Can Tho Bridge Construction	294.0
	H10	National Highway No.1 Urban Bypass (Hanoi-HCMC; 70km)	67.0
	H11	Hai Van Pass Tunnel (2nd tunnel, 10km)	250.0
	2. Ho Chi Minh Highway		
	H12	Rehabilitation and Upgrading of Ho Chi Minh Highway (Hoa Lac-Ngoc Hoi)	380.0
	H13	Rehabilitation of National Highway No.14	15.0
	II. Hanoi Metropolitan Area		
	H14	Hanoi Ring Road	256.0
	H15	Thanh Tri Bridge Construction	410.0
	H16	National Highway No.5 Improvement Project (remaining section, 91km)	215.6
	H17	National Highway No.18 Widening Projects - Phase 2 (remain section, 70km)	232.0
	H18	Bai Chay Bridge Construction	98.0
	H19	National Highway No.1 Hanoi - Ninh Binh Widening Project (80km)	76.0
	III. Northern Region		
	H20	National Highway No.70 Upgrading Project (Hanoi-Lao Cai; 191km)	125.0
	H21	National Highway No.10 Upgrading Project (147km)	302.0
	H22	National Highway No.21 Upgrading Project (80km)	58.0
	IV. Central Region		
	H23	East-West Corridor Project (ASEAN 7; NH8, 8B; 110km)	90.0
	H24	East-West Corridor Project (ASEAN 8; NH9; 75km)	24.0
	H25	East-West Corridor Project (ASEAN 7A; NH12A, 29; 120km)	39.0
	H26	National Highway No.40 Upgrading Project (ASEAN 7B,24km)	14.0
	H27	Rehabilitation (NH19, 20, 24, 26, 27, 28)	150.0
	H28	Rehabilitation Phase II (NH19/20/24/25/26/27/28; 868km)	805.0
	V. HCMC Metropolitan Area		
	H29	Trans HCMC Highway Project (21.4km)	758.6
	H30	Trans Asia Highway Project (NH22 to Cambodia; 80km)	144.7
	Secondary Road Network Development		
	H31	Hanoi-Cao Bang (NH3) Improvement (310km)	148.0
	H32	Hanoi-Ha Giang (NH2) Improvement (300km)	137.0
	H33	Hanoi-Dien Bien Phu (NH6) Improvement (468km)	223.0
	H34	Hanoi-Lai Chau (NH32) Improvement (390km)	200.0
	H35	North C1 (North-East Ring, NH5-NH3, NH37; 150km)	101.0
	H36	North C1 (North Ring, NH3-NH70, NH37; 115km)	122.0
	H37	North C1 (West-South Ring, NH70-NH1, NH37/15/47; 295km)	216.0
	H38	North C2 (North-East Ring, NH5-NH3, NH279; 255km)	171.0
	H39	North C2 (North Ring, NH3-NH70, NH279/1B; 120km)	83.0
	H40	North C2 (North-West Ring, NH70-NH6, NH279; 150km)	107.0
	H41	Cua Ong-Bac Luan (NH18) Road Improvement (130km)	92.0
	H42	Hung Yen-Thai Binh Road (NH39) Improvement (100km)	124.0
	H43	HCMC-My Tho Road (NH50) Improvement (80km)	79.0
	H44	My Tho-Soc Trang Route Improvement (NH60) (120km)	235.0
	H45	Can Tho-Ha Tien Improvement (NH80) (200km)	197.0
	H46	Can Tho-Kien Giang-Ca Mau Route (NH61,63) Improvement (200km)	197.0
	H47	Ho Chi Minh Highway Extension (N2)(Chan-Thanh-An Giang; 60km)	58.0
	H48	NH22B Improvement (Go Dau-Xau Mai; 80km)	55.0
	H49	Secondary Road Network rehabilitation Program	94.0
	H50	Tertiary Road Improvement Project	569.0
	H51	Tertiary Road Improvement Project - Phase 2	404.0
	Road Safety		
	H52	Road Safety Improvement Program	30.0

Appendix 4-C
Long List of Proposed Projects

Sector	Project No.	Project	Project Cost 2001- (M US$)
	Expressway		
	H53	North-South Expressway 1 (Hanoi-Vinh, 310km)	930.0
	H54	North-South Expressway 2 (Vinh-Hue, 400km)	1,200.0
	H55	North-South Expressway 3 (Hue-Danang, 100km)	300.0
	H56	North-South Expressway 4 (Danang-Nha Trang, 550km)	1,650.0
	H57	North-South Expressway 5 (Nha Trang-HCMC, 420km)	1,260.0
	H58	Noi Bai-Ha Long Expressway (150km)	750.0
	H59	HCMC-Vung Tau Expressway (90km)	450.0
	H60	HCMC-Can Tho Expressway 1 (HCMC-My Tho; 50km)	350.0
	H61	HCMC-Can Tho Expressway 2 (My Tho-Can Tho; 80km)	560.0
	H62	Lang - Hoa Lac Expressway (30km)	60.0
	H63	Hanoi Ring Road 3 Expressway (70km)	350.0
	H64	Dong Anh - Thai Nguyen Expressway (54km)	81.0
	H65	Ba La - Xuan Mai Expressway (21km)	21.0
	H66	Noi Bai - Viet Tri Expressway (50km)	50.0
	H67	Binh Phuoc - T. D. Mot Expressway (30km)	90.0
	H68	HCMC Ring Road Expressway (80km)	400.0
		Subtotal	**17,612.9**
Railway	*Rehabilitation and Minor Improvement*		
	R01	Hanoi-HCMC Railway Bridge Rehabilitation	47.0
	R02	Rehabilitation of Tracks & Bridges	325.0
	R03	Rehabilitation of Tracks & Bridges - Phase 2	415.0
	R04	Hai Van Pass Tunnel	389.0
	R05	Signal and Communication Equipment Modernization	128.0
	R06	Signal and Communication Equipment Modernization - Phase 2	128.0
	R07	Alarm at Crossings	21.0
	Capacity Expansion of Critical Sections		
	R08	New Stations for Train Exchange (100 stations)	26.0
	R09	New Stations for Commuters (30 stations)	8.0
	R10	Large Scale Freight Stations (30 stations)	486.0
	R11	Bien Hoa - Saigon section (29.4km)	130.0
	R12	Hanoi - Haiphong section (101.4km)	293.0
	R13	Hanoi - Giap Bat section (5.4km)	32.0
	R14	Giap Bat - Phu Ly section (51km)	129.0
	R15	Gia Lam - Yen Vien section (5.3km)	13.0
	R16	Hanoi - HCMC line (Phu Ly - Hue; 632km)	1,173.7
	R17	Hanoi - HCMC line (Danang - Bien Hoa; 906km)	1,682.6
	R18	Yen Vien - Viet Tri (62km)	115.1
	R19	Dong Anh - Ton Dong (5km)	9.3
	R20	Bac Hong - Van Dien (40km)	74.3
	R21	Single Tracking (Mao Khe - Ha Long; 48km)	75.4
	New Lines		
	R22	Saigon - My Tho (70km)	382.0
	R23	My Tho - Can Tho (100km)	450.0
	R24	Short-cut Line (Phu Thai - Mao Khe; 15km)	31.1
	R25	HCMC - Vung Tau (80km)	360.0
	Operation		
	R26	Rolling Stock Acquisition	1,882.0
	R27	Rolling Stock Acquisition - Phase 2	3,570.0
	R28	CTC and Computerization	136.0
		Subtotal	**12,511.5**
Inland Waterway	*Port Improvement*		
	W01	Hanoi/Khuyen Luong Port Improvement	11.0
	W02	Hanoi/Khuyen Luong Port Improvement - Phase 2	7.5
	W03	Ninh Binh/Ninh Phuc Port Improvement	14.4
	W04	Ninh Binh/Ninh Phuc Port Improvement - Phase 2	9.4
	W05	Viet Tri Port Improvement	3.5
	W06	Viet Tri Port Improvement - Phase 2	8.1
	W07	Hoa Binh Port Improvement	4.0
	W08	My Tho/Can Tho Port Improvement for IWT	6.1
	W09	My Tho Port Improvement for IWT - Phase 2	3.2
	W10	Vinh Thai (Vinh Long) Port Improvement	4.3
	W11	Vinh Thai (Vinh Long) Port Improvement - Phase 2	2.6

Appendix 4-C
Long List of Proposed Projects

Sector	Project No.	Project	Project Cost 2001- (M US$)
	W12	Ca Mau Port Improvement	2.9
	W13	Ca Mau Port Improvement - Phase 2	1.5
	W14	Cao Lanh (Dong Thap) Port Improvement	6.4
	W15	Cao Lanh (Dong Thap) Port Improvement Phase 2	6.1
	W16	My Thoi (Long Xuyen) Port Improvement	6.2
	W17	My Thoi (Long Xuyen) Port Improvement - Phase 2	7.6
	W18	Passenger Terminal Development	2.2
	W19	Passenger Terminal Development - Phase 2	2.6
	W20	Other Local Port Development	47.7
	W21	Other Local Port Development - Phase 2	42.0
	Waterway Improvement		
	W22	Quang Ninh-Hanoi/Pha Lai Waterway Improvement	13.9
	W23	Ninh Binh/Nam Dinh-Hanoi Waterway Improvement	19.9
	W24	Quang Ninh-Nam Dinh/Ninh Binh Waterway Improvement	6.0
	W25	Hanoi-Viet Tri-Lao Cai Waterway Improvement	74.0
	W26	Hanoi-Viet Tri-Lao Cai Waterway Improvement - Phase 2	33.2
	W27	Viet Tri - Tuyen Quang/Hoa Binh Waterway Iimprovement	3.6
	W28	Pha Lai - Thai Nguyen/Bac Giang Waterway Improvement	3.6
	W29	HCM-Can Tho Waterway Improvement	23.2
	W30	Can Tho-Ca Mau Waterway Improvement	17.6
	W31	Cho-Lach-Kien Luong Waterway Improvement	25.5
	W32	Saigon-Dong Thap Muoi-Long Xuyen Waterway Improvement	5.4
	W33	Thi Vai-Nuoc Man Canal Development	3.2
	W34	HCMC - Moc Hoa/Ben Keo/Ben Suc Waterway Improvement	6.5
	W35	Da River and Hoa Binh Port Improvement in Hoa Binh Lake	2.1
	W36	Cuu Long-Cambodia Waterway Improvement	20.5
	W37	Island Service Improvement (Co To and Cat Ba Islands)	2.5
	W38	Island Service Improvement (Other Islands)	4.6
	Operation & Safety		
	W39	IWT Safety Enhancement	52.7
	W40	IWT Safety Enhancement - Phase 2	67.3
	W41	IWT Education	14.1
	W42	IWT Education - Phase 2	14.1
	W43	IWT Fleet Development	191.9
	W44	IWT Fleet Development - Phase 2	209.6
		Subtotal	**1,014.3**
Port & Shipping	*Port Expansion/Development*		
	P01	Cai Lan Port Expansion Project	128.1
	P02	Cai Lan Port Expansion Project - Phase 2	250.0
	P03	Hai Phong General Port (Phase II)	138.0
	P04	Hai Phong General Port New Expansion Project	250.0
	P05	Cua Lo Port Project	49.3
	P06	Cua Lo Port Project - Phase 2	50.0
	P07	Danang Bay - Lien Chieu Port Development	158.0
	P08	Danang Bay - Lien Chieu Port Development - Phase 2	200.0
	P09	Danang Bay - Tien Sa Port Rehabilitation	172.0
	P10	Specialized Port for Dung Quat Industrial Zone	130.0
	P11	Specialized Port for Dung Quat Industrial Zone - Phase 2	240.0
	P12	Qui Nhon Port Development	36.0
	P13	Qui Nhon Port Development - Phase 2	80.0
	P14	Nha Trang Port Development	57.0
	P15	Nha Trang Port Development - Phase 2	80.0
	P16	Ho Chi Minh City General Port	200.0
	P17	Ho Chi Minh City General Port - Phase 2	200.0
	P18	Ba Ria-Vung Tau General Port	206.0
	P19	Varia Vung Tau General Port - Phase 2	800.0
	P20	Can Tho Port Development	64.0
	P21	Can Tho Port Development - Phase 2	150.0
	P22	Industrial Port Development	67.0
	P23	Industrial Port Development - Phase 2	200.0
	P24	Other Local Ports	22.7
	P25	Other Local and Private Ports - Phase 2	200.0

Appendix 4-C
Long List of Proposed Projects

Sector	Project No.	Project	Project Cost 2001- (M US$)
	Operation & Safety		
	P26	Port EDI System at Gateway Ports	10.0
	P27	Large-scale ICD Development Project	72.2
	P28	Large-scale ICD Development Project - Phase 2	144.5
	P29	Fleet Expansion and Modernization Program	1,407.0
	P30	Fleet Expansion and Modernization Program - Phase 2	2,142.0
	P31	Development of Aids to Navigation (ATN)	63.6
	P32	Development of Aids to Navigation (ATN) - Phase 2	133.6
	P33	Maritime SAR and Oil Spill Protection	52.8
	P34	Maritime SAR and Oil Spill Protection - Phase 2	105.6
	P35	Seafarers' Education Upgrading Project	20.9
		Subtotal	**8,280.3**
Air	*Airport Expansion/Development*		
	1. Noi Bai International Airport		
	A01	Noi Bai International Airport Development Project	17.1
	A02	New Passenger Terminal Building (T1) Construction in Noi Bai International Airport	24.0
	A03	Noi Bai Airport Development Project - Phase 1	53.9
	A04	Noi Bai Airport Development Project - Phase 2	59.1
	2. Danang International Airport		
	A05	Danang International Airport Development Project - Phase 1	77.7
	A06	Danang International Airport Development Project - Phase 2	31.9
	3. Tan Son Nhat International Airport (HCMC Area)		
	A07	Expansion of International Passenger Terminal Building in Tan Son Nhat International Airport	6.0
	A08	Airfield Pavement Overlay in Tan Son Nhat International Airport	14.4
	A09	Tan Son Nhat International Airport Development Project	226.7
	A10	New Long Thanh Airport Construction Project	350.0
	4. Other Airports		
	A11	Secondary Airport Development Project (Cat Bi, Phu Bai, Nha Trang)	85.6
	A12	Secondary Airport Development Project - Phase 2	1.0
	A13	New Airport Construction Project (Cao Bang, Lao Cai, Dong Hoi, Chu Lai)	83.6
	A14	Rehabilitation of Tertiary Airports - Phase 1 (9 airports)	120.8
	A15	Rehabilitation of Tertiary Airports - Phase 2	3.1
	Air Traffic Control		
	A16	Reconstruction of HCM Area Control Center and Noi Bai Air Traffic Management Center	58.0
	A17	Provision of Navigation Aids in Secondary Airport (Cat Bi, Phu Bai, Nha Trang)	4.5
	A18	Provision of Control Tower System Packages and Automatic Weather Observation Stations (AWOS) in 4 New Airports	1.3
	A19	Communication and Navigational Equipment Replacement Program	12.2
	A20	Equipment Installation and Upgrading Project for New CNS/ATM -Phase 1	32.8
	A21	Equipment Installation and Upgrading Project for New CNS/ATM - Phase 2	10.9
	A22	Restructuring of Air Traffic Service - Direct Speech (ATS-DS) Circuits and Aeronautical Fixed Telecommunications Network (AFTN)	2.5
	A23	Rehabilitation of Civil Aviation Training Center of Vietnam (CATCV)	3.0
	A24	Flight Calibration of Navigation Aids	1.1
	A25	Test Equipment Replacement and the Equipment Standards Laboratory	1.9
	A26	Development of CNS/ATM Facilities in Hanoi ATM Center	5.0
	A27	Equipment Replacement Program	68.9
	A28	Improvements to Aeronautical Information Services (AIS)	2.0
	A29	Modernization of Aeronautical Fixed Telecommunications Network (AFTN)	1.5
	A30	Improvements of Search and Rescue Facilities	1.1
	A31	Upgrade of Civil Aviation Training Center of Vietnam	4.0
	Aircrafts		
	A32	New Aircraft	400.0
	A33	Aircraft Purchase	1,889.0
	A34	Aircraft Purchase (2010-2020)	7,908.0
		Subtotal	**11,562.6**
		TOTAL	**50,981.6**

APPENDIX 4-D: FUNDING SYSTEM FOR TRANSPORT FACILITIES IN JAPAN

1. Responsible Bodies

Transport facilities are developed and operated by a variety of organizations in Japan as shown in Table 1.1. They can be summarized as follows:

1) Various types of organizations are involved, viz:

- National government
- Local government(s)
- Municipal corporation (independent budget of local government)
- Public corporation
- Third sector (joint venture of public and private sectors)
- Private company

2) All transport facilities are not regarded as public properties. The extent to which they are recognized as such depends on the historical background of each transport facility.

3) Some transport services are provided independently from the development of the transport facility (e.g. road transport vs. road, aviation vs. airport, shipping vs. port), while transport services and infrastructure development/maintenance are managed in an integrated manner in some cases (e.g. most railways).

4) If transport services are provided separately from infrastructure management, infrastructure is developed by the public sector as a social capital, and services are offered by the private sector as influenced by the market.

5) The dominance of private transport gives constant pressure on transport businesses.

2. Funds for Transport Facility Development

Due to the diverse operating bodies and the different historical background of transport facilities, fund sources for developing transport infrastructure are also varied. In general, there are three fund sources for investment as shown in Table 2.1.

1) Fund Source of the Central Government

The fund sources of the national government are general budget, special-purpose budget and treasury investment and loan. The general budget is collected from various taxes, other non-tax revenues, national bond, etc. Special-purpose budget is established when the interrelation between payers and beneficiaries is clearly defined. Thus the sources of the special-purpose budget are taxes

earmarked for specific purpose, tolls and charges of specific facilities, etc. The sources of the treasury investment and loan are postal savings, pension funds, national insurance funds, etc., and they are invested when the benefit of transport infrastructure development can be enjoyed by two or more generations.

2) Fund Source of the Local Government

In Japan, local finance can be divided into general account and municipal corporation account. The former comes from local taxes, subsidy from national government, local bonds, etc., and the latter is collected as revenues for services provided by the local government, local bonds and transfers from the general account.

3) Fund Source of Transport Enterprise

Excluding the case when national or local government directly operates transport services (but including the case when a public organization establishes a separate account), the fund sources are fare revenue, capital (including those from national and local government), contribution from beneficiaries, government subsidy (including those for loan interest), loan, etc.

The final payers of these funds are summarized in Table 2.2.

3. Notable Examples

3.1 Special Account for Road Development

Development of roads in Japan has been accelerated by the Special Account for Road Development coupled with the Toll Road System. This account adopts two principles, i.e.; “Beneficiaries should pay” and “Damage should be compensated by damage makers”. Thus the tax revenues built in this account are earmarked for the specific purpose of road development.

1) Revenue for the Special Account: The taxes for the national government are gasoline tax, oil and gas tax and vehicle weight tax. For the local government, there are transfers from the national government of the above-mentioned taxes, oil dealing tax and vehicle excise duty (see Figure 3.1 and Table 3.1)

2) Past Trends of Investment Amount: Due to this special account, road development has been conducted in a large scale in Japan. Its investment size has grown rapidly in parallel to the motorization, and its ratio to the GNP has been 2.0 to 2.5% since 1965 as shown in Figure 3.2.
In addition, Table 3.2 shows the recent tendency of vehicle-related taxes in Japan. Nearly 40% of road investment is financed by special-purpose taxes earmarked for road development.

3) Advantages of Special Account: The Special Account has the following advantages:

- Efficiency
  Investment is made in the market mechanism reflecting the need for road development.
- Impartiality
  Beneficiaries are charged depending on the benefit they receive and the loss they cause on roads as well as the energy consumption. Under the administrative system in Japan, “free ride” is impossible.
- Stability
  Social capital including roads should be developed continuously based on long-term plans and policies. Due to the independent characteristics of the Special Account, road development can be pursued regardless of current recession and financial situation.
- Perception
  Since the purpose of the Special Account is specific (i.e. for road development), the taxpayer’s understanding is easily obtained.

Special accounts of this type have been introduced in many countries and have contributed largely to the development of roads as well as public transport. Particularly in developing countries where funds are limited, the Special Account can be an effective measure for infrastructure development. In Vietnam, some of the road-related taxes are also used for road development. Although its amount is still small, it will increase rapidly as people’s income grows and motorization proceeds. It is important for Vietnam to secure funds for transport infrastructure development based on road vehicle-related taxes and duties. However, attention must be paid on the following points:

- Since special accounts are earmarked for specific purpose, flexibility of finance lessens.
- Road traffic problems, such as congestion and environmental degradation, cannot be solved solely by road development. The fund should be invested not only in roads but in public transport and other possible measures based on a long-term and comprehensive strategy.

3.2 Treasury Investment and Loan

Treasury Investment and Loan is defined as a government activity of finance mediation. More specifically, it is the investing and lending activities of the national government of Japan using public funds produced from postal savings, pension funds and insurance funds to accomplish predetermined policy objectives (e.g. strengthening of social capital, stimulation of domestic demand).

1) Fund Source and Use: The fund sources of the Treasury Investment and Loan are postal savings, pension fund, insurance fund, government guaranteed bond,

etc. The use of this fund is three-fold. The first is the finance for financial deficiencies of national and local governments. The second is the public loan represented by the housing loan given to the citizen through government financing organizations. The third is the finance for public investment on projects that generate revenues. This includes the finance for public investment by special accounts and public corporations, purchase of bonds for public investment, etc. In the field of transport, loans are provided, for instance, to public corporations and other organizations when they construct toll roads, railways and airports.

2) Characteristics: The characteristics of the Treasury Investment and Loan in Japan are:

- Most of the source funds should be repaid with an interest of a certain level since they are collected from postal savings, pension fund, insurance fund, etc. Hence the projects to be financed should generate revenues.
- This fund can be used at the discretion of the administrative organizations up to a certain level without the approval of the Diet. Thus it becomes possible to quickly respond to the current economic situation.
- Since transport infrastructure is used for a long time, it is logical to construct using loans and to repay them with user charges.

It may be considered effective in developing countries where financial resources are scarce to establish a system, like postal savings and pension fund, and to make use it as a fund source to develop transport infrastructure.

Table 1.1 Transport Operating Bodies in Japan

Transport Facility	Type of Transport Service	Responsible Body
Railway	High-speed urban rail	Public corporation, Private company, Municipal corporation, 3rd sector, JR
	Local railway	Public corporation, Private company, 3rd sector, JR
	Inter-city railway	Public corporation, Private company, JR
Airport	Main airport	Central government, Public corporation, 3rd sector
	Other airport	Central government, Local government
	Commuter airport	Local government
	Heliport	Local government
	Air lane	Central government
	Terminal	Private company
Port	Main facilities	Central government, Local government, Public corporation, Private company
	Other facilities	Local government
	Preparation of port site	Local government
Road	National road	Central government, (Partly local government)
	Prefectural road	Prefecture government and city government
	City and village road	City and village government
	Inter-city toll road	Public corporation, 3rd sector
	Urban toll road	Public corporation
	Other toll road	Public corporation, City and village government
	Toll bridge	Prefecture, city and village government
Street	Street Kukakuseiri.	Local government, Public corporation, 3rd sector
	Town redevelopment	Individual, Association, Local government, Public corporation
Monorail, GRT		Local government, 3rd sector,

Table 2.1 Fund Sources for Transport Facility Development

Responsible Body	Fund Source
Central government	General purpose tax. Special purpose tax. User fee. Postal saving. National insurance. Pension. National bond.
Local government	General purpose tax. Special purpose tax. Local bond
Transport enterprise	Revenue. Capital. Investment and loan by central and local government and private sector. Subsidy by central and local government.

Table 2.2 Final Payers of Funds for Transport Facility Development

Enterprise	Financial resource	Final payer
Central government	General purpose tax	State Budget
	Special purpose tax	Beneficiaries
	User fee	User
	Post office saving	Depositor
	National insurance. Pension	Subscriber
	National bond	Purchaser.
Local government	General purpose tax	Residents
	Special purpose tax	Beneficiaries
	Local bond	Purchaser
Transport enterprise	Revenue	User
	Capital	Investor
	Investment and subsidy by central and local government.	State Budget. Residents
	Investment by private sector	Private sector
	Loan from central and local government and private sector.	User

Table 3.1 Earmarked Taxes for Special Account for Road Development.

Tax		Rate
Central government	Gasoline tax	48.6 yen/liter
	Oil and gas tax	17.5 yen/kg
	Vehicle weight tax	Example: 12,600 yen/ton/year (private car)
Local government	Local Road Tax (collected by Central Government with Gasoline Tax)	5.2 yen/liter
	Transfer of oil and gas tax from Central Government	
	Transfer of vehicle weight tax from Central government	
	Diesel oil dealing tax	32.1 yen/liter
	Vehicle excise duty	3% of commercial vehicle and 5% of private vehicle purchase price

Table 3.2 Past Trends of Tax Collection Related to Vehicles

(US$ million)

Fiscal Year	National Tax				Local Tax				Total
	Gasoline Tax*	Local Road Tax*/**	Oil and Gas Tax*	Vehicle Weight Tax*	Vehicle Excise Duty*	Vehicle Tax	Light Vehicle Tax	Diesel Oil Dealing Tax*	
1989	13,919	2,503	229	5,595	4,187	8,671	615	5,555	41,046
1990	13,859	2,492	217	6,087	4,234	8,814	608	5,757	42,068
1991	15,380	2,766	229	6,452	4,631	9,969	687	6,471	46,585
1992	16,707	3,004	240	7,296	4,598	11,151	757	7,115	50,869
1993	19,778	3,186	272	8,407	4,874	13,190	887	8,821	59,415
1994	23,560	2,521	301	9,840	5,672	14,922	996	12,723	70,535
1995	26,309	2,784	340	10,844	6,061	16,740	1,097	13,937	77,826
1996	23,032	2,465	276	9,868	5,531	14,932	990	12,644	69,737
1997	21,597	2,310	264	9,246	5,297	13,960	917	11,863	65,455
1998	20,332	2,176	229	8,556	5,091	13,393	865	10,827	61,469

Note: * special-purpose tax earmarked for road development ** to be transferred to local government

Figure 3.1 Taxes Related to Vehicle Ownership and Use in Japan

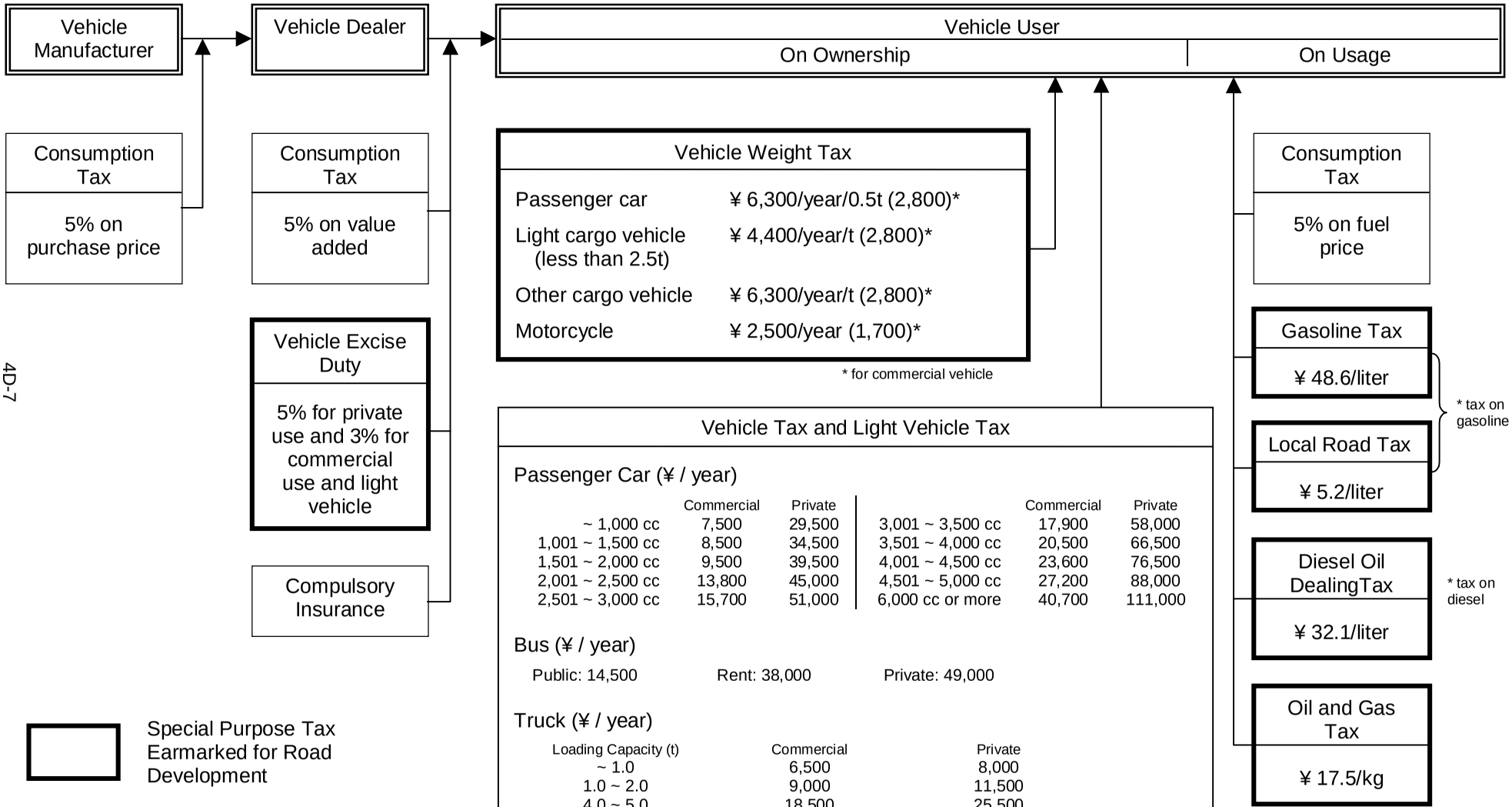
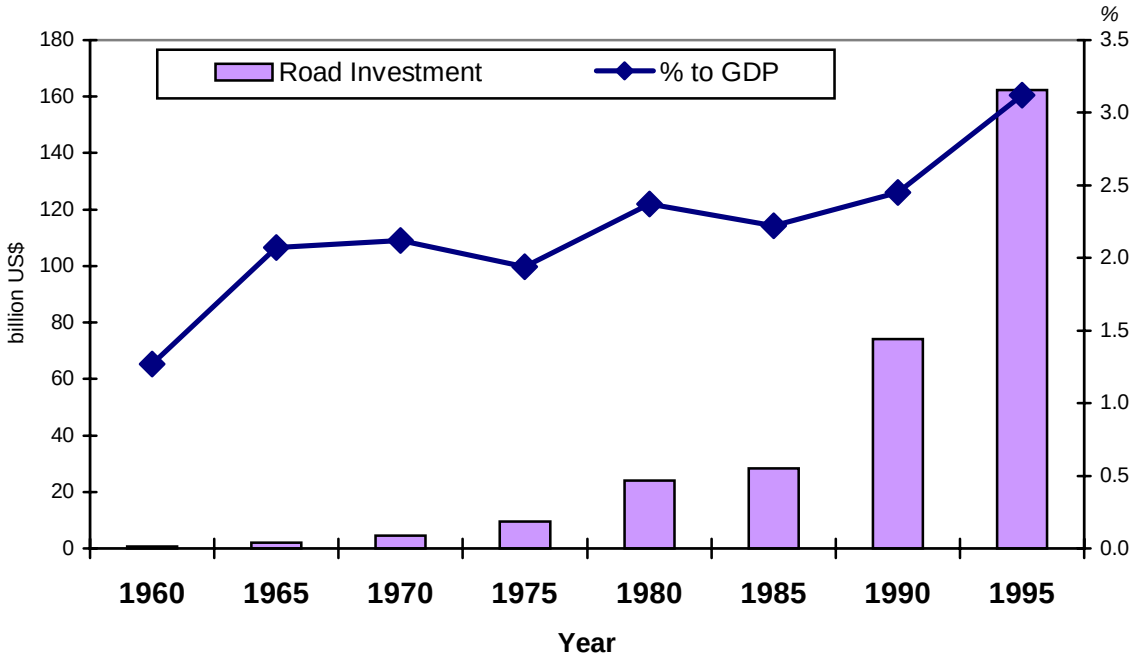


Figure 3.2 Past Trends of Road Investment in Japan



APPENDIX 4-E : SEAPORT DEVELOPMENT STRATEGY

Assessment of the Vietnamese Seaport System

There are over 60 seaports in Vietnam. Most of them have a long history, e.g., Hai Phong Port was constructed in 1876 with a 60-meter long quay wall, Saigon Port was established in 1860. Danang Port has a relatively short history as a general port after Vietnam's reunification in 1975, Cai Lan Port was firstly recommended by a former USSR study team 1970, although its full development has not been done. Most of the seaports in Vietnam may be characterized as old-fashioned general ports under old development concepts.

Geographical conditions greatly affect port development. Many Vietnamese ports are located deep in rivers and bays being safe from winds and waves. Without huge investment in protection facilities, these ports can be operational over the year. However, the ports along rivers must face physical constraints when they enlarge their capacity, i.e., narrow, shallow and zigzagging navigational ways and their estuaries likely to be silted up. Adversely, coastal ports between the two delta areas are free from such constraints. Instead, they are vulnerable in monsoons and high tides. Considerable investment is thus necessary to ensure uninterrupted port operation.

The Vietnamese seaport system has many weaknesses to be solved in the planning period as follows:

- Vietnamese general ports are comparatively small. The eight major general ports have shallow water depth ranging 5 - 11 meters. Their total length of berths of 8,267m is, for example, roughly equal to Tanjung Priok Port in Jakata (8,911 m) Port Klang (8,648 m), Manila Port (7,592 m). At least modern berths for exclusively containers and for 30,000 DWT vessels or larger are necessary to manage gateway ports in connection with international transport chains.

- Port operation is unreliable. There are several factors which conspire to spread this bad reputation: limited navigable time, non-availability or lack of well-maintained cargo handling equipment, lack of trained port labor, inadequate supervision and management, and lack of incentives and unclear port charges[1]. Foreign operators face difficulties in dealing with "dispatch-money" to port labor and management to achieve faster turnaround.

- Ships must sail with insufficient navigational aids and search and rescue services. In fact, there is still a "black sea" where no visual aid is available on Vietnamese waters and the Vietnam Maritime SAR Coordination Center does not possess any SAR fleet and oil spill protection equipment.

- Proper attention has not been paid to policy setting in port development, letting implementation alone. Port construction at random wastes precious funding sources.

[1] One state-owned operator reported that in 1998 they suffered from demurrage of 1,122 days on operating 21 general cargo vessels, mainly due to wasteful waiting time for high tide and poor cargo handling works.

Major ports cannot expand their facilities by the self-financing scheme from port charges, relying on external resource and technology.

Overall Development Strategy Towards The Year 2020

General Ports

- The central maritime administration should concentrate its public investment in nine major general ports, namely, Quang Ninh deep seaport, Hai Phong, Cua Lo (Vung Ang), Danang, Qui Nhon, Nha Trang, Saigon, a deep seaport in the Vung Tau – Thi Vai area, and Can Tho. It indicates that a major general port is located every 350 km coastline on average.

- Road and road transport will be improved and modernized to allow shippers access to the nine ports within one day during the planning period. Such concentrated investment will benefit shippers from many ship calls by larger vessels and modern cargo handling services.

- Cua Lo will be expanded to serve the north central provinces such as Nghe An, Ha Tinh and Quang Binh in the 2000s. However, when further expansion is prohibitive due to high anti-siltation and dredging costs, Vung Ang will become its alternative after the year 2010.

Gateway Ports

- Three gateway ports will be developed in the northern, central and southern regions taking account of Vietnam's long latitude. Present gateway ports, Hai Phong and Saigon, suffer from limited port area and shallow water and thus deep seaports will be necessary in Quang Ninh and Vung Tau – Thi Vai areas. The gateway functions will be gradually transferred to those new ports in the planning period. In the central region, the gateway function will be intensively accumulated within Danang Bay. Firstly, Tien Sa Port will be expanded and then Lien Chieu Port will be constructed to meet traffic demand. Since gateway ports support Vietnam's economic development, government should take full responsibility of port infrastructure development.

- To enjoy the benefits of deep seaport development, modern port operation and efficient intermodal connection must be provided to port users by way of:
  - Contracting out some port services to internationally competent operators such as container terminal operator,
  - Simplification of port procedures and introduction of port EDI, and
  - Development of high-speed access transports such as road and rail in association with full-scale ICDs at both Hanoi and HCM City.

Specialized Ports

- Specialized ports in association with specialized vessels, such as oil tankers, cement tankers, coal carriers, etc., are potent tools to enable mass haulage at cheap transport costs. Besides general ports and common carriers, however, the development

beneficiaries are limited. Therefore maritime administration should set adequate policy package for promoting various specialized maritime transport systems and undertake only maritime safety and environmental aspects around specialized ports.

Local Ports

- From national/regional development viewpoints, local coastal ports will be less significant in proportion to land transport development. Provincial governments will maintain their operation as long as salient local traffic needs remain. Therefore, the central maritime administration is responsible only for maritime safety and environmental aspects around local coastal ports.

- In regard to local inland ports, provincial governments should be responsible for their development and operation under the supervision of VIWA, the inland waterway administration.

Transshipment Ports

- The concept of building a container transshipment port is natural feeling for Vietnam but also for other Asian countries that are going to develop deep seaports so as to share some extent of the present transshipment function of Singapore and Hong Kong. The conditions to become a transshipment port are (1) good port infrastructure and (2) many ship calls with substantial capital investment by foreign shipping lines. According to the VITRANSS analysis, only Vung Tau is endowed with deep water, wide port land and sufficient container traffic demand in its hinterland including HCM City, Dong Nai and Ba Ria – Vung Tau. However, Vietnam has in inherent weakness to attract foreign capital, particularly in transport industries.

- It is true that there is some opportunity for a mega shipping line to construct a private transshipment port regardless of hinterland development[2]. Due to the inconvenient location, a transshipment port in the central region would apparently bear additional transport costs to many shippers and consignees. Therefore, the project cannot be justified to tap any public fund into port construction and related infrastructure development.

[2] Evergreen, ranking second as the global container carrier, made such MOUs with the Indonesian Government at Batam Island (20km south from Singapore) in 1993 and the Vietnam Government at Vung Tau in 1996. However, both the MOUs are no longer effective and they resultantly hindered scheduled port construction.

Strategies for Developing Gateway Ports

Hai Phong – Quang Ninh Seaport Group

Hai Phong Port	*Proposed Role*: To serve mainly domestic shipping and contribute to domestic shipping modernization by improving port productivity *Critical Paths to Port Development:* • Increasing annual dredging volume from 1.8 million m^3 during 1936 - 60 to 3.2 million m^3 during 1986 – 90 although the port hardly accommodates larger vessels over 7,000 DWT. • Modernization of cargo handling works and promotion of containerization from conventional and inefficient port operation. *Development Scenario:* 1. Up to 2005: The access channel will be dredged at least to accommodates larger vessels over 7000 DWT 2. Up to 2010: A 220-meter container berth/terminal will be constructed along the downstream and the second phase of dredging work will be done.
Quang Ninh Deep Seaport	*Proposed Role*: To serve mainly overseas shipping to enhance the competitiveness of northern Vietnam's economy in the global market. *Critical Paths to Port Development:* • Adequate coastal space allocation especially among maritime transport, tourism (burgeoning development since 1994) and coal industry (sluggish turnover since 1997) • Absolutely preservation of the World Heritage Site core zone in Ha Long Bay. • Efficient intermodal connection with Hanoi and Hai Phong. *Development Scenario:* 1. By the year 2003, three more berths will be constructed at Cai Lan Port with necessary measures for navigational aids and environmental protection such as oil spill in Ha Long Bay as well as Bai Chay Bay. 2. In the mid 2000s, a coastal space management study will be conducted between Mong Cai (Chinese border) and Cat Ba Island to determine the best gateway port site in harmony with tourism and industrial development. 3. To meet additional traffic volume, several new berths will be constructed at the determined port site by the year 2010 and further expansion during the period 2010s.

Danang Bay Seaport System

Tien Sa Port Lien Chieu Port	*Proposed Role*: To serve overseas and domestic shipping in the central region to support regional economic development and facilitate the east-west transport corridor development connecting Vietnam with Laos and Thailand. *Critical Paths to Port Development:* • Danang Bay is exposed to northeasterly winds and high waves. • Tien Sa Port is located 9 km north from Danang while Lien Chieu 15 km west from the city. Road freight movements, access to two ports and between two ports within the urbanized area and across rivers will require an elaborated traffic management plan with necessary road infrastructure. *Development Scenario:* 1. Up to 2005: Tien Sa Port will be expanded and improved through container terminal development, rehabilitation of the existing two piers, breakwater construction and dredging, access road improvement, and Tuyen Son Bridge construction across Han River. 2. Detailed engineering design will be prepared for Lien Chieu new port. 3. Up to 2010: Tien Sa Port will modernize its terminal facilities and replace old handling equipment with new ones. 4. Although Lien Chieu Port provides exclusive container operation services, provisional arrangement will be done up to 2010 due to limited container traffic demand, operating one multipurpose berth to cater to 30,000 DWT class vessels and two small berths for general cargo trampers. 5. Up to 2020: Only Lien Chieu Port will be expanded to meet future traffic demand at exclusive container berths and general cargo berths.

Saigon River Ports/Vung Tau – Thi Vai Seaport Group

Saigon River Port Group: • Saigon Port • Saigon New Port • Ben Nghe Port • VICT (Vietnam International Container Terminal)	*Proposed Role*: To strengthen its capability as the most important ports in southern Vietnam until the year 2010 by means of port expansion and operational improvement. Since Saigon River cannot accommodate large vessels over 20,000 DWT, overseas shipping will gradually transfer to a selected Vung Tau – Thi Vai port. *Critical Paths to Port Development:* • Access roads around the port group • Inefficient port operation with inadequate handling equipment, particularly at Saigon and New Saigon ports • Vessel traffic management on congested water with sailing/anchored vessels and barges *Development Scenario:* 1. Up to 2005: VICT will add one container berth/terminal. 2. Other three ports will improve cargo handling operation. 3. The Trans-HCMC Road with Thu Thiem Tunnel will be constructed. Within the project, the construction of tunnel and its access road to the Saigon River Port Group will be prioritized. 4. Vessel traffic service will commence along congested navigational ways by the assistance of Canada. 5. Up to 2010: New Saigon Port will be transferred to Cat Lai 6. The other three ports will improve port productivity with increasing ship calls. 7. Up to 2020: No capacity expansion is expected at the four ports. Some private port will be constructed at the downstream areas such as Nha Be, Hiep Phuoc and Long An in association with new industrial estates.

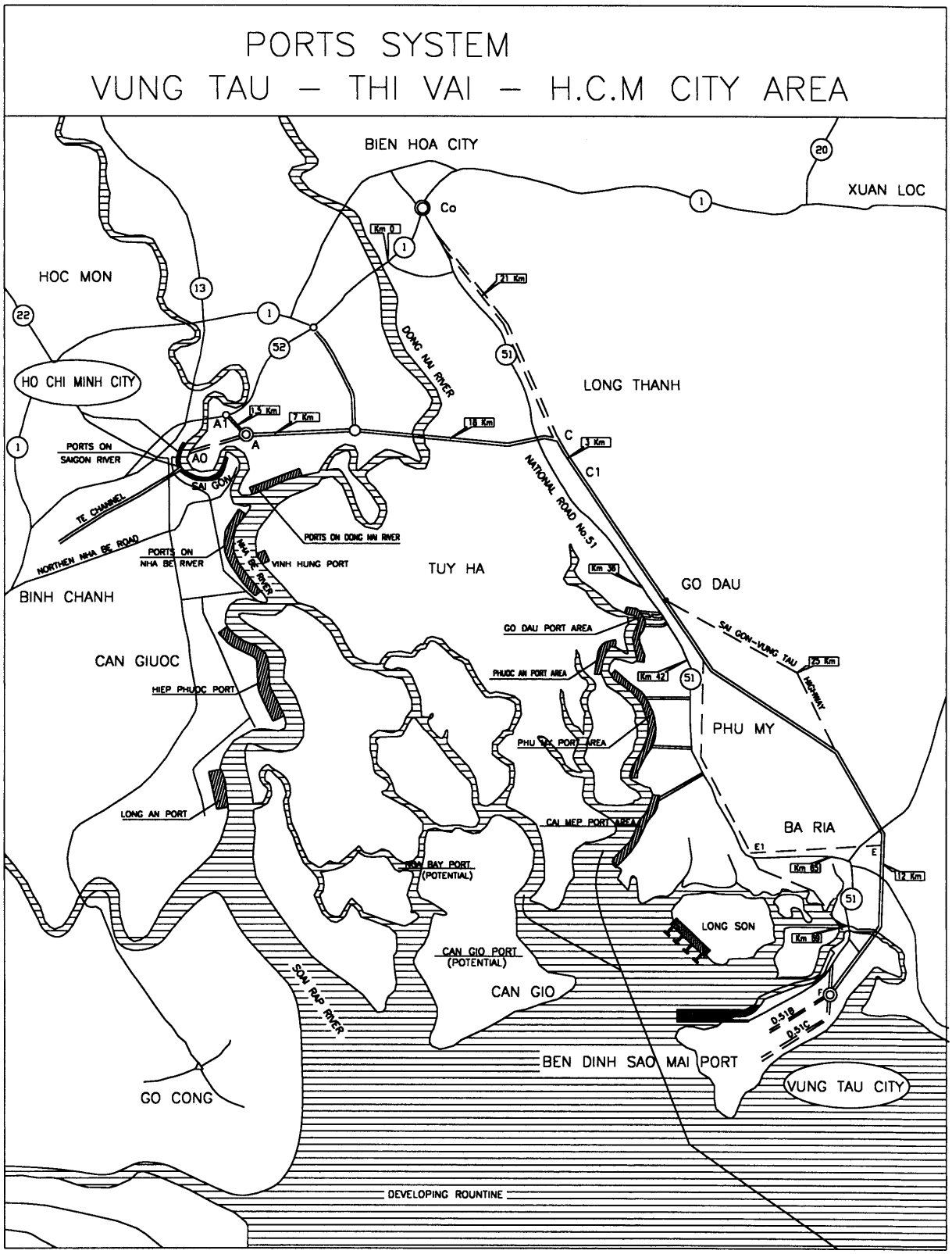
		Saigon	New Saigon	Ben Nge	VICT	Total
Management Body		VINALINES	Ministry of Defense	HCM City	Private (JV Company)	-
Present Facilities		Berth length:	Berth length:	Berth length:	Berth length: 1CY	
Future Expansion		Handling Equip. only	Transfer to Cat Lai	Handling Equip. only	1 more CY	
Port Capacity (mil tons/year)	1998					14.8
	2005	9.0	4.0	4.0	5.0	22.0
	2010	10.0	4.0	4.0	6.0	25.0

Vung Tau – Thi Vai Seaport	*Proposed Role:* To serve overseas shipping, especially container ships as a gateway port in southern Vietnam and further as a subregional hub port *Critical Paths to Port Development:* • Enough capacity at both water (port depth and navigational width) and land sides • Good access from HCMC • Concentrated investment on the best place from long-term and subregion-wide viewpoints *Development Scenario:* 1. Up to 2005: The Master Plan Study on the South Vietnam Port System will be conducted with technical assistance of JICA to identify the best port site among the Vung Tau – Thi Vai port candidate sites. 2. Detailed port engineering design will be determined at the selected site. 3. Up to 2010: Several berths will be conducted to handle 10 million tons of cargo, mostly containerized. 4. Up to 2020: a full-scale general port will be in operation consisting of exclusive container berths, specialized and general cargo berths to handle 30 million tons of cargo and to accommodate large interregional liner vessels.

So far, there are three port candidates from upstream, namely, Phu My (Thi Vai), Cai Mep, and Ben Dinh-Sao Mai (Vung Tau). The former two ports will not be enough to meet port demand in 2020 while they may show economical ways to meet port demand in 2010.

	Phu My (Thi Vai)	Cai Mep	Ben Dinh Sao Mai (Vung Tau)
Promoting Organization	VINAMARINE	Belgium	Formerly Evergreen
Water Depth along Access Channels	9 – 12 meters	9-12 meters	15-16 meters
Vessel Traffic Management	Difficult due to narrow waterway	Slightly difficult due to river entrance	Easy
Ultimate Port Capacity	14 million tons/year with a berth length of 2,000m	4 million tons/year with a berth length of 900m	No limitation because of possible reclamation
Construction Cost	Economical due to riverside	Economical due to riverside	Expensive due to protection facilities against waves

Figure 4-E.1
Location of Ports in Vung Tau-Thi Vai-HCMC



Appendix 5-A
Grouping and Assessment of Long-Listed Projects

Group 1 (On-going Projects)

Sector	Project No.	Project	Project Cost (million US$) Total	2001-
Road	*Primary Road Network Development Projects*			
	H01	Highway Rehabilitation Project (Hanoi-Lang Son; 190km)	162.5	16.3
	H02	Highway Rehabilitation Project II (Vinh-Dong Ha; 100km)	236.6	23.7
	H03	2nd Road Development (Nha Trang-Quang Ngai; 600km)	163.0	81.5
	H04	Highway Rehabilitation Project III (Can Tho-Nam Can; 230km)	180.0	180.0
	H05	Bridge Rehabilitation Project - Phase I (435km)	162.2	16.2
	H06	Bridge Rehabilitation Project - Phase II (752km)	211.0	105.5
	H07	Hai Van Pass Tunnel (2 lanes, 14km)	251.0	225.9
	H08	My Thuan Bridge (1,535m)	79.3	15.9
	H09	Can Tho Bridge Construction	294.0	294.0
	H15	Thanh Tri Bridge Construction	410.0	410.0
	H16	National Highway No.5 Improvement Project (remaining section, 91km)	215.6	215.6
	H17	National Highway No.18 Widening Projects - Phase 2 (remain section, 70km)	232.0	232.0
	H18	Bai Chay Bridge Construction	98.0	98.0
	H21	National Highway No.10 Upgrading Project (147km)	302.0	302.0
	H24	East-West Corridor Project (ASEAN 8; NH9; 75km)	30.0	24.0
	H25	East-West Corridor Project (ASEAN 7A; NH12A, 29; 120km)	65.0	39.0
	H29	Trans HCMC Highway Project (21.4km)	758.6	758.6
	H30	Trans Asia Highway Project (NH22 to Cambodia; 80km)	144.7	144.7
		Subtotal	**3,995.5**	**3,182.9**
Railway	*Rehabilitation and Minor Improvement*			
	R01	Hanoi-HCMC Railway Bridge Rehabilitation	104.0	47.0
		Subtotal	**104.0**	**47.0**
Inland Waterway	*Port Improvement*			
	W03	Ninh Binh/Ninh Phuc Port Improvement	14.4	14.4
	W08	My Tho/Can Tho Port Improvement for IWT	6.1	6.1
	Waterway Improvement			
	W29	HCM-Can Tho Waterway Improvement	23.2	23.2
	W30	Can Tho-Ca Mau Waterway Improvement	17.6	17.6
	W31	Cho-Lach-Kien Luong Waterway Improvement	25.5	25.5
	W32	Saigon-Dong Thap Muoi-Long Xuyen Waterway Improvement	5.4	5.4
	Operation & Safety			
	W41	IWT Education	14.1	14.1
		Subtotal	**106.3**	**106.3**
Port & Shipping	*Port Expansion/Development*			
	P01	Cai Lan Port Expansion Project	128.1	128.1
	P03	Hai Phong General Port (Phase II)	138.0	138.0
	P09	Danang Bay - Tien Sa Port Rehabilitation	172.0	172.0
		Subtotal	**438.1**	**438.1**
Air	*Airport Expansion/Development*			
	A01	Noi Bai International Airport Development Project	57.1	17.1
	A02	New Passenger Terminal Building (T1) Construction in Noi Bai International Airport	80.0	24.0
	A07	Expansion of International Passenger Terminal Building in Tan Son Nhat International Airport	12.0	6.0
	A08	Airfield Pavement Overlay in Tan Son Nhat International Airport	16.0	14.4
	Aircrafts			
	A32	New Aircraft	500.0	400.0
		Subtotal	**665.1**	**461.5**
		TOTAL	**5,309.0**	**4,235.8**

Appendix 5-A

Grouping and Assessment of Long-Listed Projects

Group 2 (M/P Candidate Projects)

Sector	Project No.	Project	Project Cost 2001-(M US$)	Economy	Network Integration	Int'l Linkage	Cost Recovery	Social/ Equity/ Poverty	Environ-ment	Resettlement/ ROW acqusition	Judgement (VITRANSS)
Road	*Primary Road Network Development Projects*										
	H10	National Highway No.1 Urban Bypass (Hanoi-HCMC; 70km)	67.0	a	c	c	c	b	b	c	A
	H12	Rehabilitation and Upgrading of Ho Chi Minh Highway (Hoa Lac-Ngoc Hoi)	380.0	a	a	b	c	b	b	b	A
	H13	Rehabilitation of National Highway No.14	15.0	a	a	b	c	a	b	b	A
	H14	Hanoi Ring Road	256.0	a	c	c	c	b	b	c	A
	H19	National Highway No.1 Hanoi - Ninh Binh Widening Project (80km)	76.0	a	b	c	c	b	b	c	A
	H20	National Highway No.70 Upgrading Project (Hanoi-Lao Cai; 191km)	125.0	b	b	a	c	a	b	c	A
	H22	National Highway No.21 Upgrading Project (80km)	58.0	b	b	c	c	c	c	c	B
	H23	East-West Corridor Project (ASEAN 7; NH8, 8B; 110km)	90.0	b	b	c	c	a	b	b	B
	H26	National Highway No.40 Upgrading Project (ASEAN 7B,24km)	14.0	c	c	b	c	a	b	b	B
	H27	Rehabilitation (NH19, 20, 24, 26, 27, 28)	150.0	b	a	c	c	a	b	b	B
	Secondary Road Network Development										
	H31	Hanoi-Cao Bang (NH3) Improvement (310km)	148.0	c	a	b	c	a	b	b	B
	H32	Hanoi-Ha Giang (NH2) Improvement (300km)	137.0	c	a	b	c	a	b	b	B
	H33	Hanoi-Dien Bien Phu (NH6) Improvement (468km)	223.0	c	a	b	c	a	b	b	B
	H34	Hanoi-Lai Chau (NH32) Improvement (390km)	200.0	c	a	c	c	a	b	b	B
	H35	North C1 (North-East Ring, NH5-NH3, NH37; 150km)	101.0	b	b	c	c	b	b	b	B
	H36	North C1 (North Ring, NH3-NH70, NH37; 115km)	122.0	b	b	c	c	b	b	b	B
	H37	North C1 (West-South Ring, NH70-NH1, NH37/15/47; 295km)	216.0	c	b	c	c	b	c	c	C
	H38	North C2 (North-East Ring, NH5-NH3, NH279; 255km)	171.0	c	b	c	c	b	c	b	C
	H39	North C2 (North Ring, NH3-NH70, NH279/1B; 120km)	83.0	c	b	c	c	b	c	b	C
	H40	North C2 (North-West Ring, NH70-NH6, NH279; 150km)	107.0	c	b	c	c	b	c	c	C
	H41	Cua Ong-Bac Luan (NH18) Road Improvement (130km)	92.0	b	c	b	c	b	b	b	B
	H42	Hung Yen-Thai Binh Road (NH39) Improvement (100km)	124.0	b	c	c	c	b	b	b	B
	H43	HCMC-My Tho Road (NH50) Improvement (80km)	79.0	b	b	c	c	b	c	b	B
	H44	My Tho-Soc Trang Route Improvement (NH60) (120km)	235.0	c	b	c	c	b	b	b	C
	H45	Can Tho-Ha Tien Improvement (NH80) (200km)	197.0	b	b	b	c	b	c	b	B
	H46	Can Tho-Kien Giang-Ca Mau Route (NH61,63) Improvement (200km)	197.0	b	a	c	c	b	c	b	B
	H47	Ho Chi Minh Highway Extension (N2)(Chan-Thanh-An Giang; 60km)	58.0	c	b	c	c	b	b	b	C
	H48	NH22B Improvement (Go Dau-Xau Mai; 80km)	55.0	b	b	b	c	b	b	b	B
	H49	Secondary Road Network rehabilitation Program	94.0	b	a	c	c	a	b	b	A
	H50	Tertiary Road Improvement Project	569.0	b	a	c	c	a	b	b	A
	Road Safety										
	H52	Road Safety Improvement Program	30.0	-	c	c	c	a	a	c	A
	Expressway										
	H53	North-South Expressway 1 (Hanoi-Vinh, 310km)	930.0	c	b	c	a	c	c	c	C
	H54	North-South Expressway 2 (Vinh-Hue, 400km)	1,200.0	c	b	c	b	c	b	c	C
	H55	North-South Expressway 3 (Hue-Danang, 100km)	300.0	c	b	c	b	c	b	c	C
	H56	North-South Expressway 4 (Danang-Nha Trang, 550km)	1,650.0	c	b	c	b	c	b	c	C
	H57	North-South Expressway 5 (Nha Trang-HCMC, 420km)	1,260.0	c	b	c	a	c	c	c	C
	H58	Noi Bai-Ha Long Expressway (150km)	750.0	c	b	c	a	c	c	c	C
	H59	HCMC-Vung Tau Expressway (90km)	450.0	c	b	c	b	c	c	c	C
	H60	HCMC-Can Tho Expressway 1 (HCMC-My Tho; 50km)	350.0	b	b	c	a	c	c	c	B
	H61	HCMC-Can Tho Expressway 2 (My Tho-Can Tho; 80km)	560.0	c	b	c	a	c	c	c	C
		Subtotal	**11,919.0**								

Appendix 5-A

Grouping and Assessment of Long-Listed Projects

Group 2 (M/P Candidate Projects)

Sector	Project No.	Project	Project Cost 2001-(M US$)	Economy	Network Integration	Int'l Linkage	Cost Recovery	Social/ Equity/ Poverty	Environ-ment	Resettlement/ ROW acqusition	Judgement (VITRANSS)
Railway	*Rehabilitation and Minor Improvement*										
	R02	Rehabilitation of Tracks & Bridges	325.0	a	b	b	c	a	a	a	A
	R04	Hai Van Pass Tunnel	389.0	c	a	c	c	c	c	a	B
	R05	Signal and Communication Equipment Modernization	128.0	-	c	b	c	a	a	a	A
	R07	Alarm at Crossings	21.0	-	c	c	c	a	b	a	A
	Capacity Expansion of Critical Sections										
	R08	New Stations for Train Exchange (100 stations)	26.0	a	b	c	b	b	b	c	A
	R09	New Stations for Commuters (30 stations)	8.0	-	c	c	b	b	b	c	C
	R10	Large Scale Freight Stations (30 stations)	486.0	-	b	c	b	c	b	c	C
	R11	Bien Hoa - Saigon section (29.4km)	130.0	b	b	c	b	b	b	c	B
	R12	Hanoi - Haiphong section (101.4km)	293.0	b	b	b	b	b	c	c	B
	R13	Hanoi - Giap Bat section (5.4km)	32.0	b	c	c	b	b	c	c	B
	R14	Giap Bat - Phu Ly section (51km)	129.0	c	b	c	c	b	c	b	C
	R15	Gia Lam - Yen Vien section (5.3km)	13.0	c	c	c	c	b	c	c	C
	R16	Hanoi - HCMC line (Phu Ly - Hue; 632km)	1,173.7	c	b	c	c	b	c	c	C
	R17	Hanoi - HCMC line (Danang - Bien Hoa; 906km)	1,682.6	c	c	c	c	b	c	c	C
	R18	Yen Vien - Viet Tri (62km)	115.1	c	b	c	c	b	b	c	C
	R19	Dong Anh - Ton Dong (5km)	9.3	c	c	c	c	b	b	c	C
	R20	Bac Hong - Van Dien (40km)	74.3	c	b	c	c	b	b	c	C
	R21	Single Tracking (Mao Khe - Ha Long; 48km)	75.4	c	b	c	c	b	a	a	C
	New Lines										
	R22	Saigon - My Tho (70km)	382.0	c	b	c	b	c	b	c	C
	R23	My Tho - Can Tho (100km)	450.0	c	b	c	c	c	b	c	C
	R24	Short-cut Line (Phu Thai - Mao Khe; 15km)	31.1	c	b	c	c	c	b	c	C
	R25	HCMC - Vung Tau (80km)	360.0	c	b	b	c	c	b	c	C
	Operation										
	R26	Rolling Stock Acquisition	1,882.0	-	c	c	c	c	a	a	A
	R28	CTC and Computerization	136.0	-	c	c	c	c	a	a	A
		Subtotal	**8,351.5**								
Inland Waterway	*Port Improvement*										
	W01	Hanoi/Khuyen Luong Port Improvement	11.0	a	c	b	a	a	b	a	A
	W05	Viet Tri Port Improvement	3.5	b	c	b	b	a	b	a	B
	W07	Hoa Binh Port Improvement	4.0	c	c	c	b	a	b	a	C
	W10	Vinh Thai (Vinh Long) Port Improvement	4.3	b	c	b	b	a	b	a	A
	W12	Ca Mau Port Improvement	2.9	b	c	c	b	a	b	a	A
	W14	Cao Lanh (Dong Thap) Port Improvement	6.4	c	c	b	b	a	b	a	A
	W16	My Thoi (Long Xuyen) Port Improvement	6.2	c	c	b	b	a	b	a	A
	W18	Passenger Terminal Development	2.2	-	c	c	b	a	b	a	A
	W20	Other Local Port Development	47.7	-	c	c	c	a	b	a	A
	Waterway Improvement										
	W22	Quang Ninh-Hanoi/Pha Lai Waterway Improvement	13.9	a	b	c	a	c	c	b	A
	W23	Ninh Binh/Nam Dinh-Hanoi Waterway Improvement	19.9	a	b	b	b	c	c	b	A
	W24	Quang Ninh-Nam Dinh/Ninh Binh Waterway Improvement	6.0	a	b	c	a	c	c	a	A
	W25	Hanoi-Viet Tri-Lao Cai Waterway Improvement	74.0	a	b	b	b	c	c	b	A
	W27	Viet Tri - Tuyen Quang/Hoa Binh Waterway Iimprovement	3.6	c	b	c	b	c	c	a	C
	W28	Pha Lai - Thai Nguyen/Bac Giang Waterway Improvement	3.6	c	b	c	c	c	c	a	C
	W33	Thi Vai-Nuoc Man Canal Development	3.2	a	b	c	b	c	b	b	A
	W34	HCMC - Moc Hoa/Ben Keo/Ben Suc Waterway Improvement	6.5	c	b	c	c	c	c	a	C
	W35	Da River and Hoa Binh Port Improvement in Hoa Binh Lake	2.1	b	b	c	c	c	a	a	B
	W36	Cuu Long-Cambodia Waterway Improvement	20.5	b	b	a	a	c	b	a	B
	W37	Island Service Improvement (Co To and Cat Ba Islands)	2.5	-	b	c	c	a	a	a	B
	W38	Island Service Improvement (Other Islands)	4.6	-	b	c	c	a	b	a	C
	Operation & Safety										
	W39	IWT Safety Enhancement	52.7	-	c	c	b	a	a	a	A
	W43	IWT Fleet Development	191.9	-	c	b	a	a	b	a	A
		Subtotal	**493.2**								

Appendix 5-A

Grouping and Assessment of Long-Listed Projects

Group 2 (M/P Candidate Projects)

Sector	Project No.	Project	Project Cost 2001-(M US$)	Economy	Network Integration	Int'l Linkage	Cost Recovery	Social/ Equity/ Poverty	Environ-ment	Resettlement/ ROW acqusition	Judgement (VITRANSS)
Port & Shipping	*Port Expansion/Development*										
	P05	Cua Lo Port Project	49.3	a	c	b	a	b	c	a	A
	P07	Danang Bay - Lien Chieu Port Development	158.0	b	c	a	a	b	c	a	B
	P10	Specialized Port for Dung Quat Industrial Zone	130.0	a	c	c	a	b	c	a	A
	P12	Qui Nhon Port Development	36.0	a	c	b	a	b	c	a	A
	P14	Nha Trang Port Development	57.0	a	c	b	a	b	c	a	A
	P16	Ho Chi Minh City General Port	200.0	a	c	b	a	b	c	a	A
	P18	Ba Ria-Vung Tau General Port	206.0	b	c	a	a	b	c	a	B
	P20	Can Tho Port Development	64.0	a	c	b	a	b	c	a	A
	P22	Industrial Port Development	67.0	-	c	c	a	b	c	a	A
	P24	Other Local Ports	22.7	-	c	c	b	b	c	a	A
	Operation & Safety										
	P26	Port EDI System at Gateway Ports	10.0	-	c	a	a	a	a	a	B
	P27	Large-scale ICD Development Project	72.2	-	c	b	a	a	b	a	B
	P29	Fleet Expansion and Modernization Program	1,407.0	-	c	b	a	a	a	a	A
	P31	Development of Aids to Navigation (ATN)	63.6	-	c	b	a	a	a	a	A
	P33	Maritime SAR and Oil Spill Protection	52.8	-	c	c	c	a	a	a	A
	P35	Seafarers' Education Upgrading Project	20.9	-	c	b	c	a	a	a	A
		Subtotal	**2,616.5**								
Air	*Airport Expansion/Development*										
	A03	Noi Bai Airport Development Project - Phase 1	53.9	a	c	a	a	c	a	a	A
	A05	Danang International Airport Development Project - Phase 1	77.7	a	c	a	b	c	a	b	A
	A09	Tan Son Nhat International Airport Development Project	226.7	a	c	a	c	c	a	a	A
	A11	Secondary Airport Development Project (Cat Bi, Phu Bai, Nha Trang)	85.6	a	c	b	b	c	a	a	A
	A13	New Airport Construction Project (Cao Bang, Lao Cai, Dong Hoi, Chu Lai)	83.6	b	c	c	c	b	b	b	B
	A14	Rehabilitation of Tertiary Airports - Phase 1 (9 airports)	120.8	-	c	c	c	c	a	a	A
	Air Traffic Control										
	A16	Reconstruction of HCM Area Control Center and Noi Bai Air Traffic Management Center	58.0	-	c	a	a	c	a	a	A
	A17	Provision of Navigation Aids in Secondary Airport (Cat Bi, Phu Bai, Nha Trang)	4.5	-	b	a	a	c	a	a	B
	A18	Provision of Control Tower System Packages and Automatic Weather Observation Stations (AWOS) in 4 New Airports	1.3	-	c	c	a	c	a	b	B
	A19	Communication and Navigational Equipment Replacement Program	12.2	-	b	a	a	c	a	a	A
	A20	Equipment Installation and Upgrading Project for New CNS/ATM -Phase 1	32.8	-	c	a	a	c	a	a	A
	A21	Equipment Installation and Upgrading Project for New CNS/ATM - Phase 2	10.9	-	c	a	a	c	a	a	B
	A22	Restructuring of Air Traffic Service - Direct Speech (ATS-DS) Circuits and Aeronautical Fixed Telecommunications Network (AFTN)	2.5	-	b	a	a	c	a	a	A
	A23	Rehabilitation of Civil Aviation Training Center of Vietnam (CATCV)	3.0	-	c	a	a	c	a	a	A
	A24	Flight Calibration of Navigation Aids	1.1	-	b	a	a	c	a	a	A
	A25	Test Equipment Replacement and the Equipment Standards Laboratory	1.9	-	c	c	b	c	a	a	A
	Aircrafts										
	A33	Aircraft Purchase	1,889.0	-	c	a	a	c	a	a	B
		Subtotal	**2,665.5**								
		TOTAL	**26,045.7**								

Appendix 5-A

Grouping and Assessment of Long-Listed Projects

Group 3 (Long-term Projects)

Sector	Project No.	Project	Project Cost 2001- (million US$)
Road	*Primary Road Network Development Projects*		
	H11	Hai Van Pass Tunnel (2nd tunnel, 10km)	250.0
	H28	Rehabilitation Phase II (NH19/20/24/25/26/27/28; 868km)	805.0
	Secondary Road Network Development		
	H51	Tertiary Road Improvement Project - Phase 2	404.0
	Expressway		
	H62	Lang - Hoa Lac Expressway (30km)	60.0
	H63	Hanoi Ring Road 3 Expressway (70km)	350.0
	H64	Dong Anh - Thai Nguyen Expressway (54km)	81.0
	H65	Ba La - Xuan Mai Expressway (21km)	21.0
	H66	Noi Bai - Viet Tri Expressway (50km)	50.0
	H67	Binh Phuoc - T. D. Mot Expressway (30km)	90.0
	H68	HCMC Ring Road Expressway (80km)	400.0
		Subtotal	**2,511.0**
Railway	*Rehabilitation and Minor Improvement*		
	R03	Rehabilitation of Tracks & Bridges - Phase 2	415.0
	R06	Signal and Communication Equipment Modernization - Phase 2	128.0
	Operation		
	R27	Rolling Stock Acquisition - Phase 2	3,570.0
		Subtotal	**4,113.0**
Inland Waterway	*Port Improvement*		
	W02	Hanoi/Khuyen Luong Port Improvement - Phase 2	7.5
	W04	Ninh Binh/Ninh Phuc Port Improvement - Phase 2	9.4
	W06	Viet Tri Port Improvement - Phase 2	8.1
	W09	My Tho Port Improvement for IWT - Phase 2	3.2
	W11	Vinh Thai (Vinh Long) Port Improvement - Phase 2	2.6
	W13	Ca Mau Port Improvement - Phase 2	1.5
	W15	Cao Lanh (Dong Thap) Port Improvement Phase 2	6.1
	W17	My Thoi (Long Xuyen) Port Improvement - Phase 2	7.6
	W19	Passenger Terminal Development - Phase 2	2.6
	W21	Other Local Port Development - Phase 2	42.0
	Waterway Improvement		
	W26	Hanoi-Viet Tri-Lao Cai Waterway Improvement - Phase 2	33.2
	Operation & Safety		
	W40	IWT Safety Enhancement - Phase 2	67.3
	W42	IWT Education - Phase 2	14.1
	W44	IWT Fleet Development - Phase 2	209.6
		Subtotal	**414.8**
Port & Shipping	*Port Expansion/Development*		
	P02	Cai Lan Port Expansion Project - Phase 2	250.0
	P04	Hai Phong General Port New Expansion Project	250.0
	P06	Cua Lo Port Project - Phase 2	50.0
	P08	Danang Bay - Lien Chieu Port Development - Phase 2	200.0
	P11	Specialized Port for Dung Quat Industrial Zone - Phase 2	240.0
	P13	Qui Nhon Port Development - Phase 2	80.0
	P15	Nha Trang Port Development - Phase 2	80.0
	P17	Ho Chi Minh City General Port - Phase 2	200.0
	P19	Varia Vung Tau General Port - Phase 2	800.0
	P21	Can Tho Port Development - Phase 2	150.0
	P23	Industrial Port Development - Phase 2	200.0
	P25	Other Local and Private Ports - Phase 2	200.0
	Operation & Safety		
	P28	Large-scale ICD Development Project - Phase 2	144.5
	P30	Fleet Expansion and Modernization Program - Phase 2	2,142.0
	P32	Development of Aids to Navigation (ATN) - Phase 2	133.6
	P34	Maritime SAR and Oil Spill Protection - Phase 2	105.6
		Subtotal	**5,225.7**
Air	*Airport Expansion/Development*		
	A04	Noi Bai Airport Development Project - Phase 2	59.1
	A06	Danang International Airport Development Project - Phase 2	31.9
	A10	New Long Thanh Airport Construction Project	350.0
	A12	Secondary Airport Development Project - Phase 2	1.0
	A15	Rehabilitation of Tertiary Airports - Phase 2	3.1
	Air Traffic Control		
	A26	Development of CNS/ATM Facilities in Hanoi ATM Center	5.0
	A27	Equipment Replacement Program	68.9
	A28	Improvements to Aeronautical Information Services (AIS)	2.0
	A29	Modernization of Aeronautical Fixed Telecommunications Network (AFTN)	1.5
	A30	Improvements of Search and Rescue Facilities	1.1
	A31	Upgrade of Civil Aviation Training Center of Vietnam	4.0
	Aircrafts		
	A34	Aircraft Purchase (2010-2020)	7,908.0
		Subtotal	**8,435.6**
		TOTAL	**20,700.1**

Appendix 5-B
Economic Evaluation of Master Plan

1. Evaluation by Subsector

In order to assess to the economic viability of the Master Plan proposed in VITRANSS (including ongoing/committed projects), traffic assignment explained in Appendix 4-A was conducted for the following cases:

A. Do-Nothing Case (present network)

B. “Road Projects Only” Case

C. “Road Projects Newly Proposed in VITRANSS Only” Case

D. “Railway Projects Only” Case

E. “Port/Costal Shipping Projects Only Case

F. “ All Three-Subsector Projects” Case

Air and inland waterway subsector were excluded from the evaluation because it was difficult to estimate the time value of air passengers, and inland waterway network confined in the delta areas was not suitable for nationwide macroscopic traffic assignment. The result of this traffic assignment for the year 2010 and 2020 are summarized in terms of traffic volume and transport cost on the network in Table 5-B.1, 5-B.2, 5-B.3 and 5-B.4.

Table 5-B.1 Assigned Traffic Volume by Case, 2010[1)]

A. Do-Nothing

	Road	IW	Rail	CS	Air	Total
Ton-km (bil.)	95.5	15.3	28.9	75.5	1.3	216.7
Percentage	44.1	7.1	13.4	34.9	0.6	100

B. Road (All Projects)

	Road	IW	Rail	CS	Air	Total
Ton-km (bil.)	106.2	9.2	29.6	79.2	1.3	225.5
Percentage	47.1	4.1	13.1	35.1	0.6	100

C. Road (Excluding Committed and On-going Projects)

	Road	IW	Rail	CS	Air	Total
Ton-km (bil.)	103.0	9.2	29.1	77.5	1.3	220.1
Percentage	46.8	4.2	13.2	35.2	0.6	100

D. Railway

	Road	IW	Rail	CS	Air	Total
Ton-km (bil.)	94.2	15.9	60.0	75.3	0.8	246.2
Percentage	38.3	6.5	24.4	30.6	0.3	100

E. Port/Costal Shipping

	Road	IW	Rail	CS	Air	Total
Ton-km (bil.)	75.8	26.6	26.6	107.7	1.0	237.7
Percentage	31.9	11.2	11.2	45.3	0.4	100

F. Three Subsectors

	Road	IW	Rail	CS	Air	Total
Ton-km (bil.)	104.4	10.4	31.2	79.7	0.2	225.9
Percentage	46.2	4.6	13.8	35.3	0.1	100

1) Traffic volume of passengers is included in the above after converting it into PCU terms

Table 5-B.2 Assigned Traffic Volume by Case, 2020[1)]

A. Do-Nothing

	Road	IW	Rail	CS	Air	Total
Ton-km (bil.)	146.7	31.2	32.1	145.9	5.1	361.0
Percentage	40.7	8.6	8.9	40.4	1.4	100

B. Road (All Projects)

	Road	IW	Rail	CS	Air	Total
Ton-km (bil.)	200.9	12.3	23.8	113.2	2.0	352.2
Percentage	57.0	3.5	6.8	32.1	0.6	100

C. Road (Excluding Committed and On-going Projects)

	Road	IW	Rail	CS	Air	Total
Ton-km (bil.)	193.2	11.9	24.5	118.3	2.1	350.0
Percentage	55.2	3.4	7.0	33.8	0.6	100

D. Railway

	Road	IW	Rail	CS	Air	Total
Ton-km (bil.)	107.1	21.0	129.6	96.1	2.1	356.0
Percentage	30.1	5.9	36.4	27.0	0.6	100

E. Port/Costal Shipping

	Road	IW	Rail	CS	Air	Total
Ton-km (bil.)	87.3	48.2	44.5	171.6	3.6	355.1
Percentage	24.6	13.6	12.5	48.3	1.0	100

F. Three Subsectors

	Road	IW	Rail	CS	Air	Total
Ton-km (bil.)	87.3	48.2	44.5	171.6	3.6	353.5
Percentage	47.9	7.3	12.4	32.3	0.1	100

1)Traffic volume of passengers is included in the above after converting it into PCU terms

Table 5-B.3 Transport Cost on Network, 2010

A. Do-Nothing

(VND Bill./year)

Mode	Pax VOT	Pax Oper	Fre Oper	Maint	Infra	Total
Road	10,352	11,833	224,456	5,019	0	251,660
IW	31	22	10,099	218	0	10,370
Rail	234	1,703	3,661	2,419	0	8,017
Coastal	0	0	31,814	952	0	32,766
Air	34	3,393	24	0	0	3,451
Total	10,652	16,951	270,054	8,608	0	306,265

B. Road (All Projects)

Mode	Pax VOT	Pax Oper	Fre Oper	Maint	Infra	Total
Road	10,935	12,927	118,034	5,669	18,232	165,797
IW	31	22	8,922	234	0	9,209
Rail	234	1,703	10,358	2,501	0	14,796
Coastal	0	0	78,896	2,156	0	81,051
Air	34	3,393	92	0	0	3,519
Total	11,234	18,045	216,302	10,560	18,232	274,373

C. Road (Excluding Committed and On-going Projects)

Mode	Pax VOT	Pax Oper	Fre Oper	Maint	Infra	Total
Road	11,962	14,141	129,121	6,202	19,945	181,371
IW	34	25	9,760	256	0	10,075
Rail	256	1,863	11,331	2,736	0	16,186
Coastal	0	0	86,306	2,358	0	88,664
Air	37	3,711	101	0	0	3,849
Total	12,290	19,741	236,620	11,551	19,945	300,146

D. Railway

Mode	Pax VOT	Pax Oper	Fre Oper	Maint	Infra	Total
Road	10,471	13,803	121,963	2,817	0	149,054
IW	31	22	19,449	431	0	19,933
Rail	172	1,801	14,191	14,827	812	31,803
Coastal	0	0	95,251	2,955	0	98,207
Air	29	3,301	70	0	0	3,400
Total	10,703	18,928	250,925	21,029	812	302,397

E. Port/Costal Shipping

Mode	Pax VOT	Pax Oper	Fre Oper	Maint	Infra	Total
Road	10,017	14,191	159,243	5,130	0	188,581
IW	31	22	11,015	284	593	11,945
Rail	244	1,801	15,069	4,665	0	21,779
Coastal	0	0	45,439	1,477	2,652	49,568
Air	29	3,244	107	0	0	3,380
Total	10,320	19,258	230,873	11,555	3,245	275,251

F. Three Subsectors

Mode	Pax VOT	Pax Oper	Fre Oper	Maint	Infra	Total
Road	10,353	9,498	177,437	5,551	15,292	218,131
IW	31	22	6,452	178	318	7,001
Rail	234	1,806	8,297	6,696	314	17,347
Coastal	0	0	22,594	745	1,264	24,603
Air	34	3,244	23	0	0	3,301
Total	10,652	14,569	214,804	13,170	17,188	270,383

Table 5-B.4 Transport Cost on Network, 2020

A. Do-Nothing

(VND Bill./year)

Mode	Pax VOT	Pax Oper	Fre Oper	Maint	Infra	Total
Road	33,094	17,761	415,181	1,868	0	467,904
IW	82	37	22,895	586	0	23,600
Rail	711	3,368	10,566	1,712	0	16,357
Coastal	0	0	93,490	2,913	0	96,403
Air	90	5,707	119	0	0	5,916
Total	33,977	26,873	542,251	7,079	0	610,180

B. Road (All Projects)

Mode	Pax VOT	Pax Oper	Fre Oper	Maint	Infra	Total
Road	34,341	15,936	229,898	6,558	44,835	331,568
IW	82	37	27,308	691	0	28,118
Rail	711	3,368	14,835	3,058	0	21,972
Coastal	0	0	143,454	4,168	0	147,622
Air	90	5,707	104	0	0	5,901
Total	35,224	25,048	415,599	14,476	44,835	535,182

C. Road (Excluding Committed and On-going Projects)

Mode	Pax VOT	Pax Oper	Fre Oper	Maint	Infra	Total
Road	38,578	17,903	258,268	7,368	50,367	372,484
IW	92	42	30,678	777	0	31,589
Rail	799	3,783	16,665	3,436	0	24,683
Coastal	0	0	161,156	4,681	0	165,837
Air	101	6,412	116	0	0	6,629
Total	39,570	28,140	466,884	16,262	50,367	601,223

D. Railway

Mode	Pax VOT	Pax Oper	Fre Oper	Maint	Infra	Total
Road	33,215	17,324	398,171	2,012	0	450,722
IW	70	32	22,263	568	0	22,933
Rail	565	3,778	17,571	3,010	4,253	29,177
Coastal	0	0	89,244	2,800	0	92,044
Air	77	5,557	55	0	0	5,689
Total	33,927	26,690	527,305	8,390	4,253	600,565

E. Port/Costal Shipping

Mode	Pax VOT	Pax Oper	Fre Oper	Maint	Infra	Total
Road	32,973	17,566	437,791	1,990	0	490,320
IW	70	32	5,227	132	1,366	6,827
Rail	771	3,778	11,166	1,799	0	17,514
Coastal	0	0	21,949	707	6,485	29,141
Air	75	5,463	126	0	0	5,664
Total	33,889	26,838	476,259	4,628	7,851	549,465

F. Three Subsectors

Mode	Pax VOT	Pax Oper	Fre Oper	Maint	Infra	Total
Road	33,128	16,639	322,020	8,650	20,533	400,970
IW	82	33	11,610	308	523	12,556
Rail	711	3,785	28,558	3,389	2,344	38,787
Coastal	0	0	46,297	1,497	2,730	50,524
Air	90	5,463	64	0	0	5,617
Total	34,011	25,920	408,549	13,845	26,131	508,456

Based on the traffic assignment, economic evaluation was conducted. The assumptions were:

- Evaluation period is 19 years from 2002 to 2020.
- All projects are implemented in three years from 2002 to 2004, and are put in use in 2005.
- Economic project cost is 85% (Standard Conversion Factor in Vietnam) of the financial project cost.
- Project cost is disbursed 20% in 2002, 30% in 2003 and 50% in 2004.
- Lifetime of projects is 30 years. In 2020, the residual value is taken into account.
- Benefit of the projects is composed of the savings in transport cost (sum of passenger time cost, operating cost of passenger transport, operating cost of freight transport, maintenance and development cost of infrastructure). The difference in transport cost between each case and the Do-Nothing case is corresponding to this (see Table 5-B.3 and 5-B.4).

The result is shown in Table 5-B.5. The benefit presented here includes that produced by the modal shift. As a result, the EIRR for the port/shipping subsector is calculated high (in usual feasibility studies for port/shipping projects, the benefit is taken from the reduction of ships queuing at ports with a fixed traffic demand, and EIRR is calculated lower than this analysis).

Table 5-B.5 Result of Economic Evaluation

Road (All Projects) (US$ million)

Year	Total cost	Total Benefit	Net	
2002	1422.6	0.0	-1422.6	
2003	2133.9	0.0	-2133.9	
2004	3556.5	0.0	-3556.5	
2005	0.0	1458.5	1458.5	
2006	0.0	1618.1	1618.1	
2007	0.0	1762.6	1762.6	
2008	0.0	1919.9	1919.9	
2009	0.0	2091.3	2091.3	
2010	0.0	2278.0	2278.0	
2011	0.0	2481.4	2481.4	
2012	0.0	2702.9	2702.9	
2013	0.0	2944.2	2944.2	
2014	0.0	3207.0	3207.0	
2015	0.0	3493.3	3493.3	
2016	0.0	3805.2	3805.2	
2017	0.0	4144.9	4144.9	
2018	0.0	4514.9	4514.9	
2019	0.0	4918.0	4918.0	
2020	0.0	5357.0	5357.0	
Residual	-3556.5		3556.5	EIRR
Total	3556.5	48724.0	41611.0	24.68%
Cost	7113.0			

Road (VITRANSS Proposal only) (US$ million)

Year	Total cost	Total Benefit	Net	
2002	605.6	0.0	-605.6	
2003	908.4	0.0	-908.4	
2004	1514.0	0.0	-1514.0	
2005	0.0	361.3	361.3	
2006	0.0	375.3	375.3	
2007	0.0	389.9	389.9	
2008	0.0	405.1	405.1	
2009	0.0	420.8	420.8	
2010	0.0	437.1	437.1	
2011	0.0	454.1	454.1	
2012	0.0	471.7	471.7	
2013	0.0	490.1	490.1	
2014	0.0	509.1	509.1	
2015	0.0	528.9	528.9	
2016	0.0	549.4	549.4	
2017	0.0	570.7	570.7	
2018	0.0	592.9	592.9	
2019	0.0	615.9	615.9	
2020	0.0	639.8	639.8	
Residual	-1514.0		1514.0	EIRR
Total	1514.0	7812.2	4784.2	12.18%
Cost	3028.0			

Rail (US$ million)

Year	Total cost	Total Benefit	Net	
2002	196.0	0.0	-196.0	
2003	294.0	0.0	-294.0	
2004	490.0	0.0	-490.0	
2005	0.0	175.2	175.2	
2006	0.0	192.0	192.0	
2007	0.0	210.3	210.3	
2008	0.0	230.3	230.3	
2009	0.0	252.3	252.3	
2010	0.0	276.3	276.3	
2011	0.0	302.6	302.6	
2012	0.0	331.5	331.5	
2013	0.0	363.1	363.1	
2014	0.0	397.7	397.7	
2015	0.0	435.6	435.6	
2016	0.0	477.1	477.1	
2017	0.0	522.6	522.6	
2018	0.0	572.5	527.5	
2019	0.0	627.0	627.0	
2020	0.0	686.8	686.8	
Residual	-490.0		490.0	EIRR
Total	490.0	6052.9	5073.0	22.46%
Cost	979.9			

Port/Shipping (US$ million)

Year	Total cost	Total Benefit	Net	
2002	282.2	0.0	-282.2	
2003	423.3	0.0	-423.3	
2004	705.5	0.0	-705.5	
2005	0.0	559.3	559.3	
2006	0.0	641.1	641.1	
2007	0.0	734.9	734.9	
2008	0.0	842.4	842.4	
2009	0.0	965.7	965.7	
2010	0.0	1107.0	1107.0	
2011	0.0	1269.0	1269.0	
2012	0.0	1454.6	1454.6	
2013	0.0	1667.5	1667.5	
2014	0.0	1911.5	1911.5	
2015	0.0	2191.1	2191.1	
2016	0.0	2511.7	2511.7	
2017	0.0	2879.2	2879.2	
2018	0.0	3300.5	3300.5	
2019	0.0	3783.4	3783.4	
2020	0.0	4337.0	4337.0	
Residual	-705.5		705.5	EIRR
Total	705.5	30156.0	28745.0	
Cost	1411.0			

3 Subsectors (US$ million)

Year	Total cost	Total Benefit	Net	
2002	1900.8	0.0	-1900.8	
2003	2851.2	0.0	-2851.2	
2004	4752.0	0.0	-4752.0	
2005	0.0	1671.3	1671.3	
2006	0.0	1820.5	1820.5	
2007	0.0	1983.0	1983.0	
2008	0.0	2160.0	2160.0	
2009	0.0	2352.9	2352.9	
2010	0.0	2562.9	2562.9	
2011	0.0	2791.7	2791.7	
2012	0.0	3040.9	3040.9	
2013	0.0	3312.4	3312.4	
2014	0.0	3608.1	3608.1	
2015	0.0	3930.2	3930.2	
2016	0.0	4281.1	4281.1	
2017	0.0	4663.3	4663.3	
2018	0.0	5079.6	5079.6	
2019	0.0	5533.0	5533.0	
2020	0.0	7266.6	7266.6	
Residual	-4752.0		4752.0	EIRR
Total	4752.0	56057.5	46553.6	21.78%
Cost				

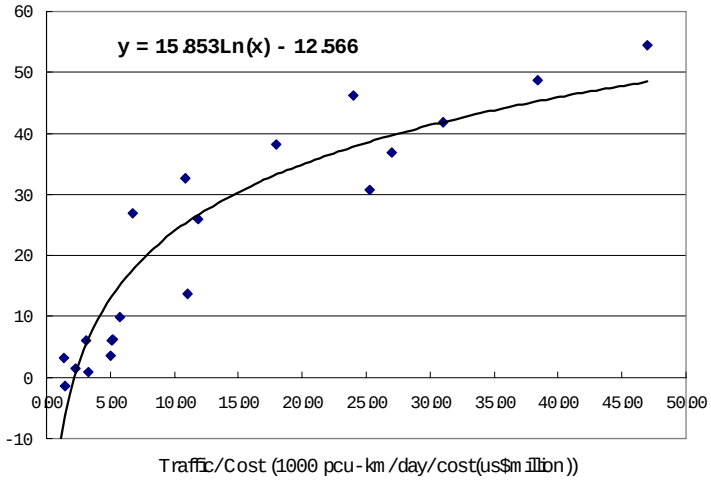
2. Evaluation of Each Project

VITRANSS Master Plan was evaluated economically by subsector as explained above. It was conducted based on the comparison of "With Project" case with "Do-Nothing" case. However, for individual projects, this approach was not taken because the traffic assignment model developed in VITRANSS was too complicated to apply individually to a number of projects, and a simplified methodology was applied as follows:

Road Project

Assuming a constant traffic volume on the project link both for "With Project" case and "Do-Nothing" case, the entire subsector benefit was allocated to each project in proportion to the difference in vehicle operating cost (VOC) and passenger time cost. The relationship between calculated EIRR and traffic volume per unit cost is shown in Figure 5-B.1.

Figure 5-B.1 Interrelation between Calculated EIRR and Traffic Volume per Unit Cost of Construction



Railway Project

The entire subsector benefit was allocated to each project in proportion to the difference between cost of road transport and cost of railway for the traffic demand increase due to the railway project.

Port/ Shipping Project

The entire subsector benefit was allocated to each port project in proportion to the traffic demand exceeding the present cargo handling capacity.

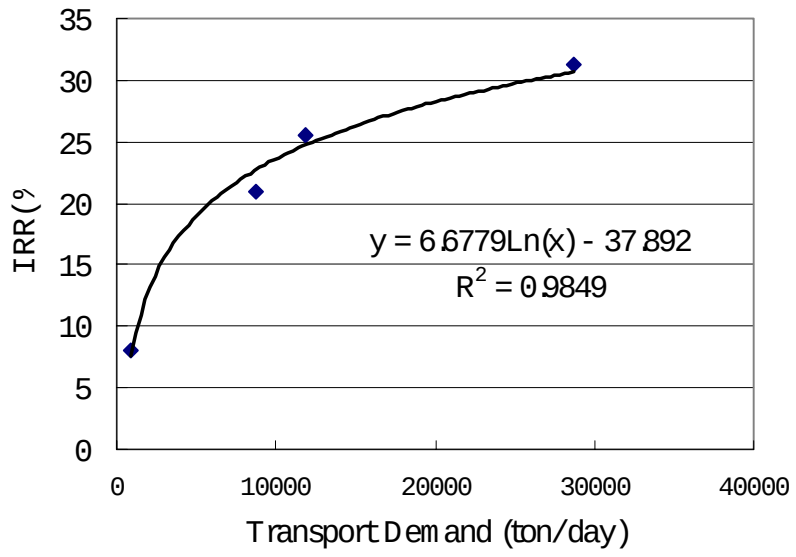
Airport Project

The benefit for each airport project was calculated as the difference in transport cost of road transport and air transport for the traffic demand exceeding the present capacity of the airport. Average travel distance of passengers was calculated by airport using the OD table, and the time value of air passengers was assumed at 10 times of that of passenger car users.

Inland Waterway Project

Using the study conducted by ADB in the Red River Delta, EIRR was directly estimated by the correlation shown in Figure 5-B.2.

Figure 5-B.2 Correlation between EIRR and Transport Demand in Inland Waterway Projects.



APPENDIX 6-A : FINANCIAL FEASIBILITY OF EXPRESSWAY PROJECTS

1. General

This appendix intends to show an exercise to roughly assess the financial viability of expressway projects under the current situation of Vietnam. Although private sector participation in expressway construction and operation is often advocated, the opportunities are rather limited and project implementation is not an easy task.

2. Assumptions of Exercise

1) Construction Cost

The construction cost of a four-lane access-controlled expressway is variable at US$ 1, 2, 3, 4, and 5 million per km. The construction cost of an ordinary highway of four lanes is US$ 0.7 - 1.0 million per km at present in Vietnam. Since the construction cost of expressway is much higher than that of ordinary highway, the realistic cost will be US$ 3-4 million per km.

2) Traffic Volume

Considering the present low time value of Vietnam's citizen, traffic volume of expressway should be relatively large because the toll cannot be set high. For the analysis, traffic volume is set variable at 10,000, 20,000, 30,000, 40,000 and 50,000 PCUs per day.

3) Toll Rate

This is set at VND 500 per PCU-km. Thus the toll rate for bus and truck is VND 1,000 per PCU-km.

4) Construction and Operation Period

Construction period is assumed to be three years with 1/3 allocation of cost for each year. Analysis period is 30 years with no residual value at the end of the period. For operation and maintenance, 2% of construction cost is allocated every year.

3. Conclusion

Based on the assumptions described above, the FIRR (Financial Internal Rate of Return) was calculated as presented in Figure 6-A.1.

Figure 6-A.1
Financial IRR of Expressway Project under Various Conditions
of Construction Cost and Traffic Volume

When the construction cost is US$ 3 million per km, FIRR is negative at 10,000 PCUs per day and becomes 5.2% at 20,000 PCUs per day. Even if the fund is a soft loan of 2-3% p.a., an FIRR of 5% will be needed at least to maintain sound cash flow. Thus, an expressway project is hardly feasible when traffic demand is less than 20,000 PCUs per day. Moreover, a traffic demand of more than 40,000 PCUs per day is required to invite the private sector for the project (an FIRR of 15% or more).

Although the threshold becomes lower than the above if the construction cost is cheaper, it is difficult at present to identify routes suitable for expressway project in Vietnam except for some suburban sections near HCMC and Hanoi. In order to promote private sector participation, some incentives, such as revenue guarantee and granting of regional development rights, will be needed in addition to the establishment of legal/institutional systems.

Appendix 7-A Possible Technical Assistance Projects (Including Ongoing Projects)

Code	Project/ Program	Description	Implem-enting Agency	Funding Agency
	GENERAL			
G	Transport Management Capacity of MOT	TA to assist MOT in the continued development of policies and organizational structure for effective transport sector management. Assess the functions and responsibilities of the MOT general departments. Assess the relationship between the ministry and the institutes, modal organizations, and provincial offices under MOT. Assess the relationships between the MOT and other key agencies with responsibilities for transport, including the Civil Aviation Authority of Vietnam and other ministries. Assess MOT's policy-making capacity regarding (a) regulation, pricing, subsidy and cost recovery (b) project and policy evaluation (c) strategic planning (d) monitoring of policy and project implementation. In each case propose strengthening measures, including organizational changes, functional definitions, management systems and procedures, staffing and training. Give recommendations on establishing oversight and contractual relationship with the railway, and how to strengthen capacity to oversee aviation. The TA would be in two parts - initially assistance would be given to establish the overall organisational and system changes required. Further assistance would then be given to implement the changes in specific areas.	MOT	
G	Legal Assistance to MOT	TA to assist MOT in establishing the legal framework for the transport sector that incorporates international agreements and protocols, and incorporates international experience in establishing the legal basis for multimodal transport, effective competition between modes and other areas. Future international trade and transport agreements include ASEAN agreements (especially the ASEAN Framework Agreement on the Facilitation of Goods in Transit, the ASEAN Framework Agreement on Inter-state Transport, and the ASEAN Agreement on Multimodal Transport), which cover transport liberalisation, conditions for cross-border transport, development of combined transport and increase of technical standards. There are also 11 United Nations Agreements and Conventions on cross-border transport activities that could be signed by Vietnam in future. The legal framework for multimodal transport requires new legislation governing the basis of freight carriage (limits of liability), the basis for multimodal transport operators, and basis for freight forwarders to act as principals rather than as agents. Other areas that may require assistance include establishing an umbrella law for transport and the legal basis for a road fund.	MOT	

Code	Project/ Program	Description	Implem-enting Agency	Funding Agency
G	Establishing a transport database	Assess information needs of MOT for (a) planning, and (b) management of the transport sector, including but not limited to information required for assessing traffic levels, transport costs and prices, utilization of infrastructure and transport equipment, potential infrastructure bottlenecks, safety levels and environmental impacts. Assess the current availability of the information, effectiveness of current database systems used by MOT, alternative means of obtaining the required information, and current obstacles to MOT staff obtaining reliable information in a timely manner (such as data collection, handling and analysis methods, institutional relationships, finance, legal constraints). Recommend an action program to implement an affordable transport monitoring database that would meet the requirements of decision-makers and specialists (including institutional strengthening of the agency appointed to manage the VITRANSS planning database to improve capability to define data needs, and to improve methods of data collection and management).	MOT	
G	Strengthening Human Resource Management Capacity of MOT	Strengthening of the training section of the MOT Labor and Personnel Department to handle the planning and management of human resource development programs within the transport sector. Specifically for (a) upgrading data collection/analysis methods, (b) designing short/medium/long-term strategies, (c) developing five year master plan and annual plans for staff in MOT and subsector agencies (including provinces). This assistance is proposed to start after the institutional reforms of the ministry and subsector agencies have been approved (expected in 2001).	MOT	
G	Transport Management Training	TA to promote training on those basic management aspects common to most modes of transport such as costing, marketing, financial planning, fleet planning and control, financial evaluation, legal aspects etc. Train-the-trainer assistance would be given to trainers from several institutes around the country in order to produce course modules and materials of relevance to managers in the transport industry and decision-makers in government. Advice would be given on marketing the training courses so that the newly trained trainers can replicate the courses around the country on a self-financing basis and, if necessary, adapt courses to the particular needs of different parts of the transport industry.	MOT	
G	Upgrading Technical Secondary and Vocational Training Schools	Assess the present technical and vocational schools under MOT in order to upgrade the quality of education. There is a general shortage of people trained in technical skills but the schools are unable to respond to the growing need for technical training because they are supply-driven rather than demand-driven. An ADB project "Vocational and Technical Education Project" is underway to reform certain schools outside the transport sector. The schools under MOT offer basic technical training oriented towards transport applications and, once enough experience has been acquired on the ADB project to implement reforms more widely, improvements should be made in the schools under MOT. The proposed project would reorientate the MOT schools towards the real needs and, based on this, review qualification standards and upgrade facilities, curricula, retrain teachers, and upgrade training equipment and materials.	MOT	

Code	Project/ Program	Description	Implem-enting Agency	Funding Agency
G	Transport Training Capacity Building	TA to improve training incentives and training capacity in Vietnam. Involving definition of modern professional qualification standards for government transport officials, promotion of professional accreditation schemes, updating syllabuses of professional transport training courses, training trainers in transport (management, technical, planning, economics aspects), supply training materials and equipment	MOT	
G	State-owned Enterprise Reform	TA to prepare an equitization plan for SOEs in the transport sector. Further assistance is required after this project to develop the equitization programme and to implement it (in the short-term for small scale enterprises, in the long-term for large scale enterprises).	MOT	Proposed by ASEM/ World Bank
G	Donor Coordination	This project on improving donor coordination could use the transport sector in Vietnam as a pilot study. One aspect could be how to improve availability of information about donor activities through forums, internet facilities etc.	MOT	Proposed by World Bank
G	Developing New Sources of Capital	TA to help set up a commercial leasing company which could supply the transport industry with new equipment. This would have to coordinate with on-going efforts by The World Bank to improve the supply of credit to the private sector in Vietnam.	Ministry of Finance	
	ROAD			
H	Improvement of Highway Management Capacity	TA developing systems and documentation for VRA for management of infrastructure, regulation of road transport and development of road safety.	VRA/ MOT	ADB
H	Regional Road Management	TA to strengthen the capacity of the RRMUs and PMUs to manage road infrastructure (including establishment of Road Information System, Road Management System and Pavement Management System).	PMU1	Proposed by World Bank
H	Road Network Development	TA to assist VRA, PTAs and District Authorities in applying a uniform system of technical and functional standards for roads and bridges. The work would involve advice on (a) conducting a road network survey, (b) demarcating responsibilities between government agencies, (c) international experience in defining standards, and (d) developing a pavement testing laboratory as an annex to the Research Institute for Transport Science and Technology (RITST).	VRA, PTAs, District Authorit-ies	
H	Road and Bridge Standards	TA to achieve capability in MOT for setting and enforcing national technical standards.	PMU1	Proposed by World Bank
H	Road Safety	TA to assist VRA implement the recommendations of the World Bank-funded Road Safety Study. Covering quality and usefulness of accident statistics, institutional strengthening of the National Traffic Safety Committee to coordinate and manage road safety activities, incorporate a road safety audit system into road design, installing a vehicle testing laboratory to upgrade testing skills, strengthening capacity of enforcement agencies.	VRA	
H	Rural Transport Project II	Project to develop and implement rural transport plans. Institutional development assistance to PMU18, PDOTS and MOT aspects).	MOT	World Bank/UKs DFID

Code	Project/ Program	Description	Implem-enting Agency	Funding Agency
H	Accelerating Rural Transport Development	In addition to the above project, further TA work could include (a) integrating rural transport networks with the newly classified primary/secondary networks, (b) extending the application of the area-specific planning approach based on local socio-economic characteristics, (c) promotion of rural transport services through regulatory and credit schemes, (d) increasing community involvement in rural planning.	MOT, PTAs, District Authorit-ies	
H	Provincial Transport Project to Upgrade PTAs	TA to strengthen capacity of PTAs to plan and manage provincial roads, focusing on human resource development needs, introduction of management methods and management tools required to implement policy (plan preparation, contracting methods, data collection, monitoring systems).	MOT	
H	Provincial Road Maintenance	TA to strengthen the capacity of provincial maintenance units to maintain provincial and national roads	MOT	
H	Road Financing	TA project to improve the system of financing roads, based on the results and conclusions of the World Bank Seminar held in Hanoi in May 2000.	VRA	World Bank
H	Expressway Development Plan	Although VITRANSS does not recommend construction of expressways in the short-term, it is anticipated that these will be constructed later. This project would assist VRA in carrying out a long-term expressway development study in order to prepare outline standards, administrative procedures, costings, potential demand estimates, assessment of funding possibilities and scope for private sector involvement.	VRA	
	INLAND WATER			
W	Rural Infrastructure/ Inland Waterways Project	TA to commercialize VIWA operations, improve management systems/tools, introduce market concepts, introduce local funding initiatives, develop legal documents. This TA will produce a national plan for institutional development by 2002. In the long-term, assistance is required to implement this plan.	VIWA	Canadian CIDA
W	Promotion of the Private Sector	TA to accelerate the equitization in water transport, prepare programs and implement pilot projects to increase the role of the private sector (especially in transport services and port management).	VIWA	
	RAILWAY			
R	Railway Business Plan	Short-term TA to assist VR in developing plans for business development and adopting a Lines of Business form of organisation. This TA would include advice on the optimum form of organisation, on required legal changes, and on management systems (especially management information system, costing tools, financial planning system, systems for charging for infrastructure and other services provided to business units) and training.	VR	
R	Implementing Railway Reorganisation	Long-term TA to implement the agreed business plan and organisation, through development of a management information system, introducing traffic forecasting and marketing methods, adapting the accounting system, implementing costing tools, implementing a financial planning system, and implementing systems for charging for infrastructure and other services provided to business units. Implement management training programs.	VR	

Code	Project/ Program	Description	Implem-enting Agency	Funding Agency
R	Commuter Railway Planning	Although VITRANSS does not recommend development of new urban railway infrastructure in the short-term, in the long-term it is anticipated that there will be a potential role for commuter rail services in HCMC and Hanoi. This TA would involve carrying out economic feasibility studies, as part of comprehensive studies of urban transport, to assess the need for such services, in the long-term, and the necessary actions to prepare for implementation. No recent comprehensive transport master plan has been carried out in HCMC, and such a master plan study would be a suitable means of studying the potential for commuter services.		
R	Inter-state Railway Study	This TA would give advice on preparing a possible project to implement the recommendations of the Singapore - Kunming Rail Link feasibility study, due for completion in 2000. This could involve advice on traffic forecasting, engineering design, environmental analysis, inter-state management and operation planning for the HCMC to Phnom Penh section.		
	MARITIME			
P	Maritime Institutional Strengthening	TA project concerned with drafting legal documents, formulating maritime processes, training in legal matters and assistance in interpreting international conventions. Assistance is required in improving infrastructure management systems, staff qualification levels and use of computer systems.	VINA-MARINE	
P	Commercialisation of Ports	TA to identify ways to strengthen management of ports by assessing existing management of ports and recommending port development policies aimed at improving efficiency, level of service, profitability and return on investment, identifying functions of ports that could be managed and financed on a more commercial basis (either specialised berths or general handling services), to consider the role that the private sector could play under each function, define possible development options, assessment of the financial viability of each feasible option, assessment of the organisational changes required to implement the proposed changes (including definition of professional standards of port management, strengthening of the Vietnam Ports Association, and simplification of port documentation), assessment of the need for modern management tools (especially port information management systems, Electronic Database Interchange systems, port charging and contracting systems), assessment of the legal changes required to implement the recommended changes.	VINALINES/ other ports	
P	Gateway Port Planning	Although VITRANSS recommended development of the three main gateway ports, detailed plans have yet to be developed. Basic options remain to be identified and evaluated comprehensively, taking account of broad economic, social and environmental impacts. This TA would involve comprehensive technical and economic feasibility studies of options for developing deep sea ports in Vietnam and refine the recommendations of VITRANSS in more detail.	VINA-MARINE	

Code	Project/ Program	Description	Implem-enting Agency	Funding Agency
P	Enhancement of Maritime Safety and Fleet Control	Vietnamese flag vessels have the worst Port State Control detention rate among Asian and Pacific countries. Substandard vessels should be restored urgently and ship management should abide by international standards. Safety facilities and safety management in Vietnam is generally weak. This TA would cover (a) specific inspection issues such as training, development of an inspection testing laboratory, and adoption of the ISM-Code into daily shipping management, (b) improvement of the maritime accident data system, (c) strengthening of the Maritime Search and Rescue (SAR) Coordination Centers under the National SAR Coordination Committee by training staff and introducing systematic operation skills, (d) introduction of vessel traffic services (VTS) or a radar-based vessel control measure on congested waters, and (e) strengthening capability of safety related experts such as aids to navigation (ATN), SAR and sea communication, especially in compliance with the global maritime distress and safety system (GMDSS).	VINA-MARINE	
	AVIATION			
A	Institutional Strengthening in Infrastructure Management	Training CAAV staff in (a) developing and evaluating air transport plans, (b) setting and enforcing higher technical and environmental standards, in support of an increasingly liberalised air transport market, and (c) incorporating into Vietnamese law the regulatory changes recommended by the on-going French-Vietnam TA.	CAAV	
A	Airport Management Training	Training TA is required in business techniques (business planning, costing, charging and financial evaluation, passenger service, and contracting methods) to enable the Vietnamese airports to be managed on a commercial basis.	CAAV	
A	Upgrade of Air Safety	To ensure safe air services, there are various training needs in the airline industry such as enabling the air traffic management agency (VATM) to meet ICAO safety standards and introduce the new CNS/ATM system proposed for Vietnam. This TA would provide training on introducing CNS/ATM system, equip training institutions such as the Singapore Aviation Academy (SAA), upgrade the Civil Aviation Training Center of Vietnam to meet international qualification standards (using ATC radar simulators and a multimedia language laboratory).	CAAV	
A	Aeronautical/ Meteorological Training	Training TA is required for observers and forecasters	CAAV	
	MULTIMODAL			
	Multimodal Transport Development	There is a need to foster multimodal transport (MT) operators by provision of a suitable regulatory regime, simplification and modernization of custom procedures and transit arrangements, and provision of modern container ports and ICDs. Areas for TA include (a) preparing regulations in compliance with the international MT convention and the ASEAN Framework Agreement on MT, (b) preparing the regulatory arrangements for international traffic flow such as improving customs clearance and acceding to related international conventions, (c) encouraging private sector participation in container terminals and ICDs, (d) establishing a Vietnam Shippers' Council to represent cargo users, and (e) providing training for possible MT operators.	MOT	