10 BASIC PLAN FOR THE NORTH-SOUTH HIGH-SPEED RAILWAY

10.1 Role of North-South High-speed Railway in the Overall Transportation System

10.1 The physical characteristic of Vietnam, i.e., a long stretch of land with two major growth centers on opposite ends separated by a distance of more than 1,500km without equivalent growth centers in between, has long been the country's main development and political concern. Such a setting has greatly affected development in general, particularly transportation development, in many ways. Integrating the north and south economic centers requires large investment in infrastructure, even as demand remains relatively limited due to the long travel. Absence of large urban areas and growth centers along the north–south corridor also amplifies development difficulties. Moreover, transportation infrastructure and services are poorly provided, further suppressing transportation demand.

10.2 However, the situation has been quickly changing; steady economic growth driven by the rapid progress of the north and south development clusters has pushed transportation demand higher than ever, calling for improved connectivity between the north and south. During the period between 1999 and 2008, demand for passenger and goods transportation between the north and south increased by 2.6 and 3.0 times, respectively. Recently, the development of the central cluster has gained momentum, and the interaction among the three development clusters has quickly picked up. Future demand along the corridor for both passengers and goods is therefore estimated to become high.

10.3 While demand has rapidly increased in quantity, the quality of transportation services has not improved as much as required. Traffic congestion on roads in and around the main urban areas and along main transportation corridors has become serious. Increased vehicular traffic, especially of larger trucks, has caused serious traffic accidents on roads and has damaged pavements due to overloading and poor maintenance. Existing roads are also vulnerable to various disasters. The existing railway is a single-tracked system with numerous at-grade crossings with roads, weak bridges, and sharp curvature which limit transportation capacity at higher speeds. Coastal shipping has a large potential but has not been fully tapped due to inadequate infrastructure, inefficient operation, poor connectivity between land transportation, and lack of services, among others. Air transportation services, which have improved dramatically, are limited to the high-end market, although its potential for long-distance north–south travel is considered as significant. Although all modes of transportation are available to serve the corridor, their quality has to be improved a lot.

10.4 Vietnam's further growth in a more competitive and sustainable manner requires a much tighter integration of the north and south, which are at the moment competing for development priority, but which can complement each other's development efforts and goals when provided with improved connectivity, especially through transportation. Toward this end, the development of a high-speed railway together with expressways is considered an opportunity to dramatically improve services. However, it should be noted that high-speed railway should not only intend to connect the south and north but, of equal importance, to promote the process of urbanization and economic development along its route. Without this rationale in mind, the role of a high-speed railway will become limited.

10.2 Conceptual Plan for the High-speed Railway

1) Tasks of Study Component

10.5 The study component on the NSHSR has been the main focus of VITRANSS 2 because of various uncertainties surrounding it including large investment costs, demand for such services, mobilization of fund sources, and impact on regional development, among others. Painstaking effort was made particularly in estimating the level of investment needed for, and likely ridership on, the NSHSR. The tasks in studying the NSHSR are briefly explained as follows:

(a) **Define Role of NSHSR:** In the first Steering Committee meeting held in December 2007, it was agreed that the NSHSR should be examined comprehensively to define its role as an integral part of the overall transportation system in the country.

(b) **Study Alternatives:** In the second Steering Committee meeting held in March 2008, it was agreed that alternatives in HSR development in terms of route, service level, relationship with the existing railway, and locations of terminals in Hanoi and HCMC, among others, should be studied comprehensively to provide a sufficient basis for decision making.

(c) **Coordinate Parallel Studies:** Following the discussions in the Steering Committee meetings, the VITRANSS 2 Study Team and the Transport Investment and Construction Consulting (TRICC)-Japan Transportation Consultants, Inc. (JTC) Team, which was also conducting their own study on the NSHSR, coordinated with each other in conducting their respective studies. VITRANSS 2 formulated the overall strategy for NSHSR development and the TRICC-JTC study formulated the detailed plans. The two study teams exchanged data and information during the course of their studies. VITRANSS 2 Study Team shared data on demand forecast and project evaluation, while the TRICC-JTC Team provided information mainly on engineering and costs.

(d) **Prepare Alternatives:** Basic alternative NSHSR routes were formulated based on the extent of using existing railway facilities and space. Discussions were then held in the third Steering Committee meeting held in June 2008 and the agreements made then are as follows:

(i) Existing railway lines will be separated from the NSHSR because the former, which has a meter gauge, must comply with a prior ASEAN commitment that the railway in Vietnam would be part of the Singapore–Kunming Railway Link (SKRL). Besides, the existing railway provides freight and local passenger transportation services, while the NSHSR would exclusively be for passenger movement;[1]

(ii) For the NSHSR, two alternative concepts were worked out: one is a completely new line and the other makes use of the existing railway alignment. Wherever sections of the latter would be deemed suitable for high-speed operation, the NSHSR tracks would be constructed in parallel to the existing railway. For sections with substandard curvature and structures, new alignments would be identified; and

(iii) The location of terminals in Hanoi and HCMC would be a critical concern for the study. Alternatives and relevant discussions are presented here.

[1] A discussion was also held on the combined operation of passenger and freight services on the NSHSR. However, as the differences in the nature of services, including operating speeds on long distances, may cause conflicts and poor safety levels, it was decided that the NSHSR would be dedicated to passenger services.

2) Alternative Route Plan

10.6 A preliminary alignment study was undertaken using the available 1:50,000 topographic maps based on two alternative concepts, namely, one with completely new alignment and the other making the alignment parallel to the existing one wherever the required technical standards could be met. The total length of the completely new alignment would be 1,570km, while the combined new and existing alignments would be about 1,600km (see Figure 10.2.1 for the general alignment and Figure 10.2.2 for a more detailed plan of a sample section).

10.7 A total of 25 preliminary sections were identified which took into consideration the areas with higher population concentrations and the prospects for high-speed train operation. The average spacing between stations is about 61km.

10.8 In planning routes and alignments, the following factors were considered:

(a) **Topography and Curvature:** These will affect the target maximum and operating speeds of the NSHSR. It is considered that the completely new alignment can ensure a maximum speed of 300km/h, while the combined alignments can meet a maximum speed of 200km/h;

(b) **Connectivity of NSHSR Stations with Existing Stations:** It is planned that NSHSR stations would be constructed close to existing railway stations for better connectivity and access; and

(c) **Other Key Factors:** Thes include road crossings, avoiding disaster-prone and environmentally sensitive areas, among others.

10.9 Results of the preliminary alignment plans were handed over to TRICC and further study was undertaken by them in close coordination with the VITRANSS 2 Team. The new-alignment alternative was eventually considered the right option, judging from the engineering analysis and economic/financial evaluation.

3) Location of Stations in Hanoi and HCMC

10.10 The location of the NSHSR terminals in Hanoi and HCMC will be important not only for the residents of the two cities but also for those residing in hinterland provinces and will be using the NSHSR. Clearly, this means that a good access through efficient connectivity with urban and provincial transportation will be crucial. An analysis of the NSHSR demand indicates that the NSHSR would attract fairly a lot of passengers from the provinces beyond Hanoi and HCMC.

10.11 However, constructing terminals in these cities will face various difficulties since both are so heavily developed and congested that it would require careful planning to design the structure and minimize negative social impacts while maximizing economic development opportunities.

10.12 Notwithstanding this obstacle, alternative locations of the terminals were identified in Hanoi and HCMC to assist in the comparative assessment (see Table 10.2.1).

Table 10.2.1 Alternative Locations of NSHSR Terminals in Hanoi and HCMC

Alternative Location		Description/Comment
HANOI	1. Existing Hanoi Station	• Terminal will be located in heavily congested urban area though space for constructing it is available. • Access to the central station will be difficult unless it is built underground, which will be expensive and may conflict with UMRT Line 3. • Traffic congestion at and around the terminals will become serious due to ingress/egress of NSHSR passengers who require feeder services. • Good connectivity with UMRT Line 1 and Line 3. • Will entail higher cost.
	2. Crossing between Existing Rail and Proposed Ring Rail in the South	• Less conflict with urban traffic. • Good connectivity with provincial rail lines using the proposed ring rail and UMRT Line 1. • Will provide opportunity to develop a new urban center leveraging on the NSHSR terminal. • Will entail lower cost.
	3. West of Hanoi Urban Areas	• Good opportunity to serve rapidly growing urban areas in the west and to develop a new urban center. • Possibility to extend NSHSR toward Noi Bai Airport using western section of existing rail and Thang Long Bridge.[1] • Good connection with urban rail and Lang-Hoa Lac corridor must be ensured. • Will entail lower to medium cost.
HCMC	1. Existing Hoa Hung Station	• Easier construction of terminal and with available space. • Difficult access to the terminal unless the existing alignment is converted for the NSHSR. If the existing railway will be elevated, access to the terminal will only be possible via underground. • Will entail higher cost.
	2. Connection with UMRT Line 1 Station	• Least-cost solution. • Will require coordination with ongoing Line 1 project.
	3. Connection with UMRT Line 2 at Thu Thiem Station	• Will provide opportunity to develop a new central station in Thu Thiem new CBD close to the existing CBD. • Good connection with UMRT Line 2. • Opportunity to link HCMC and new urban center in Nhon Trac and new international airport in Long Thanh. • Will entail medium cost.

Source: VITRANSS 2 Study Team.

[1] When the proposed ring rail is completed, the west section may not be fully utilized by provincial lines. Thang Long Bridge is provided with double tracks with standard gauge.

4) Operations Plan

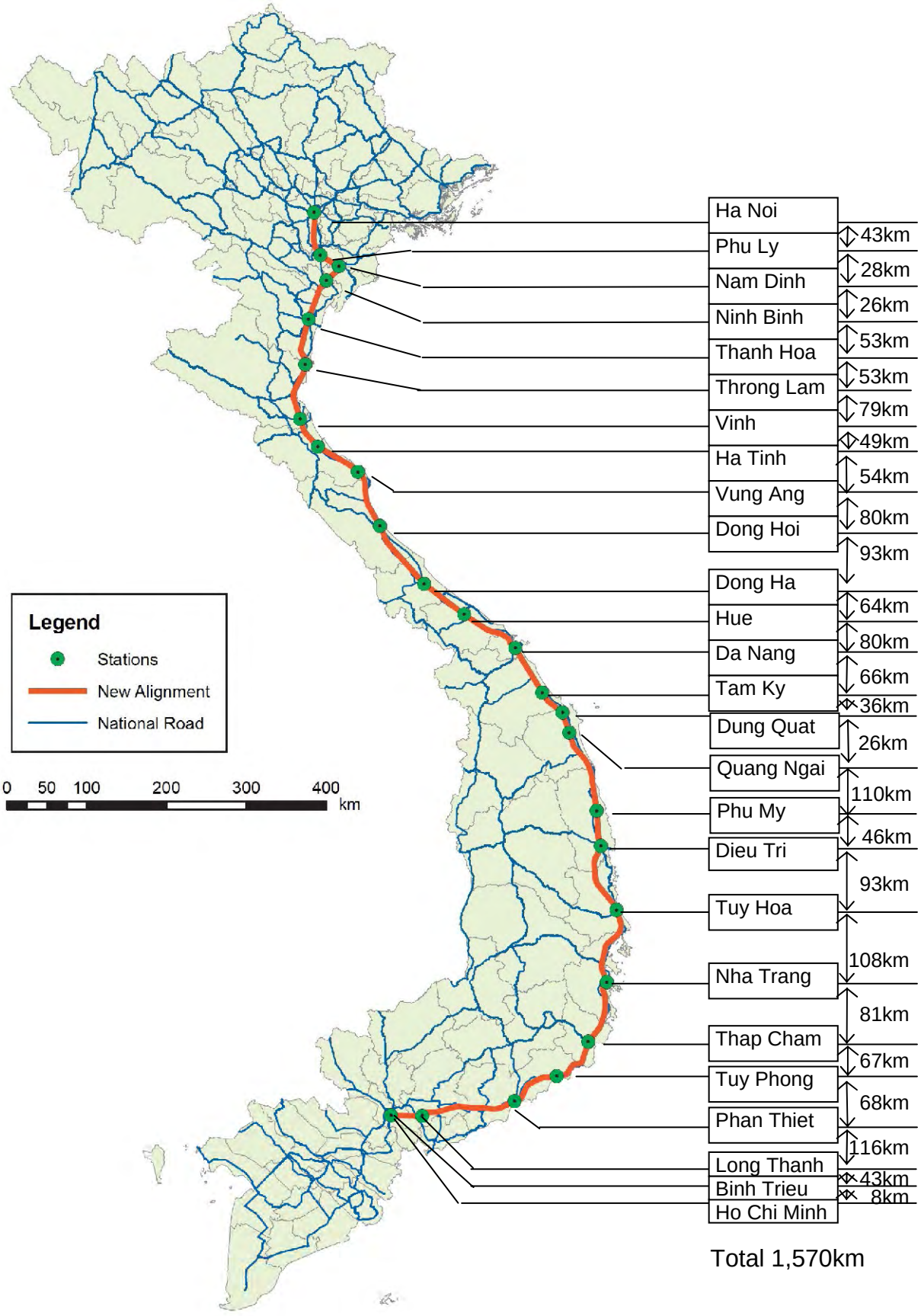
10.13 A preliminary study of the operation of a high-speed train showed that Hanoi and HCMC can be connected around 5 hours 30 minutes when the maximum train speed is 300km/h.

Table 10.2.2 Estimated Travel Time between Hanoi and HCMC on the NSHSR (Max. Speed 300km/h)

Action	Travel Time
Stopping at all 26 stations	About 6hours 50minutes
Stopping at 6 priority stations only	About 5hours 40minutes

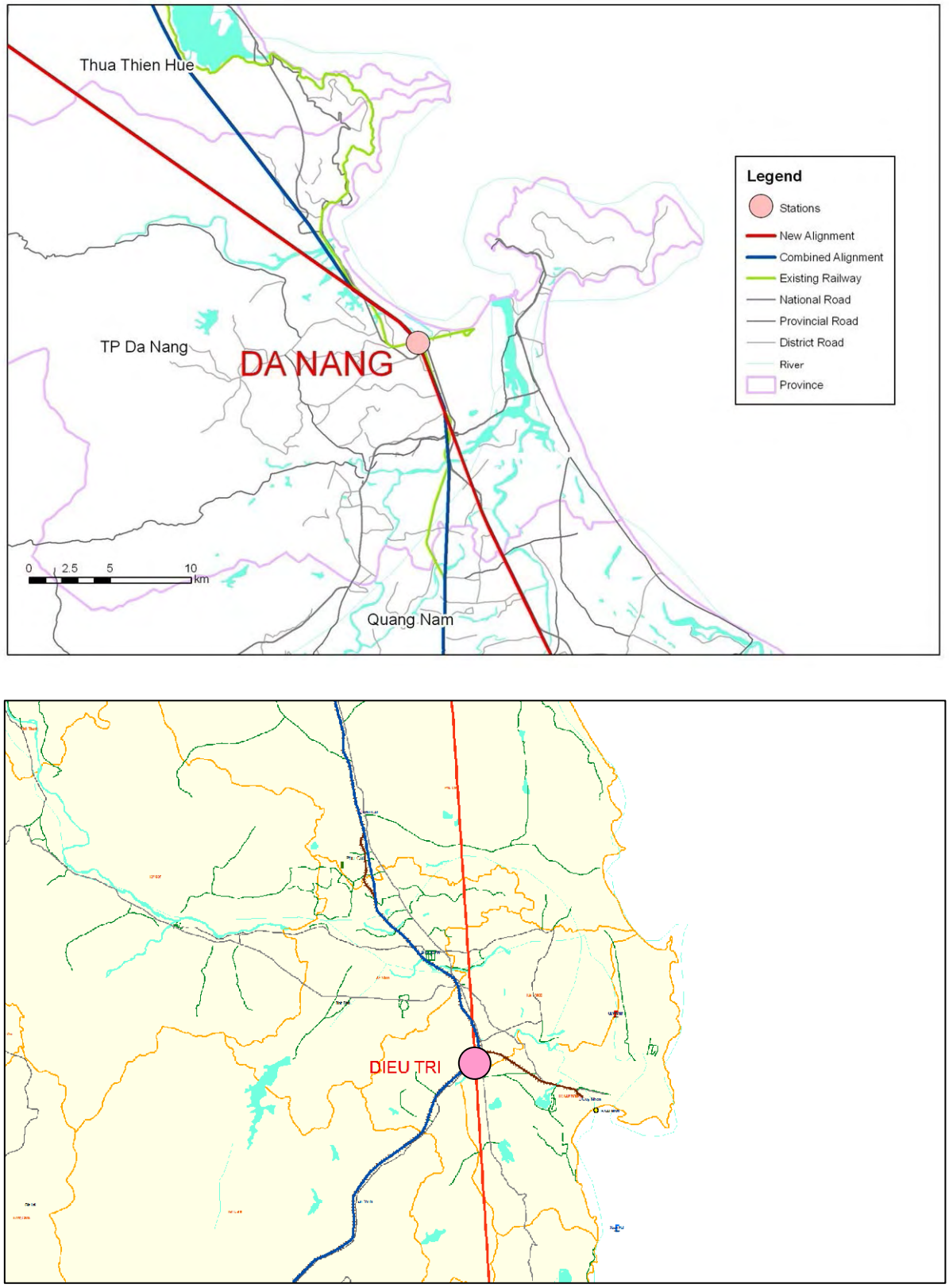
Source: TRICC-JTC Team.

Figure 10.2.1 Proposed NSHSR Alignment and Station Locations



Source: VITRANSS 2 Study Team.

Figure 10.2.2 Sample Section of NSHSR Alignment



Source: VITRANSS 2 Study Team.

5) Construction Cost Estimates

10.14 Based on the study on alignment, civil works and operations, the investment cost for the NSHSR was estimated for the purpose of assessing investment viability.[2] The results of the work show that the construction of the infrastructure and facilities require approximately USD 38 billion or about USD 25 million per kilometer (see Table 10.2.3). Note that this is economic cost which excludes rolling stock cost, contingency, and taxes.

Table 10.2.3 Estimated Investment Cost for the NSHSR[1]

Item		New Alignment: Assumed Speed 300km/h
		Total Cost (USD mil.)
Construction	Civil work & track	19,612
	Station	2,818
	Subtotal	22,430
Depot		732
Electric Facilities		7,008
Signaling/Telecommunications		5,352
Engineering Service		711
Land Acquisition		1,791
Total		38,024
Cost/Km (USD mil.)		22.6

Source: TRICC [1] Economic cost excluding rolling stock, contingency and taxes.

6) Requirement for Rolling Stock

10.15 The number of cars required for HSR operation differs depending on transportation demand. Assuming an average occupancy of 81 passengers per car (100% of seats) and an average running kilometrage of 2,000km per day per car, the rolling stock requirement and its cost were estimated (see Table 10.2.4).

Table 10.2.4 Number of Cars Required and Rolling Stock Cost[1]

Speed of NSHSR	Fare Level (% of Airfare)	Pax-km, 2026 (mil./day)	No. of Cars Required, 2026	Rolling Stock Cost, 2026 (USD mil.)
300km/h	100	70	520	2,266
	50	123	918	4,003
	25	161	1,202	5,243
200km/h	100	57	427	1,862
	50	102	759	3,311
	25	138	1,027	4,480

Source: VITRANSS 2 Study Team.

[1] Assumes: (i) opening in 2026; (ii) average occupancy: 81 pax/car (100% of seats); (iii) average daily kilometrage: 2,000 km/car; (iv) cost includes that of maintenance cars; and (v) excludes taxes.

7) Estimate of Operating Cost

(1) Operating Cost

(a) O&M Cost (Excluding Personnel Cost and Taxes)

10.16 It is difficult to precisely estimate the O&M cost of HSR due to the unavailability of data. To overcome this problem, some railway statistics were collected from Japanese sources as shown in Table 10.2.5.

[2] As the level of engineering study is at the master planning stage yet, it should be noted that costs may vary considerably at the detailed planning stage.

Table 10.2.5 O&M Cost[1] of Selected Private Railway Companies in Japan

Railway Company	Variable Cost (JPY/pax-km)	Fixed Cost (JPY million/ route-km/year)	Route-km (km)	Transportation Density (000 pax/route-km)
Odakyu	1.18	154	120.5	245.4
Keihin Kyukou	1.59	162	87.0	197.6
Tsukuba Express	1.20	57	58.3	73.9
Touyou Kousoku	1.63	71	16.2	71.2
Aichi Kanjou	3.67	22	45.3	8.5
Hokuetsu Kyukou	2.25	24	59.5	8.1
Abukuma Kyukou	4.49	7	54.9	1.8

Note: Compiled by VITRANSS 2 Study Team based on available documents
[1] Excluding personnel cost and taxes.

10.17 Using the data listed above, a regression analysis was conducted for both fixed and variable O&M costs. The results are presented in tables 10.2.6 and 10.2.7. For both analyses, transportation density is the explanatory variable. Note that the values are all expressed in Japanese Yen (JPY).

Table 10.2.6 Estimates of Fixed O&M Costs[1]

Railway Company	Transportation Density (000 pax/route-km) X	Fixed Cost (JPY mil./ route-km/year) Y	Fixed Cost (JPY mil./ route-km/year) Y calculated
Odakyu	245.4	154	172
Keihin Kyukou	197.6	162	141
Tsukuba Express	73.9	57	63
Touyou Kousoku	71.2	71	61
Aichi Kanjou	8.5	22	21
Hokuetsu Kyukou	8.1	24	21
Abukuma Kyukou	1.8	7	17

Source: VITRANSS 2 Study Team.
Notes: Y=aX+b, a=0.634, b=16.055 (R=0.979).
[1] Excluding personnel cost and taxes.

Table 10.2.7 Estimates of Variable O&M Costs[1]

Railway Company	Transportation Density (000 pax/route-km) X (logarithmic)	Variable Cost (JPY/pax-km) Y	Variable Cost (JPY/pax-km) Y calculated
Odakyu	5.50	1.18	0.97
Keihin Kyukou	5.29	1.59	1.11
Tsukuba Express	4.30	1.10	1.73
Touyou Kousoku	4.27	1.63	1.76
Aichi Kanjou	2.14	3.67	3.11
Hokuetsu Kyukou	2.09	2.25	3.13
Abukuma Kyukou	0.56	4.49	4.10

Source: VITRANSS 2 Study Team.
Note: Y=aX+b, a=-0.633, b=4.457, (R=0.901).
[1] Excluding personnel cost and taxes.

(b) Personnel Cost

10.18 In order to estimate personnel cost, JR's transportation performance in terms of passenger-km per employee was first reviewed. It was 5,840 transport units per employee in 2006. Transport unit is the sum of passenger-km and ton-km. In Vietnam, however, this performance is hardly expected due to the differences in operational scale and quality of assets.

10.19 In 2006, the number of railway employees in Vietnam was 42,000, and they were paid VND 593 billion for salary and social insurance. This is equivalent to VND 14.12 million per employee per year.

10.20 Given a transportation volume in terms of passenger-km (PKT), the personnel cost is calculated as follows:

(i) Total number of employees: NE = PKT/(5840/2) - half performance of JR

(ii) Total personnel cost: PC = NE x 14.12 (VND million)

(c) Total Operating Cost (Excluding Taxes)

10.21 Table 10.2.8 summarizes the estimated operating cost by scenario. The share of personnel cost was extremely low. Per passenger-km, the unit cost ranges roughly US cent 3 to 5.

Table 10.2.8 Estimated Total Operating Cost[1] per Year by Scenario

Speed of NSHSR	Fare Level (% of airfare)	Pax-km, 2026 (mil./day)	Fixed Cost//Year, 2026 (USD mil.)	Variable Cost/Year, 2026 (USD mil.)	Personnel Cost/Year, 2026 (USD mil.)	Total, 2026 (USD mil.)	Unit Cost (US cent/pax-km)
300km/h	100	70	626	472	20	1,119	4.4
	50	123	933	687	36	1,657	3.7
	25	161	1,153	809	47	2,009	3.4
200km/h	100	57	554	412	17	983	4.7
	50	102	811	609	30	1,450	3.9
	25	138	1,018	737	40	1,795	3.6

Source: VITRANSS 2 Study Team.

[1] For an assumed opening year of 2026. Excluding taxes.

10.3 Demand Analysis

1) Sensitivity of HSR Demand against Speed and Fare Levels

10.22 The table below shows the estimated modal shares of the HSR under different speed and fare assumptions.

Table 10.3.1 Demand for HSR under Different Assumptions, 2030

Condition			Car			Bus			CR	HSR	Air	Total
			Road	Expwy	Total	Road	Expwy	Total				
2008		No. of pax/day (000)	-	-	292	-	-	645	31	-	17	985
		Modal share (pax basis, %)	-	-	29.6	-	-	65.5	3.1	-	1.7	100
		Pax-km/day (million)	27	-	27	117	-	117	13	-	14	171
		Modal Share (pax-km basis, %)	15.7	-	15.7	68.6	-	68.6	7.5	-	8.2	100
		Pax-hours/day(million)	0.67	-	0.67	3.67	-	3.67	0.23	-	0.07	4.63
2030 Without HSR		No. of pax/day (000)	-	-	739	-	-	1,932	115	-	191	2,978
		Modal share (pax basis, %)	-	-	24.8	-	-	64.9	3.9	-	6.4	100
		Pax-km/day (million)	48	93	140	149	225	374	32	-	178	724
		Modal Share (pax-km basis, %)	6.6	12.8	19.4	20.5	31.1	51.6	4.4	-	24.6	100
		Pax-hours/day(million)	1.19	0.93	2.11	4.65	2.81	7.46	0.59	-	0.79	10.96
HSR 300km/h	2030 300km/h airfare	No. of pax/day (000)	-	-	719	-	-	1,880	109	146	123	2,978
		Modal share (pax basis, %)	-	-	24.2	-	-	63.1	3.7	4.9	4.1	100
		Pax-km/day (million)	46	87	134	140	211	351	31	84	126	726
		Modal Share (pax-km basis, %)	6.3	12.0	18.4	19.3	29.0	48.4	4.3	11.6	17.3	100
		Pax-hours/day(million)	1.15	0.87	2.03	4.38	2.64	7.02	0.37	0.43	0.53	10.37
	2030 300km/h airfare*1/2	No. of pax/day (000)	-	-	712	-	-	1,860	106	208	92	2,978
		Modal share (pax basis, %)	-	-	23.9	-	-	62.5	3.6	7.0	3.1	100
		Pax-km/day (million)	45	80	125	138	198	336	30	149	93	733
		Modal Share (pax-km basis, %)	6.2	10.9	17.1	18.8	27.0	45.8	4.1	20.3	12.7	100
		Pax-hours/day(million)	1.13	0.80	1.93	4.31	2.47	6.78	0.36	0.70	0.39	10.17
	2030 300km/h airfare*1/4	No. of pax/day (000)	-	-	705	-	-	1,843	103	248	78	2,978
		Modal share (pax basis, %)	-	-	23.7	-	-	61.9	3.5	8.3	2.6	100
		Pax-km/day (million)	44	73	117	135	181	316	28	195	79	735
		Modal Share (pax-km basis, %)	6.0	10.0	16.0	18.4	24.6	43.0	3.8	26.5	10.7	100
		Pax-hours/day(million)	1.10	0.73	1.83	4.22	2.26	6.48	0.33	0.90	0.33	9.88
HSR 200km/h	2030 200km/h airfare	No. of pax/day (000)	-	-	725	-	-	1894	111	114	135	2,978
		Modal share (pax basis, %)	-	-	24.3	-	-	63.6	3.7	3.8	4.5	100
		Pax-km/day (million)	47	89	135	145	215	361	31	69	134	731
		Modal Share (pax-km basis, %)	6.4	12.1	18.5	19.9	29.5	49.4	4.3	9.5	18.3	100
		Pax-hours/day(million)	1.16	0.89	2.05	4.54	2.69	7.24	0.37	0.46	0.57	10.69
	2030 200km/h airfare*1/2	No. of pax/day (000)	-	-	720	-	-	1,882	109	165	102	2,978
		Modal share (pax basis, %)	-	-	24.2	-	-	63.2	3.7	5.5	3.4	100
		Pax-km/day (million)	46	85	131	139	205	344	32	123	100	729
		Modal Share (pax-km basis, %)	6.3	11.6	17.9	19.1	28.1	47.2	4.3	16.9	13.7	100
		pax-hours/day(million)	1.15	0.85	2.00	4.34	2.56	6.91	0.37	0.78	0.43	10.48
	2030 200km/h airfare*1/4	No. of pax/day (000)	-	-	714	-	-	1,866	106	203	89	2,978
		Modal share (pax basis, %)	-	-	24.0	-	-	62.7	3.6	6.8	3.0	100
		Pax-km/day (million)	45	78	123	137	191	329	30	166	86	734
		Modal Share (pax-km basis, %)	6.2	10.6	16.7	18.7	26.1	44.8	4.0	22.7	11.8	100
		Pax-hours/day(million)	1.13	0.78	1.91	4.28	2.39	6.68	0.35	1.04	0.37	10.34

Source: VITRANSS 2 Study Team.

10.23 If the fare is half of the base case (300km/h, same fare as air), the number of HSR passengers would increase by about 42%, as shown in Table 10.3.2. If the HSR speed becomes 200km/h, patronage decreases by about 22%. However, even when the HSR speed is 200km/h but the fare is half of that of the base case, the number of HSR passengers would be about 13% higher than the base case.

Table 10.3.2 Estimated Number of HSR Passengers, 2030

Condition		No. of HSR Passengers (000/day)
300 km/h	Airfare	146
	Airfare*1/2	208
	Airfare*1/4	248
200 km/h	Airfare	114
	Airfare*1/2	165
	Airfare*1/4	203

Source: VITRANSS 2 Study Team.

10.24 Table 10.3.3 shows the intermodal relationships among Hanoi, Danang, and HCMC in the north–south corridor. Between Hanoi and HCMC, HSR shares 30% in the base case (300km/h, same fare as air) which is considerably low compared to air (67%). However, if the fare is halved, the share of HSR jumps to 62%, surpassing air's 36%. When the HSR speed becomes 200km/h, the HSR shares decrease considerably.

10.25 Between Hanoi and Danang, as well as HCMC and Danang, HSR shares become higher than Hanoi–HCMC's. HSR and air seem to compete evenly with each other in this distance range (700─800km).

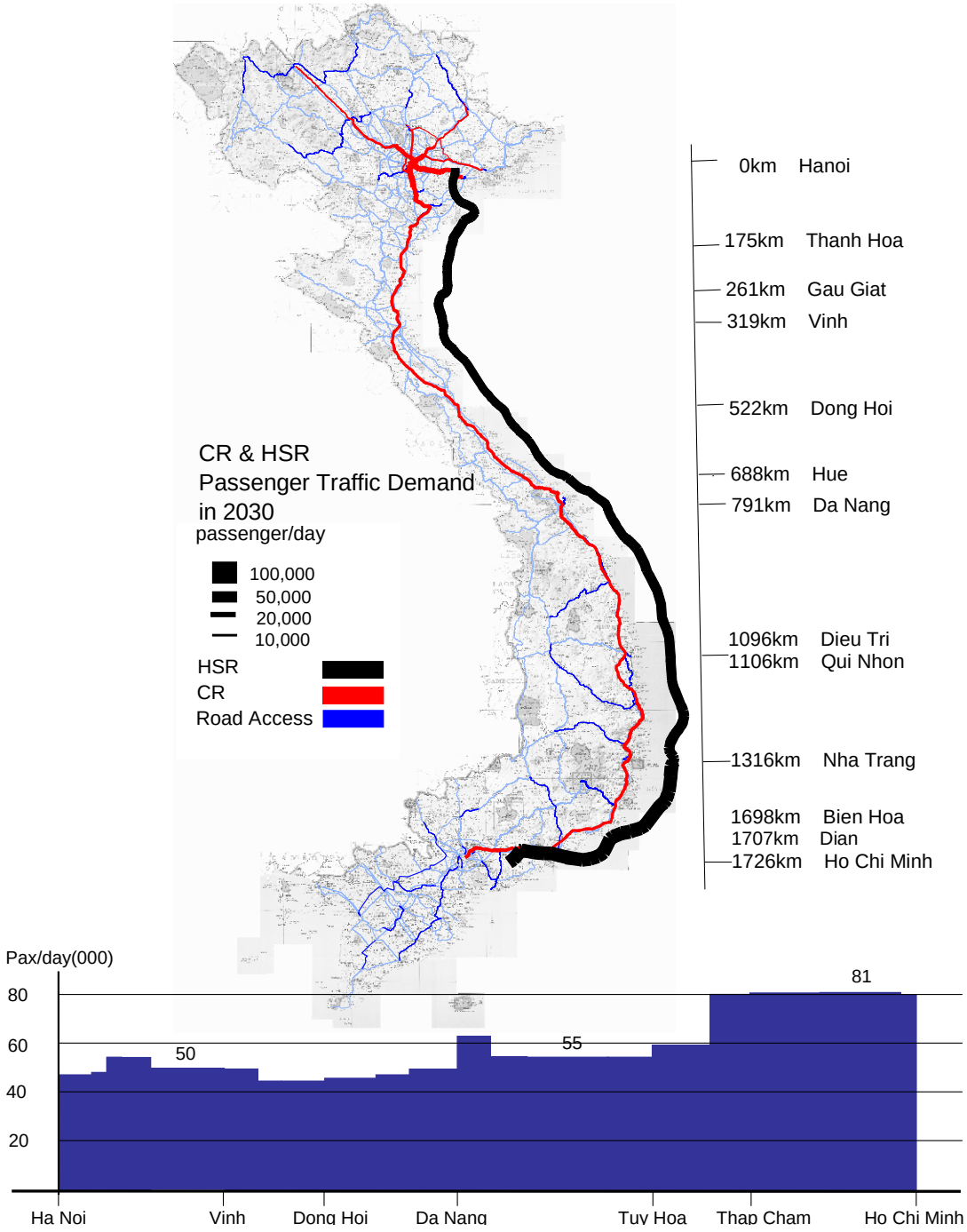
Table 10.3.3 Demand for HSR under Different Assumptions by Route, 2030

Condition			Route (Length)	Car	Bus	CR	HSR	Air	Total
Speed: 300 km/h	Fare: Equal to Air	No. of pax/day (000)	Hanoi-Danang	88	220	36	1,478	1,536	3,358
			Hanoi-HCMC	138	354	52	5,174	11,354	17,072
			HCMC-Danang	162	432	56	3,004	4,150	7,804
		Share (%)	Hanoi-Danang	3	7	1	44	46	100
			Hanoi-HCMC	1	2	0	30	67	100
			HCMC-Danang	2	6	1	38	53	100
	Fare: Half of Air	No. of pax/day (000)	Hanoi-Danang	52	130	22	2,020	1,134	3,358
			Hanoi-HCMC	82	208	30	10,604	6,150	17,074
			HCMC-Danang	114	300	40	4,388	2,964	7,806
		Share (%)	Hanoi-Danang	2	4	1	60	34	100
			Hanoi-HCMC	0	1	0	62	36	100
			HCMC-Danang	1	4	1	56	38	100
	Fare: Quarter of Air	No. of pax/day (000)	Hanoi-Danang	38	96	16	2,268	936	3,354
			Hanoi-HCMC	42	108	16	13,024	3,884	17,074
			HCMC-Danang	80	214	28	5,082	2,402	7,806
		Share (%)	Hanoi-Danang	1	3	0	68	28	100
			Hanoi-HCMC	0	1	0	76	23	100
			HCMC-Danang	1	3	0	65	31	100
Speed: 200 km/h	Fare: Equal to Air	No. of pax/day (000)	Hanoi-Danang	88	220	36	1,348	1,664	3,356
			Hanoi-HCMC	138	354	52	3,956	12,574	17,074
			HCMC-Danang	162	432	56	2,664	4,490	7,804
		Share (%)	Hanoi-Danang	3	7	1	40	50	100
			Hanoi-HCMC	1	2	0	23	74	100
			HCMC-Danang	2	6	1	34	58	100
	Fare: Equal to Air	No. of pax/day (000)	Hanoi-Danang	60	152	24	1,872	1,248	3,356
			Hanoi-HCMC	118	300	44	9,030	7,586	17,078
			HCMC-Danang	136	362	48	3,980	3,280	7,806
		Share (%)	Hanoi-Danang	2	5	1	56	37	100
			Hanoi-HCMC	1	2	0	53	44	100
			HCMC-Danang	2	5	1	51	42	100
	Fare: Quarter of Air	No. of pax/day (000)	Hanoi-Danang	46	114	18	2,134	1,046	3,358
			Hanoi-HCMC	60	156	22	11,756	5,078	17,072
			HCMC-Danang	98	258	34	4,704	2,712	7,806
		Share (%)	Hanoi-Danang	1	3	1	64	31	100
			Hanoi-HCMC	0	1	0	69	30	100
			HCMC-Danang	1	3	0	60	35	100

Source: VITRANSS 2 Study Team.

Figure 10.3.1 Assigned Rail Traffic Volume, 2030

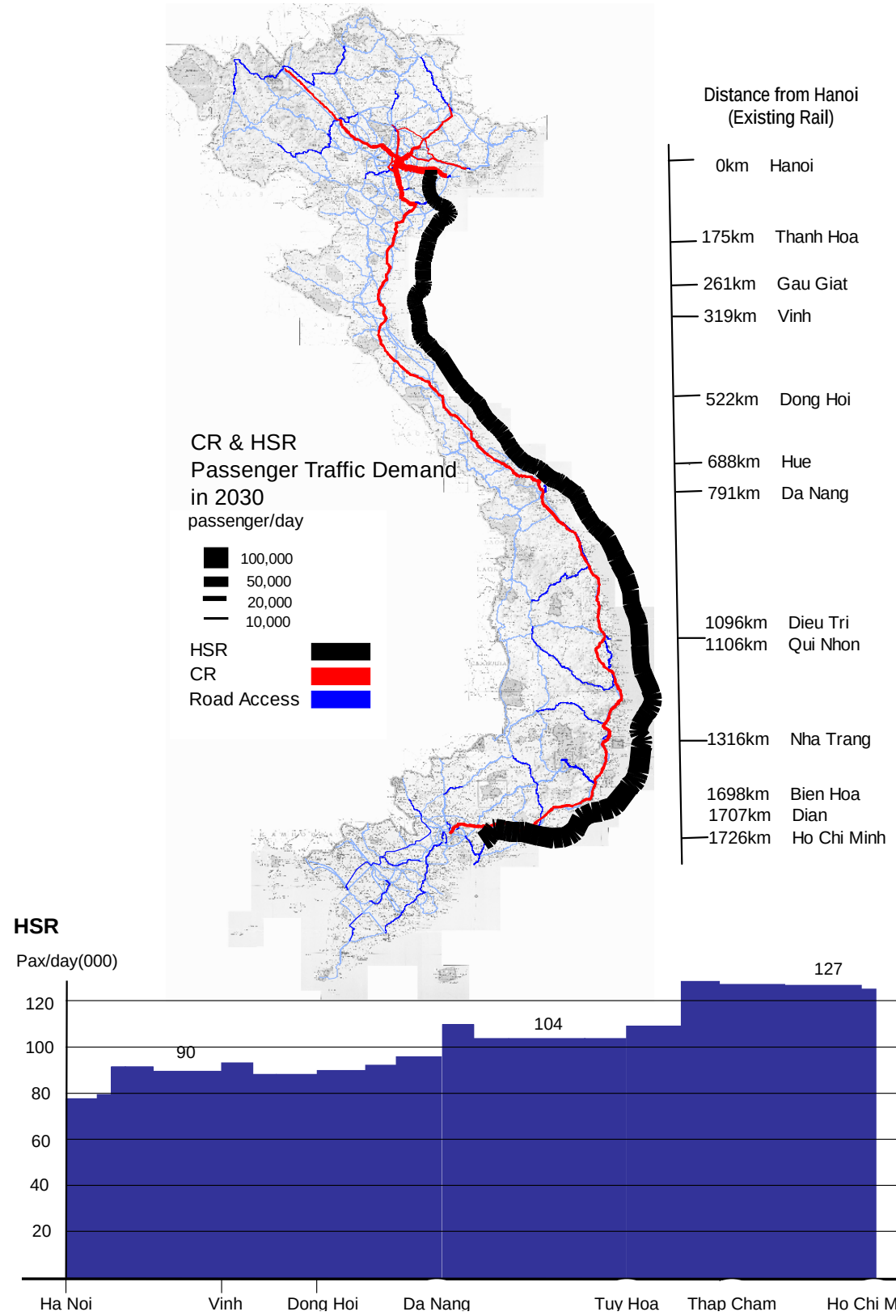
(HSR Speed: 300 km/h, HSR Fare: Half of Airfare)



Source: VITRANSS 2 Study Team.
Note: Refer to demand forecast chapter for the "Equal to Airfare" case.

Figure 10.3.2 Assigned Rail Traffic Volume, 2030

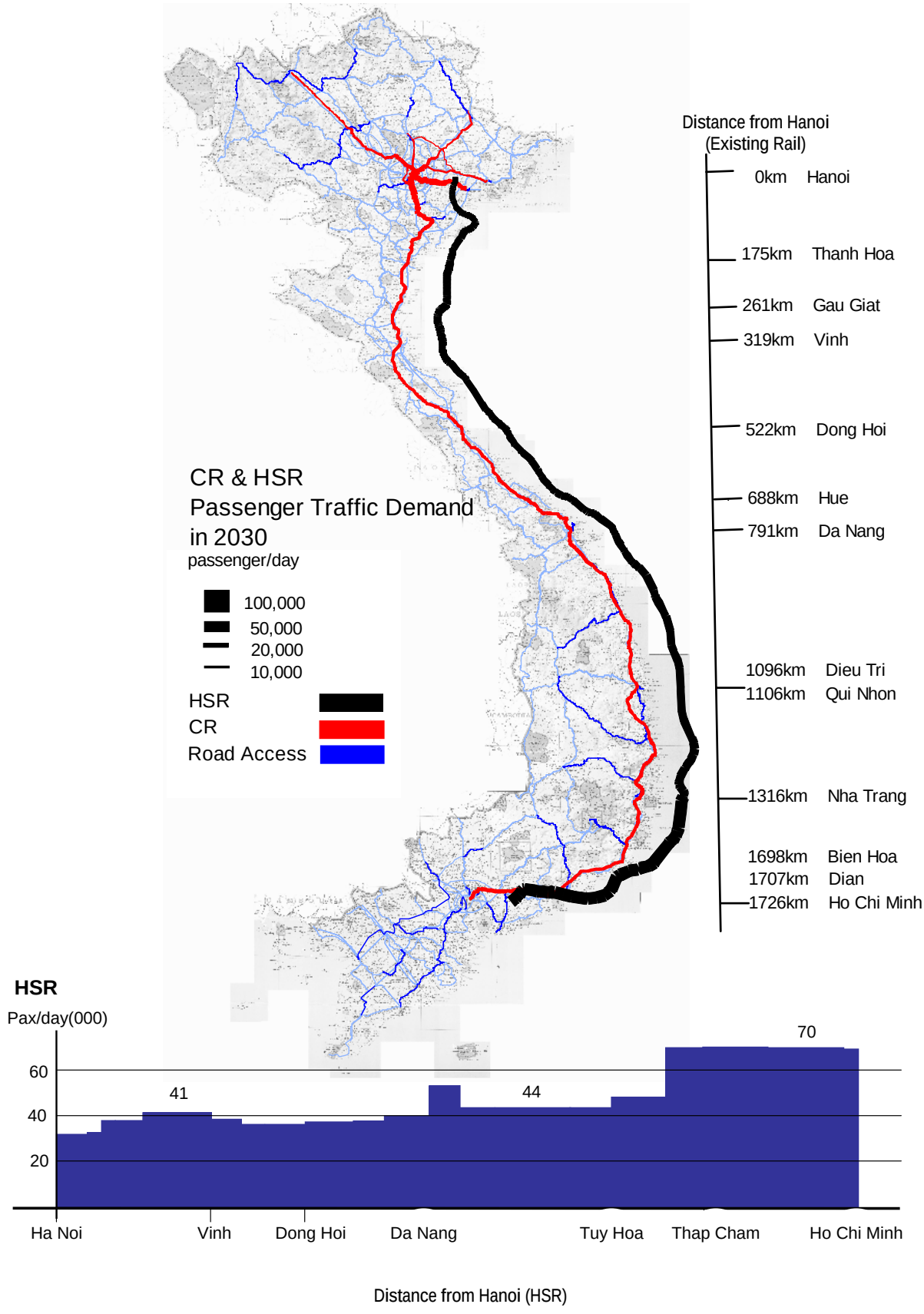
(HSR Speed: 300 km/h, HSR Fare: Equal to Airfare)



Source: VITRANSS 2 Study Team.

Figure 10.3.3 Assigned Rail Traffic Volume, 2030

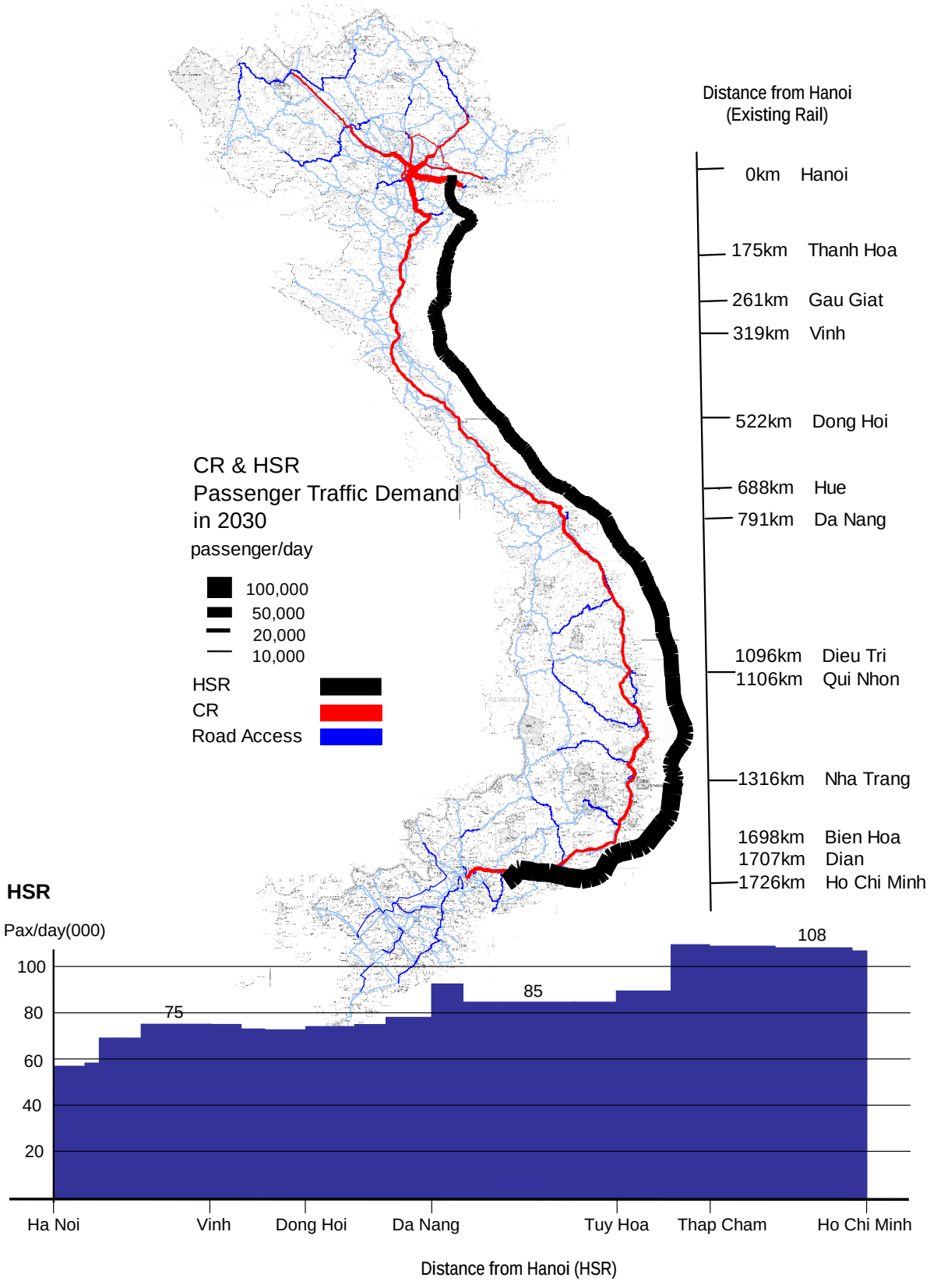
(HSR Speed: 200 km/h, HSR Fare: Equal to Airfare)



Source: VITRANSS 2 Study Team.

Figure 10.3.4 Assigned Rail Traffic Volume, 2030

(HSR Speed: 200 km/h, HSR Fare: Half of Airfare)



Source: VITRANSS 2 Study Team.

2) Sensitivity of HSR Demand under Partial Construction Scenario

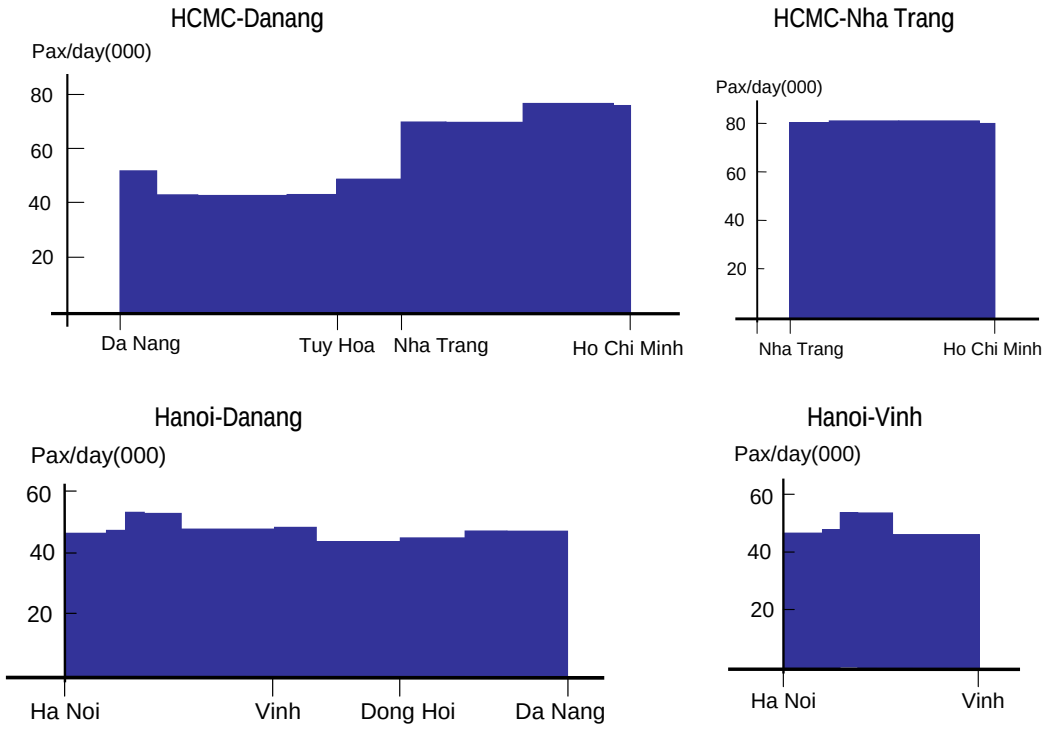
10.26 Table 10.3.4 summarizes the demand forecasts for different sections assuming a partial completion of the HSR. Figure 10.3.4 shows the demand distribution by section for these assumed cases. It should be noted that the estimated cross-sectional demand is only slightly less than that of the complete line from Hanoi to HCMC.

Table 10.3.4 Demand on HSR by Section, 2030

Section		Car			Bus			CR	HSR	Air	Total
		Road	Expy	Total	Road	Expy	Total				
Ho Chi Minh - Danang Section	No. of pax/day (000)	-	-	725	-	-	1928	116	102	108	2978
	Modal share (pax, %)	-	-	24.3	-	-	64.7	3.9	3.4	3.6	100
	pax-km/day (million)	34	99	132	105	261	366	60	48	92	699
	Modal Share (pax-km, %)	4.8	14.1	18.9	15.0	37.3	52.3	8.6	6.9	13.2	100
	pax-hours/day(million)	0.84	0.99	1.83	3.27	3.26	6.53	0.60	0.16	0.12	9.24
Ho Chi Minh - Nha Trang Section	No. of pax/day (000)	-	-	732	-	-	1,913	113	86	134	2,978
	Modal share (pax, %)	-	-	24.6	-	-	64.2	3.8	2.9	4.5	100
	pax-km/day (million)	47	90	137	143	215	358	81	32	117	724
	Modal Share (pax-km, %)	6.5	12.4	18.9	19.7	29.7	49.4	11.2	4.4	16.1	100
	pax-hours/day(million)	1.17	0.90	2.07	4.46	2.69	7.15	0.87	0.19	0.55	10.83
Hanoi - Da-nang Section	No. of pax/day (000)	-	-	730	-	-	1,942	116	72	118	2978
	Modal share (pax, %)	-	-	24.5	-	-	65.2	3.9	2.4	4.0	100
	pax-km/day (million)	34	100	134	104	264	367	72	34	90	698
	Modal Share (pax-km, %)	4.9	14.3	19.2	14.9	37.8	52.7	10.3	4.8	12.9	100
	pax-hours/day(million)	0.85	1.00	1.85	3.25	3.29	6.54	0.72	0.11	0.11	9.34
Hanoi - Vinh Section	No. of pax/day (000)	-	-	734	-	-	1,917	113	53	161	2,978
	Modal share (pax, %)	-	-	24.6	-	-	64.4	3.8	1.8	5.4	100
	pax-km/day (million)	47	91	138	146	221	366	72	14	131	721
	Modal Share (pax-km, %)	6.6	12.6	19.2	20.2	30.6	50.8	10.0	1.9	18.1	100
	pax-hours/day(million)	1.18	0.91	2.09	4.56	2.76	7.31	0.77	0.10	0.65	10.92

Source: VITRANSS 2 Study Team.

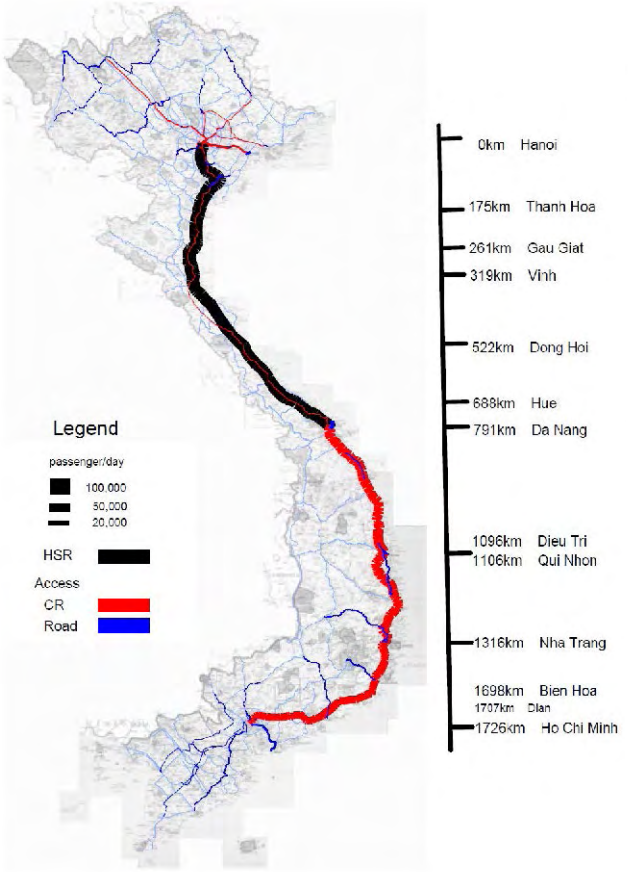
Figure 10.3.5 HSR Demand Distribution by Section, 2030



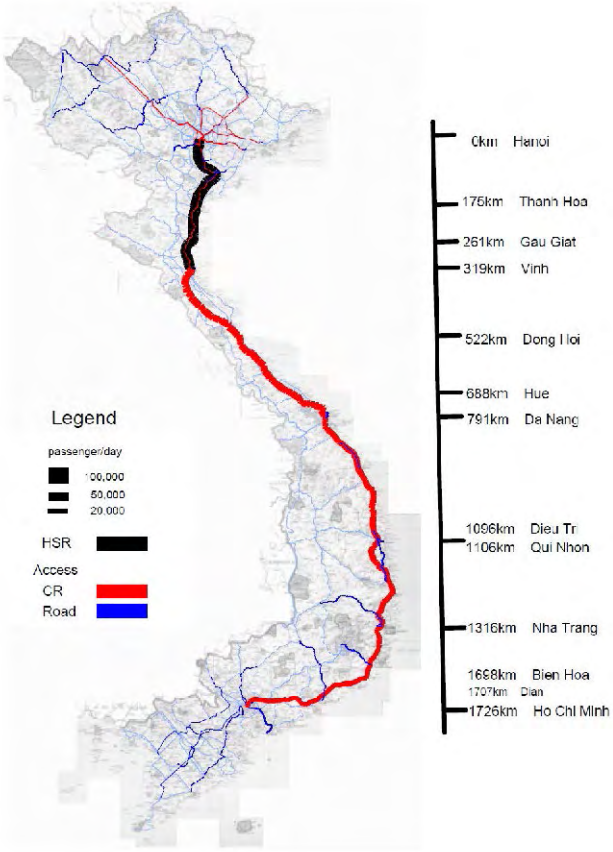
Source: VITRANSS 2 Study Team.

Figure 10.3.6 HSR Passenger Distribution by Section, 2030

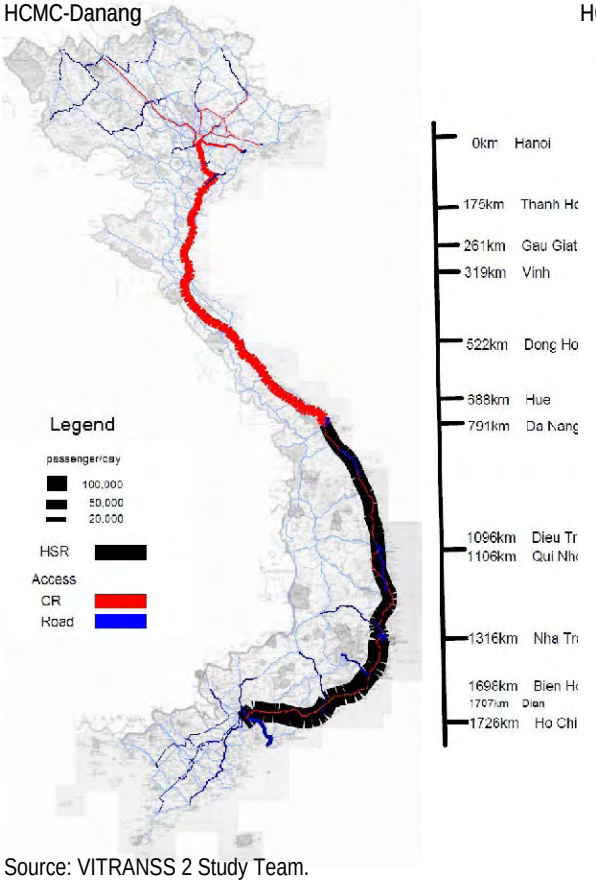
Hanoi- Danang



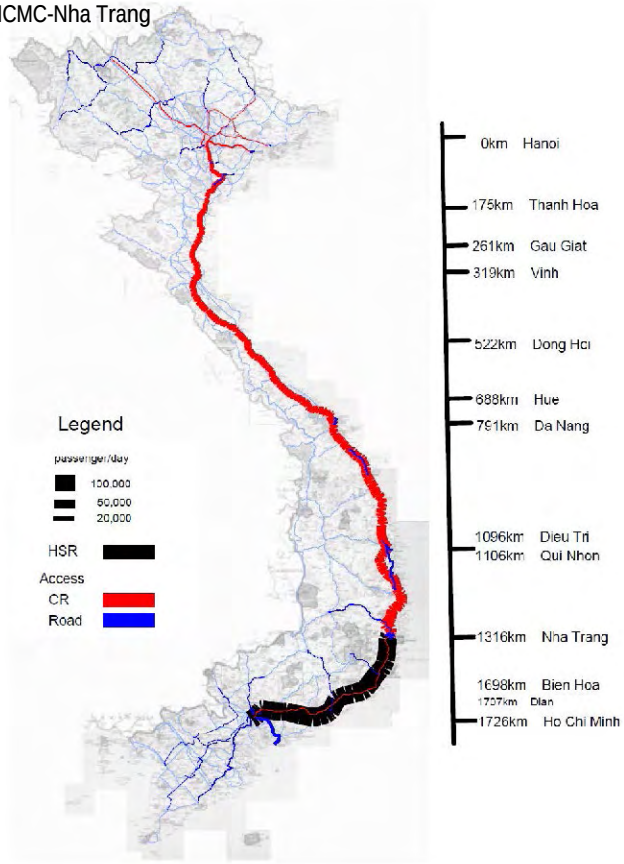
Hanoi-Vinh



HCMC-Danang



HCMC-Nha Trang



Source: VITRANSS 2 Study Team.

10.4 Economic and Financial Evaluation

10.27 This section describes only the economic and financial evaluation of the NSHSR's viability. (For the comprehensive evaluation of NSHSR, including environmental analysis, this is presented in Chapter 5.)

1) Economic Evaluation

(1) Economic Benefits

10.28 Passenger time saving, O&M cost saving of other modes, and reduction in road traffic accidents were taken as economic benefits. Although other benefits can be considered, such as growth in industrial outputs and environmental influences, those were excluded from the economic analysis, since those are largely dependent on the social condition and political will.

(a) Passenger Time Cost Saving

10.29 Passenger time cost saving was calculated by the following formula:

Passenger Time Cost (without HSR) – Passenger Time Cost (with HSR)

10.30 Since the unit passenger time cost differs by mode and by year, passenger-hours should first be calculated by mode for the entire transportation network. Table 10.4.1 shows the passenger time costs by mode and by year assumed in this study. In addition, it was also assumed that HSR passengers would belong to the high-income group.

Table 10.4.1 Assumed Passenger Time Costs

Condition	Mode	2008	2010	2020	2030
Average Income (USD/month)	Car/Air	400	421	694	1,056
	Bus/Rail/IWT	200	211	347	528
Passenger Time Cost (USD/hour)	Car/Air	2.50	2.63	4.33	6.60
	Bus/Rail/IWT	1.25	1.32	2.17	3.30

Source: VITRANSS 2 Study Team.
Notes: 1. 160 working hours a month.
2. Income growth in proportion to per capita GDP.

(b) O&M Cost Saving of Other Modes

10.31 The HSR reduces the passenger transportation volumes of other modes. By traffic assignment, passenger-km figures can be obtained by mode as shown earlier in Table 10.3.1. The table below summarizes the estimated operating cost by transportation mode.

Table 10.4.2 Operating Cost by Transportation Mode

(VND/pax-km)

Mode	Economic	Financial
Car (Ordinary Road)	941	1,426
Car (Expressway)	993	1,372
Bus (Ordinary Road)	427	443
Bus (Expressway)	535	548
CR	250	290
Air	1,077	1,215

Source: VITRANSS 2 Study Team.

(c) Reduction in Road Traffic Accidents

10.32 Due to the shift of passengers to HSR from road transportation, road traffic accidents are likely to decrease in proportion to a reduction in road passenger-kilometers. Table 10.4.3 shows the estimated economic losses from road traffic accidents for the period 2007–2020. The average growth rate is expected to be 8.24% per year[3]. The reduction in economic losses was calculated based on road passenger-kilometers under a "with" and "without" HSR cases, the resulting difference of which was taken as one of the economic benefits of the HSR.

Table 10.4.3 Estimated Economic Loss from Road Traffic Accidents

Year	GDP in VND Billion	Losses in VND Billion
2007	1,130,000	32,657
2008	1,220,400	35,270
2009	1,318,032	38,091
2010	1,423,475	41,138
2011	1,537,353	44,429
2012	1,660,341	47,984
2013	1,793,168	51,823
2014	1,936,621	55,968
2015	2,091,551	60,446
2016	2,258,875	65,281
2017	2,439,585	70,504
2018	2,634,752	76,144
2019	2,845,532	82,236
2020	3,073,175	88,815

(2) Evaluation of Entire NSHSR (Hanoi–Ho Chi Minh)

(a) Opening by 2026 (Base Case)

10.33 Table 10.4.4 presents the cost and benefit stream of the NSHSR project (Hanoi-Ho Chi Minh, 300km/h, 100% of airfare) calculated based on the conditions stated above. 2026 was assumed to be the starting year of HSR operation. Analysis period is 30 years from 2016 to 2045. O&M cost, passenger time cost saving, and operating cost saving were assumed to increase year by year at an annual rate of 4.9% (annual growth rate of trip generation/attraction, 2020–2030). Road traffic accident cost was assumed to grow at 8.2% a year.

10.34 Table 10.4.5 presents the results of economic evaluation. All the calculated EIRRs are below the threshold of 12%, even indefinable in some cases. When the speed of HSR is 300km/h, EIRR becomes 2–3% higher than that of 200km/h cases. The amount of economic benefit is small throughout the analysis period compared to the economic cost. Thus the economic viability of the HSR project is considered low under the assumed condition. The reason is clear: the HSR gets a share of the passenger transportation market from other modes of transportation, particularly from its competitor, the faster mode of air. Therefore, passenger time cost saving, which is usually the major benefit in ordinary transportation projects, is small.

[3] Since per capita GDP will grow at 5.1% p.a. and the number of vehicles at 7.7% p.a, the accident rate of a vehicle will decrease at about 4% p.a.

Table 10.4.4 Cost–Benefit Stream of NSHSR (Hanoi–Ho Chi Minh, 300km/h, Equal to Airfare)

(USD million)

Year	Capital Cost								O&M Cost	Cost Total	Benefit			Benefit Total	Benefit - Cost
											Passenger	Operating Cost	Accident		
	Construction	Depot	Electric Facilities	Signal/ Telecom	Engineering Service	Rolling Stock	Land Acquisition	Toal			Time Saving	Saving of Other Modes	Cost Saving		
2016	0	0	0	0	0	0	0	0		0					0
2017	0	0	0	0	0	0	0	0		0					0
2018	0	0	0	0	354	0	0	354		354					-354
2019	0	0	0	0	354	0	0	354		354					-354
2020	0	0	0	0	0	0	0	0		0					0
2021	2,226	0	0	0	0	0	591	2,817		2,817					-2,817
2022	3,339	0	701	535	0	0	591	5,166		5,166					-5,166
2023	5,566	220	701	803	0	0	609	7,898		7,898					-7,898
2024	5,566	256	2,102	1,338	0	453	0	9,716		9,716					-9,716
2025	5,566	256	3,504	2,676	0	1,813	0	13,815		13,815					-13,815
2026								0	1,119	1,119	516	1,354	511	2,380	1,262
2027								0	1,155	1,155	541	1,420	553	2,513	1,359
2028								0	1,193	1,193	567	1,489	598	2,655	1,462
2029								0	1,232	1,232	595	1,562	648	2,804	1,572
2030						609		609	1,272	1,881	624	1,638	701	2,963	1,081
2031								0	1,315	1,315	654	1,718	759	3,131	1,816
2032								0	1,359	1,359	686	1,801	821	3,309	1,950
2033								0	1,404	1,404	720	1,889	889	3,498	2,094
2034								0	1,451	1,451	755	1,981	962	3,698	2,247
2035						773		773	1,501	2,273	791	2,078	1,042	3,911	1,638
2036								0	1,552	1,552	830	2,179	1,128	4,137	2,585
2037								0	1,604	1,604	870	2,285	1,221	4,377	2,772
2038								0	1,659	1,659	913	2,397	1,321	4,631	2,972
2039								0	1,716	1,716	957	2,514	1,430	4,901	3,185
2040						980		980	1,776	2,756	1004	2,636	1,548	5,188	2,432
2041								0	1,837	1,837	1053	2,765	1,676	5,494	3,657
2042								0	1,901	1,901	1104	2,900	1,814	5,818	3,917
2043								0	1,967	1,967	1158	3,041	1,963	6,162	4,196
2044								0	2,035	2,035	1215	3,189	2,125	6,529	4,494
2045								0	2,106	2,106	1274	3,345	2,300	6,919	4,813
	-13877	-464	-3189	-1454	0	0	-1,790	-20,774	0	-20,774					20,774

Source: VITRANSS 2 Study Team.

Table 10.4.5 Economic Indicators of HSR Project (Hanoi–Ho Chi Minh, Opening by 2026)

Speed of HSR (km/h)	Fare Level as % of Airfare	No. of Passengers, 2030 (000/day)	EIRR (%)	Benefit–Cost Ratio (at 12%p.a.)
300	100	146	-	0.46
300	75	172	5.6	0.58
300	50	208	6.9	0.66
300	25	248	9.6	0.84
200	100	114	-	0.29
200	75	136	-	0.46
200	50	165	4.2	0.51
200	25	203	6.5	0.65

Source: VITRANSS 2 Study Team.

(b) Opening by 2036 (10-year Delay)

10.35 The above analysis assumed the opening of the HSR by 2026. If this opening is delayed, the project's economic viability naturally becomes higher due to the increase in traffic demand. Table 10.4.6 summarizes the results of analysis when the opening of the HSR is delayed by 10 years. The situation shows that the EIRR will improve by about 5%, and the low-fare case (25% of airfare, similar to bus fare) will become marginally feasible. The 200km/h cases were excluded from this analysis, because it is already clear that they entail almost the same cost and are less favorable compared to 300km/h cases.

Table 10.4.6 Economic Indicators of HSR Project (Hanoi–Ho Chi Minh, 2036 Opening)

Speed of HSR (km/h)	Fare Level as % of airfare	No. of passengers, 2040 (000/day)	EIRR (%)	Benefit–Cost Ratio (at 12%p.a.)
300	100	235	7.7	0.70
300	75	277	9.8	0.85
300	50	335	11.6	0.98
300	25	399	14.9	1.21

Source: VITRANSS 2 Study Team.

(c) Opening by 2046 (20-year Delay)

10.36 If the opening of the HSR is further delayed, its economic viability will improve even more. Table 10.4.7 summarizes the results of analysis when the opening of the HSR is delayed by 20 years, that is, 2046. The EIRR will again improve by about 5%, and all the cases will become economically feasible. However, this forecast was made mainly by extrapolation based on various assumptions prepared for 2020 and 2030.

Table 10.4.7 Economic Indicators of HSR Project (Hanoi–Ho Chi Minh, Opening by 2046)

Speed of HSR (km/h)	Fare Level as % of Airfare	No. of Passengers, 2050 (000/day)	EIRR (%)	Benefit–Cost Ratio (at 12%p.a.)
300	100	378	12.2	1.02
300	75	446	14.2	1.16
300	50	539	16.3	1.32
300	25	642	19.9	1.59

Source: VITRANSS 2 Study Team.

(d) Opening by 2026 Amid Extensive Urban Development

10.37 The poor economic performance of the NSHSR project is primarily due to the lack of demand generated by and attracted to the medium- to small-sized cities located between Hanoi and Ho Chi Minh City. If urban development is carried out extensively and more rapidly than assumed, then the demand for the HSR will increase and its economic viability will improve. Table 10.4.8 shows the results of such an analysis. Table 10.4.9 summarizes the assumption adopted in urban development. Note the rapid urbanization assumed for Thanh Hoa, Vinh, and Danang. Since urbanization will inevitably proceed in Vietnam, and when the rapid urbanization of the cities between Hanoi and Ho Chi Minh meets the national strategy of balanced development of the nation, this scenario should be paid more attention.

10.38 The EIRR of the HSR project will become 2–3% higher than the Base Case in this scenario, and the low-fare case reaches the threshold of 12%.

Table 10.4.8 Economic Indicators of HSR Project (Hanoi–Ho Chi Minh, Opening by 2026 amid Extensive Urban Development)

Speed of HSR (km/h)	Fare Level as % of Airfare	No. of Passengers, 2030 (000/day)	EIRR (%)	Benefit–Cost Ratio (at 12%p.a.)
300	100	225	4.9	0.55
300	75	261	6.2	0.63
300	50	311	9.3	0.83
300	25	368	12.3	1.03

Source: VITRANSS 2 Study Team.

Table 10.4.9 Assumption of Extensive Urban Development

Province (City)	Urban Population (000)			2030-B/ 2030-A (%)
	2005	2030-A (Base Case)	2030-B (Extensive Urban Development)	
Hanoi (Hanoi City)	2,055	4,735	6,000	127
Thanh Hoa (Thanh Hoa)	360	684	1500	219
Nghe An(Vinh)	323	761	1500	197
Thua Thien-Hue (Hue)	358	748		134
Danang (Danang City)	670	1,041	2,500	240
Quang Nam (Tam Ky)	250	738	1000	136
Binh Dinh (Quy Nhon)	392	1,047	1,500	143
Khanh Hoa(Nha Trang)	448	1,256	1,500	119
Binh Thuan (Phan Thiet)	432	1,128	1,500	133
Dong Nai (Bien Hoa)	680	1,716	2,500	146
Ho Chi Minh (Ho Chi Minh City)	5,060	10,049	12,000	119
Total	12,649	28,775	39,600	138

Source: VITRANSS 2 Study Team.

(e) Opening by 2036 (10-year Delay) with Extensive Urban Development

10.39 This case assumes a 10-year delay of opening of the HSR operations and extensive urban development. The result is shown in Table 10.4.10. As expected, the EIRR will improve further, by about 4–5% as compared to the cases mentioned above. The medium-fare case (50% of airfare) will become economically feasible in addition to the low-fare case.

Table 10.4.10 Economic Indicators of HSR Project (Hanoi–Ho Chi Minh, Opening by 2036 amid Extensive Urban Development)

Speed of HSR (km/h)	Fare Level as % of Airfare	No. of Passengers, 2040 (000/day)	EIRR (%)	Benefit–Cost Ratio (at 12%p.a.)
300	100	362	8.9	0.80
300	75	420	10.3	0.89
300	50	501	14.1	1.14
300	25	592	17.6	1.39

Source: VITRANSS 2 Study Team.

(f) Influence of Fuel Prices on Road and Air Transportation

10.40 Recently, oil prices have fluctuated remarkably. However, in the long run, it is expected to be in an upward trend. If fuel prices for road vehicles and airplanes go up by 50%, the EIRR of the HSR project will improve by 1–2% for each of the cases mentioned above.

(3) Evaluation of Partial Completion of NSHSR

(a) Opening by 2026 (Base Case)

10.41 Table 10.4.11 presents the results of the economic evaluation for the partial completion of the NSHSR. In this analysis, each of the sections was assumed to be independent from the others, i.e., when one is constructed, the others are not existing. Compared to the construction of the entire Hanoi–Ho Chi Minh route, the economic viability becomes considerably higher, particularly in short sections such as Hanoi–Ninh Binh, Hanoi–Thanh Hoa, Nha Trang–Ho Chi Minh, and Phan Thiet–Ho Chi Minh. The low- and medium-fare cases of these sections seem to be feasible economically, though the EIRRs are still marginal. The relatively higher performance of a partial HSR completion can be attributed to lower competition with air transportation, i.e., the HSR is strong in medium-distance travel.

Table 10.4.11 Economic Indicators of HSR Project by Section (Opening by 2026)

Section	Speed of HSR (km/h)	Fare Level as % of Airfare	No. of Passengers, 2030 (000/day)	EIRR (%)	Benefit–Cost Ratio (at 12%/year)
1. Hanoi–Ninh Binh (97km)	300	100	19	11.6	0.97
	300	75	20	12.4	1.04
	300	50	20	12.8	1.08
	300	25	21	13.3	1.13
2. Hanoi–Thanh Hoa (150km)	300	100	46	10.9	0.92
	300	75	48	11.7	0.98
	300	50	50	12.2	1.02
	300	25	53	13.0	1.09
3. Hanoi–Vinh (282km)	300	100	53	10.0	0.85
	300	75	57	10.2	0.86
	300	50	61	10.9	0.92
	300	25	65	11.6	0.97
4. Hanoi–Hue (622km)	300	100	75	7.8	0.70
	300	75	84	8.6	0.76
	300	50	95	9.5	0.82
	300	25	107	10.9	0.92
5. Hanoi–Danang (702km)	300	100	79	6.3	0.60
	300	75	90	7.1	0.66
	300	50	103	8.0	0.72
	300	25	117	10.7	0.91
6. Hue–Danang (80km)	300	100	57	5.8	0.54
	300	75	58	6.7	0.60
	300	50	60	7.6	0.66
	300	25	61	8.5	0.73
7. Danang–Hochi minh (868km)	300	100	110	6.7	0.63
	300	75	125	7.1	0.67
	300	50	143	8.3	0.75
	300	25	165	10.7	0.91
8. Nha Trang–Hochi minh (382km)	300	100	86	11.3	0.95
	300	75	93	11.8	0.99
	300	50	101	12.3	1.03
	300	25	110	13.4	1.11
9. Phan Thiet–Hochi minh (167km)	300	100	79	10.9	0.91
	300	75	82	11.6	0.97
	300	50	86	12.4	1.03
	300	25	89	13.3	1.11

Source: VITRANSS 2 Study Team.

(b) Opening by 2020 (6 Years Early)

10.42 The Vietnamese government has a strong intention to complete part of the NSHSR by 2020. In order to test the reality of this plan, economic evaluation was conducted assuming its opening in 2020. The results show that the EIRR will become lower than the base case by about 3%, thereby falling below the threshold of 12% (see Table 10.4.12).

Table 10.4.12 Economic Indicators of HSR Project by Section (Opening by 2020)

Section	Speed of HSR (km/h)	Fare Level as % of Airfare	No. of Passengers, 2030 (000/day)	EIRR (%)	Benefit–Cost Ratio (at 12%/year)
1. Hanoi–Ninh Binh (97km)	300	100	19	8.4	0.70
	300	75	20	9.1	0.75
	300	50	20	9.4	0.78
	300	25	21	9.9	0.82
2. Hanoi–Thanh Hoa (150km)	300	100	46	8.0	0.70
	300	75	48	8.7	0.74
	300	50	50	9.1	0.77
	300	25	53	9.7	0.82
3. Hanoi–Vinh (282km)	300	100	53	7.2	0.64
	300	75	57	7.3	0.65
	300	50	61	7.9	0.69
	300	25	65	8.5	0.73
4. Hanoi–Hue (622km)	300	100	75	5.4	0.54
	300	75	84	6.1	0.58
	300	50	95	6.8	0.63
	300	25	107	8.0	0.71
5. Hanoi–Danang (702km)	300	100	79	4.2	0.46
	300	75	90	4.8	0.51
	300	50	103	5.5	0.56
	300	25	117	7.9	0.71
6. Hue–Danang (80km)	300	100	57	-	0.37
	300	75	58	-	0.41
	300	50	60	4.5	0.46
	300	25	61	5.3	0.51
7. Danang–Hochi minh (868km)	300	100	110	4.4	0.49
	300	75	125	4.7	0.52
	300	50	143	5.7	0.58
	300	25	165	7.8	0.72
8. Nha Trang–Hochi minh (382km)	300	100	86	8.2	0.73
	300	75	93	8.7	0.76
	300	50	101	9.1	0.79
	300	25	110	10.0	0.86
9. Phan Thiet–Hochi minh (167km)	300	100	79	7.0	0.63
	300	75	82	7.6	0.67
	300	50	86	8.4	0.73
	300	25	89	9.2	0.78

Source: VITRANSS 2 Study Team.

(c) Opening by 2020 (6 Years Early) with Extensive Urban Development

10.43 Table 10.4.13 shows the results of an economic evaluation of the HSR opening by 2020, six years earlier than the base case, and amid extensive urban development. EIRRs improve by about 3–5% compared to the case above. The effect of extensive urban development is larger in the north for Hanoi–Ninh Binh, Hanoi–Thanh Hoa, and Hanoi–Vinh rather than in the south. This is due to the difference in the distribution of cities where extensive urban development is assumed to take place.

Table 10.4.13 Economic Indicators of HSR Project by Section (Opening by 2020 amid Extensive Urban Development)

Section	Speed of HSR (km/h)	Fare Level as % of Airfare	No. of Passengers, 2030 (000/day)	EIRR (%)	Benefit–Cost Ratio (at 12%/year)
1. Hanoi–Ninh Binh (97km)	300	100	39	13.0	1.10
	300	75	40	13.4	1.13
	300	50	41	13.8	1.17
	300	25	42	14.5	1.23
2. Hanoi–Thanh Hoa (150km)	300	100	71	11.5	0.96
	300	75	74	11.9	1.00
	300	50	78	13.0	1.08
	300	25	81	14.0	1.17
3. Hanoi–Vinh (282km)	300	100	87	10.9	0.92
	300	75	92	11.8	0.99
	300	50	98	12.8	1.07
	300	25	105	13.4	1.12
4. Hanoi–Hue (622km)	300	100	121	6.4	0.61
	300	75	135	7.5	0.69
	300	50	151	8.6	0.76
	300	25	168	10.0	0.86
5. Hanoi–Danang (702km)	300	100	129	5.3	0.55
	300	75	146	6.4	0.62
	300	50	164	7.5	0.69
	300	25	185	10.4	0.88
6. Hue–Danang (80km)	300	100	84	10.4	0.87
	300	75	86	10.9	0.91
	300	50	89	11.4	0.96
	300	25	91	11.9	1.00
7. Danang–Hochi minh (868km)	300	100	151	5.2	0.55
	300	75	170	5.5	0.58
	300	50	194	6.1	0.62
	300	25	225	8.7	0.79
8. Nha Trang–Hochi minh (382km)	300	100	110	10.9	0.92
	300	75	119	11.2	0.95
	300	50	129	11.8	0.99
	300	25	140	12.8	1.06
9. Phan Thiet–Hochi minh (167km)	300	100	106	8.1	0.73
	300	75	110	8.6	0.76
	300	50	114	9.3	0.81
	300	25	119	10.1	0.87

Source: VITRANSS 2 Study Team.

(d) Influence of Fuel Prices on Road and Air Transportation

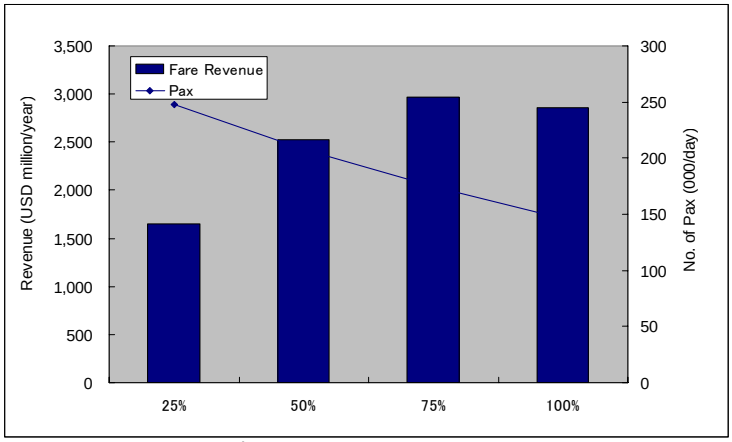
10.44 The influence of oil price increases was tested as well. If fuel prices for road vehicles and airplanes go up by 50%, the EIRRs of the HSR project will improve by about 2% for each of the cases mentioned above.

2) Financial Evaluation

(1) Analysis of Fare Levels for Maximum Revenue

10.45 Figure 10.4.1 presents the relationship between HSR demand and fare levels. HSR revenue reaches its maximum when fare levels are around 90% of airfare. This relation should be carefully taken into account in the implementation plan of the NSHSR project, because economic viability and financial viability conflict with each other in general. Which means the lower the fare, the higher the economic viability becomes due to increased demand. However, low fares will not sustain the commercial operation of the HSR. Moreover, low fares attract more passengers which in turn increases the O&M cost to cope with the increased demand.

Figure 10.4.1 HSR Revenues for Different Fare Levels at 300km/h Speeds, 2030



Source: VITRANSS 2 Study Team.

(2) Evaluation of Entire NSHSR (Hanoi–Ho Chi Minh)

(a) Opening by 2026 (Base Case)

10.46 Table 10.4.14 presents the expenditure and revenue stream for the base case calculated based on the conditions stated earlier (example for 300km/h high-fare case only). Year 2026 was assumed to be the starting year of HSR operation. Analysis period is 30 years from 2016 to 2045, similar to economic evaluation. Expenditure is about 18% bigger than economic cost to include contingencies and various taxes. Financial viability is low, as FIRR is indefinable. However, farebox recovery ratio is calculated at 2.0 on average for the operation period of 20 years[4].

10.47 Table 10.4.15 summarizes the results of financial evaluation for the base cases that assumed an opening year of 2026. Financial viability is generally very low as FIRRs cannot be calculated. However, the farebox recovery ratio, which is the ratio of fare revenue to operating expenditure and rolling stock cost, is favorable being over 1.0 for high- to medium-fare cases. This means that the HSR is commercially sustainable if the huge initial cost is shouldered by the government. Moreover, if premium fare is introduced at double the ordinary fare (and is applied to passengers who use HSR even when the fare is double), the farebox recovery ratio improves further. This implies that even the medium- to low-fare cases could become commercially sustainable.

[4] In railway projects, it is generally difficult to attain an FIRR over 15% due to the huge initial cost and the logn time required for construction. In Japan, farebox recovery ratio is deemed as one of the criteria for the private sector to participate in the operation.

(b) Opening by 2036 (10-year Delay)

10.48 Table 10.4.16 summarizes the results of analysis when opening of HSR delays by 10 years. FIRR is still either indefinable or very low.

Table 10.4.14 Expenditure and Revenue Stream (HSR: 300km/h, equal to airfare)

Year	Pax-km (million/day)	Expenditure (USD million)	Revenue (USD million)	Profit (USD million)
2016		0	0	0
2017		0	0	0
2018		407	0	-407
2019		407	0	-407
2020		0	0	0
2021		3240	0	-3,240
2022		5941	0	-5,941
2023		9082	0	-9,082
2024		11173	0	-11,173
2025		15887	0	-15,887
2026	70	1286	2,359	1,072
2027	73	1328	2,474	1,146
2028	77	1371	2,594	1,223
2029	80	1416	2,721	1,304
2030	84	2164	2,854	690
2031	88	1512	2,993	1,481
2032	93	1562	3,139	1,576
2033	97	1615	3,292	1,677
2034	102	1669	3,452	1,783
2035	107	2614	3,620	1,006
2036	112	1784	3,797	2,013
2037	118	1845	3,982	2,137
2038	123	1908	4,176	2,268
2039	129	1974	4,380	2,406
2040	136	3169	4,593	1,424
2041	142	2113	4,817	2,705
2042	149	2186	5,052	2,866
2043	156	2262	5,299	3,037
2044	164	2341	5,557	3,216
2045	172	2422	5,828	3,406
Residual Value			23,890	23,890

Source: VITRANSS 2 Study Team Note: FIRR is indefinable.

Table 10.4.15 Financial Indicators of HSR Project (Hanoi–Ho Chi Minh, Opening by 2026)

Speed of HSR (km/h)	Fare Level as % of Airfare	No. of Passengers, 2030 (000/day)	FIRR (%)	Farebox Recovery Ratio, Ave. (range)	Premium Fare Applied	
					FIRR (%)	Farebox Recovery Ratio, Ave. (range)
300	100	146	-	1.9 (0.7-2.4)	. N.A	N.A.
300	75	172	-	1.5 (0.5-2.0)	N.A	N.A
300	50	208	-	1.1 (0.4-1.4)	-	1.6 (0.5-2.1)
300	25	248	-	0.6 (0.2-0.8)	-	1.0 (0.3-1.3)
200	100	114	-	1.8 (0.7-2.3)	N.A.	N.A.
200	75	136	-	1.5 (0.5-0.9)	N.A	N.A
200	50	165	-	1.0 (0.4-1.3)	-	1.7 (0.6-2.2)
200	25	203	-	0.6 (0.2-0.7)	-	1.0 (0.3-1.3)

Source: VITRANSS 2 Study Team. Note: Premium fare is double the ordinary fare.

Table 10.4.16 Financial Indicators of HSR Project (Hanoi–Ho Chi Minh, Opening by 2036)

Speed of HSR (km/h)	Fare Level as % of Airfare	No. of Passengers, 2040 (000/day)	FIRR (%)	Farebox Recovery Ratio, Ave. (range)	Premium Fare Applied	
					FIRR (%)	Farebox Recovery Ratio, Ave. (range)
300	100	235	4.1	2.1 (0.5-2.7)	N.A.	N.A.
300	75	277	-	1.7 (0.4-2.3)	N.A.	N.A.
300	50	335	-	1.2 (0.3-1.6)	4.8	1.8 (0.4-2.5)
300	25	399	-	0.6 (0.1-0.9)	-	1.1 (0.2-1.5)

Source: VITRANSS 2 Study Team. Note: Premium fare is double the ordinary fare.

(c) Opening by 2046 (20-year Delay)

10.49 If the HSR opening is further delayed by 20 years, that is, by 2046, its economic viability will improve again (see Table 10.4.17). FIRRs are still either very low or indefinable, though some improvement is seen.

Table 10.4.17 Financial Indicators of HSR Project (Hanoi–Ho Chi Minh, Opening by 2046)

Speed of HSR (km/h)	Fare Level as % of Airfare	No. of Passengers, 2050 (000/day)	FIRR (%)	Farebox Recovery Ratio, Ave. (range)	Premium Fare Applied	
					FIRR (%)	Farebox Recovery Ratio, Ave. (range)
300	100	378	6.5	2.1 (0.3-3.1)	N.A.	N.A.
300	75	446	4.9	1.7 (0.3-2.6)	N.A.	N.A.
300	50	539	-	1.2 (0.2-1.8)	6.8	1.9 (0.3-2.9)
300	25	642	-	0.6 (0.1-1.0)	-	1.1 (0.2-1.8)

Source: VITRANSS 2 Study Team.
Note: Premium fare is double the ordinary fare.

(d) Opening by 2026 amid Extensive Urban Development

10.50 The poor financial performance of the NSHSR project is primarily due to its huge cost and partially due to the lack of demand generated from, and attracted to, the medium- to small-sized cities located between Hanoi and Ho Chi Minh City. Similar to economic evaluation, a financial analysis was conducted assuming an extensive urban development (see Table 10.4.18). However, no significant improvement is observed.

Table 10.4.18 Financial Indicators of HSR Project (Hanoi–Ho Chi Minh, Opening by 2026 amid Extensive Urban Development)

Speed of HSR (km/h)	Fare Level as % of Airfare	No. of Passengers, 2030 (000/day)	FIRR (%)	Farebox Recovery Ratio, Ave. (range)	Premium Fare Applied	
					FIRR (%)	Farebox Recovery Ratio, Ave. (range)
300	100	225	4.1	2.1 (0.7-2.7)	N.A.	N.A.
300	75	261	-	1.7 (0.5-2.2)	N.A.	N.A.
300	50	311	-	1.2 (0.4-1.6)	5.0	1.9 (0.6-2.5)
300	25	368	-	0.6 (0.2-0.8)	-	1.1 (0.3-1.5)

Source: VITRANSS 2 Study Team.
Note: Premium fare is double the ordinary fare.

(e) Opening by 2036 (10-year Delay) amid Extensive Urban Development

10.51 This case assumes a 10-year delay of opening and extensive urban development (Table 10.4.19). Although the FIRRs improve to some extent as compared to the case mentioned above, the entire project still remains unfeasible financially.

Table 10.4.19 Financial Indicators of HSR Project (Hanoi–Ho Chi Minh, Opening by 2036 amid Extensive Urban Development)

Speed of HSR (km/h)	Fare Level as % of Airfare	No. of Passengers, 2040 (000/day)	FIRR (%)	Farebox Recovery Ratio, Ave. (range)	Premium Fare Applied	
					FIRR (%)	Farebox Recovery Ratio, Ave. (range)
300	100	362	7.0	2.3 (0.5-3.1)	N.A.	N.A.
300	75	420	5.0	1.8 (0.4-2.5)	N.A.	N.A.
300	50	501	-	1.3 (0.3-1.8)	7.8	2.0 (0.4-2.8)
300	25	592	-	0.7 (0.1-1.0)	-	1.2 (0.2-1.7)

Source: VITRANSS 2 Study Team.
Notes:
1. To calculate farebox recovery ratio, the cost of rolling stock additionally acquired during the operation period is taken into account.
2. Premium fare is double the ordinary fare .

(3) Evaluation of the Partial Completion of NSHSR

(a) Opening by 2026 (Base Case)

10.52 Table 10.4.20 presents the results of financial evaluation for the partial completion of the NSHSR. In this analysis, each of the sections was assumed to be independent from other sections; i.e., when one is constructed, the others do not exist. Although financial viability is also low in this case similar to the construction of the entire Hanoi-Ho Chi Minh route, the farebox recovery ratio suggests the possibility of a commercial operation of the NSHSR—only if the huge infrastructure cost is shouldered by the government.

Table 10.4.20 Financial Indicators of HSR Project by Section (Opening by 2026)

Section	Speed of HSR (km/h)	Fare Level as % of Airfare	No. of Passengers, 2030 (000/day)	FIRR (%)	Farebox Recovery Ratio, Ave. (range)
1. Hanoi–Ninh Binh (97km)	300	100	19	-	1.4 (0.6-1.7)
	300	75	20	-	1.0 (0.4-1.3)
	300	50	20	-	0.7 (0.3-0.9)
	300	25	21	-	0.4 (0.1-0.5)
2. Hanoi–Thanh Hoa (150km)	300	100	46		1.8 (0.7-2.3)
	300	75	48		1.4 (0.5-1.7)
	300	50	50		0.9 (0.3-1.2)
	300	25	53		0.5 (0.2-0.6)
3. Hanoi–Vinh (282km)	300	100	53	-	1.8 (0.7-2.3)
	300	75	57	-	1.4 (0.5-1.8)
	300	50	61	-	0.9 (0.3-1.2)
	300	25	65	-	0.5 (0.2-0.6)
4. Hanoi–Hue (622km)	300	100	75	-	1.9 (0.7-2.4)
	300	75	84	-	1.5 (0.5-1.9)
	300	50	95	-	1.0 (0.3-1.3)
	300	25	107	-	0.5 (0.2-0.7)
5. Hanoi–Danang (702km)	300	100	79	-	1.9 (0.7-2.4)
	300	75	90	-	1.5 (0.5-1.9)
	300	50	103	-	1.0 (0.3-1.3)
	300	25	117	-	0.5 (0.2-0.7)
6. Hue–Danang (80km)	300	100	57	-	1.9 (0.7-2.5)
	300	75	58	-	1.5 (0.5-1.9)
	300	50	60	-	1.0 (0.3-1.2)
	300	25	61	-	0.5 (0.2-0.6)
7. Danang–Hochi minh (868km)	300	100	110	-	2.0 (0.7-2.6)
	300	75	125	-	1.6 (0.5-2.0)
	300	50	143	-	1.1 (0.4-1.4)
	300	25	165	-	0.6 (0.2-0.7)
8. Nha Trang–Hochi minh (382km)	300	100	86	4.4	2.1 (0.7-2.7)
	300	75	93	-	1.6 (0.5-2.1)
	300	50	101	-	1.1 (0.4-1.4)
	300	25	110	-	0.6 (0.2-0.7)
9. Phan Thiet–Hochi minh (167km)	300	100	79	3.8	2.1 (0.7-2.7)
	300	75	82	-	1.6 (0.5-2.0)
	300	50	86	-	1.1 (0.4-1.4)
	300	25	89	-	0.5 (0.2-0.7)

Source: VITRANSS 2 Study Team.

(b) Opening by 2020 (6 Years Early)

10.53 The Vietnamese government has strong intentions of completing part of the NSHSR by 2020. In order to test the reality of this plan, financial evaluation was conducted assuming its opening by 2020. The results are shown in Table 10.4.21. Financial viability becomes even lower than the base case.

Table 10.4.21 Financial Indicators of HSR {Project by Section (Opening by 2020)

Section	Speed of HSR (km/h)	Fare Level as % of Airfare	No. of Passengers, 2030 (000/day)	FIRR (%)	Farebox Recovery Ratio, Ave. (range)
1. Hanoi–Ninh Binh (97km)	300	100	19	-	1.2 (0.6-1.6)
	300	75	20	-	0.9 (0.5-1.2)
	300	50	20	-	0.6 (0.3-0.8)
	300	25	21	-	0.3 (0.2-0.4)
2. Hanoi–Thanh Hoa (150km)	300	100	46	-	1.7 (0.7-2.1)
	300	75	48	-	1.3 (0.6-1.6)
	300	50	50	-	0.9 (0.4-1.1)
	300	25	53	-	0.4 (0.2-0.6)
3. Hanoi–Vinh (282km)	300	100	53	-	1.7 (0.7-2.1)
	300	75	57	-	1.3 (0.6-1.6)
	300	50	61	-	0.9 (0.4-1.1)
	300	25	65	-	0.5 (0.2-0.6)
4. Hanoi–Hue (622km)	300	100	75	-	1.7 (0.8-2.2)
	300	75	84	-	1.4 (0.6-1.7)
	300	50	95	-	0.9 (0.4-1.2)
	300	25	107	-	0.5 (0.2-0.6)
5. Hanoi–Danang (702km)	300	100	79	-	1.8 (0.8-2.2)
	300	75	90	-	1.4 (0.6-1.7)
	300	50	103	-	1.0 (0.4-1.2)
	300	25	117	-	0.5 (0.2-0.6)
6. Hue–Danang (80km)	300	100	57	-	1.8 (0.8-2.3)
	300	75	58	-	1.4 (0.6-1.7)
	300	50	60	-	0.9 (0.4-1.2)
	300	25	61	-	0.5 (0.2-0.6)
7. Danang–Hochi minh (868km)	300	100	110	-	1.9 (0.8-2.4)
	300	75	125	-	1.5 (0.6-1.9)
	300	50	143	-	1.0 (0.4-1.3)
	300	25	165	-	0.5 (0.2-0.7)
8. Nha Trang–Hochi minh (382km)	300	100	86	-	2.0 (0.8-2.5)
	300	75	93	-	1.5 (0.6-1.9)
	300	50	101	-	1.0 (0.4-1.3)
	300	25	110	-	0.5 (0.2-0.7)
9. Phan Thiet–Hochi minh (167km)	300	100	79	-	2.0 (0.8-2.5)
	300	75	82	-	1.5 (0.6-1.9)
	300	50	86	-	1.0 (0.4-1.3)
	300	25	89	-	0.5 (0.2-0.6)

Source: VITRANSS 2 Study Team.

(c) Opening by 2020 (6 Years Early) with Extensive Urban Development

10.54 Table 10.4.22 shows the results of financial evaluation when the HSR is opened by 2020, six years earlier than the base case, and amid extensive urban development. Financial viability will improve considerably in this case due to demand increase from extensive urban development, although the overall financial performance will still be very low.

Table 10.4.22 Financial Indicators of HSR Project by Section (Opening by 2020 amid Extensive Urban Development)

Section	Speed of HSR (km/h)	Fare Level as % of Airfare	No. of Passengers, 2030 (000/day)	FIRR (%)	Farebox Recovery Ratio, Ave. (range)
1. Hanoi–Ninh Binh (97km)	300	100	19	-	1.6 (0.7-2.0)
	300	75	20	-	1.2 (0.5-1.5)
	300	50	20	-	0.8 (0.4-1.0)
	300	25	21	-	0.4 (0.2-0.5)
2. Hanoi–Thanh Hoa (150km)	300	100	71	-	1.9 (0.8-2.4)
	300	75	74	-	1.4 (0.6-1.8)
	300	50	78	-	1.0 (0.4-1.2)
	300	25	81	-	0.5 (0.2-0.6)
3. Hanoi–Vinh (282km)	300	100	53	-	1.9 (0.8-2.4)
	300	75	57	-	1.5 (0.6-1.8)
	300	50	61	-	1.0 (0.4-1.2)
	300	25	65	-	0.5 (0.2-0.6)
4. Hanoi–Hue (622km)	300	100	75	-	1.9 (0.8-2.4)
	300	75	84	-	1.5 (0.6-1.9)
	300	50	95	-	1.0 (0.4-1.3)
	300	25	107	-	0.5 (0.2-0.7)
5. Hanoi–Danang (702km)	300	100	79	-	2.0 (0.8-2.5)
	300	75	90	-	1.5 (0.6-1.9)
	300	50	103	-	1.1 (0.4-1.3)
	300	25	117	-	0.6 (0.2-0.7)
6. Hue–Danang (80km)	300	100	57	-	2.0 (0.8-2.5)
	300	75	58	-	1.5 (0.6-1.9)
	300	50	60	-	1.0 (0.4-1.3)
	300	25	61	-	0.5 (0.2-0.6)
7. Danang–Hochi minh (868km)	300	100	110	-	2.0 (0.8-2.6)
	300	75	125	-	1.6 (0.6-2.0)
	300	50	143	-	1.1 (0.4-1.4)
	300	25	165	-	0.6 (0.2-0.7)
8. Nha Trang–Hochi minh (382km)	300	100	86	4.2	2.1 (0.8-2.7)
	300	75	93	-	1.6 (0.6-2.1)
	300	50	101	-	1.1 (0.4-1.4)
	300	25	110	-	0.6 (0.2-0.7)
9. Phan Thiet–Hochi minh (167km)	300	100	79	4.0	2.1 (0.8-2.7)
	300	75	82	-	1.6 (0.6-2.0)
	300	50	86	-	1.1 (0.4-1.4)
	300	25	89	-	0.5 (0.2-0.7)

Source: VITRANSS 2 Study Team.

3) Conclusion

10.55 The results of the economic and financial analyses for the NSHSR Project is summarized as follows:

(i) The determination of the fare level of the NSHSR needs careful consideration, because demand significantly influences economic and financial viability. From both economic and financial points of view, the fare level at around 50% of airfare seems reasonable;

(ii) The entire stretch of the NSHSR between Hanoi and Ho Chi Minh becomes economically feasible if the opening is around 2036 and if extensive urban development has taken place or the prices of fuel for road vehicles and airplanes have increased by more than 50%. The financial viability is very low due to the huge cost required for construction. However, the O&M cost and the rolling stock can be covered by fare revenue; and

(iii) The partial completion of the NSHSR by 2020, i.e., Hanoi–Ninh Binh, Hanoi–Thanh Hoa, Hanoi–Vinh, or Nha Trang–Ho Chi Minh sections, will become marginally feasible economically if urban development in the cities along the NSHSR becomes more rapid than at present. If the completion could be delayed to 2026, then the Hanoi–Ninh Binh, Hanoi–Thanh Hoa, Nha Trang–Ho Chi Minh, or Phan Thiet–Ho Chi Minh sections would become economically feasible even without accelerated urbanization and if the fare is set lower. Financially, however, the feasibility is very low, although the O&M cost and the rolling stock cost can be covered by the fare revenue as well.

10.56 To realize the NSHSR, many key issues should be addressed besides the construction work. It is preferable to tackle these issues as soon as possible before the constuction or the operation starts.

Table 10.4.23 Main Issues for North-South High Speed Railway Development

Key Aspects	Main Issues
● Land Acquisition	• Delay in land acquisition for a partial section affects the schedule for a whole line, resulting in high risks of NSHSR development. • Effective implementation approach and implementation plan for smooth implementation must be introduced.
● Human Resource Development	• Human resource development programs should be designed to train necessary staff in proper ways. • It should consider the current human resource situation and concrete study methodologies.
● Design of Development and Operational Institutions	• Institutional reform plan which provides clear institutional responsibilities and jurisdictions setup to develop and operate HSR in harmony with existing railways shall be necessary.
● Development of Regulations including Technical Standards	• Efficient and smooth railway development and operation require development of regulations stipulating the roles of local authorities, private sector and other stakeholders, development procedures, engineering standards as well as land acquisition process and development and operational institutions
● Integrated High Speed Railway and Urban Development Plan	• Integrated development plan of NSHSR and urban area will enforce the importance of NSHSR as transport system connecting urban areas and growing centers strongly and accelerating the well-balanced national land development. • Integrated urban development also ensure the feasibility of NSHSR.
● Implementation Plan	• Implementations of NSHSR face varieties of issues (funding, land acquisition, connectivity with urban transport in Hanoi and HCMC, development measures in sections where require high level engineering approaches, e.g. Hai Van Tunnel, disaster prevention, environmental impacts and others.) • Feasible sections should be chosen based on a detailed feasibility study. Sections must be developed with a phased approach.

Source: VITRANSS 2 Study Team.

10.57 The required tasks were identified as shown in the following table. Conducting these tasks carefully and substantially, the construction would be implemented smoothly and the operation would start in efficient and effective manner without any big troubles

Table 10.4.24 Required Tasks before North-South High Speed Railway Development

Tasks	Actions
1. Land Acquisition	(a) Adopt HSR to Urban Development Plan (b) Establish implementation system for local central government (c) Develop regulations regarding land acquisition (d) Acquire land for test truck (e) Acquire land for priority sections
2. Human Resource Development	(a) Develop human resource development plan (b) Develop human resource development system (c) Implement training
3. Design of Development and Operational Institutions	(a) Develop HSR operational institution Plan (b) Develop relevant regulations (c) Develop operational institutions
4. Development of Regulations including Technical Standards	(a) Develop regulations and implementation standards regarding HSR technical standards (b) Develop regulations regarding HSR construction and operations
5. Integrated High Speed Railway and Urban Development Plan	(a) Revise urban development plans and local development plans (b) Implement integrated urban development projects (c) Develop HSR promoting measures (d) Implement HSR promoting measures
6. Implementation Plan	(a) Conduct F/S (b) Formulate phased development plan (c) Implement Detailed Design for each phase

Source: VITRANSS 2 Study Team.

11 BASIC PLAN FOR THE NORTH–SOUTH EXPRESSWAY

11.1 Role of North–South Expressway in Overall Transportation System

11.1 The need for high-quality transportation infrastructure to provide much more improved services, especially along the national backbone, has long been a priority policy in the national land and transportation development plan of Vietnam. One such plan is the development of the North–South Expressway together with the development of a high-speed railway, air transportation, and coastal shipping.

11.2 Although intensive investments in roads have been made during the last decade, the demand–supply gap has widened more than ever in and around major urban areas and along main transportation corridors. In addition to the sharp increase in overall road traffic volume, significant changes have taken place in the nature of traffic, such as increase in cars for passenger transportation and heavy trucks for goods transportation, although motorcycle numbers remain considerable on the roads. These changes are taking place everywhere on conventional national roads which are mostly substandard and associated with unplanned roadside developments. Many sections of main roads have become degraded, hampering smooth inter-city traffic and decreasing safety and comfort levels for local transportation. Safety levels have also suffered due to increasing mix of different types of traffic. While these problems can be alleviated by widening main roads, this too is difficult to implement on many sections because of the need for resettlement and high investment costs, among others. Segregating long-distance heavy traffic from local traffic is also hard to implement because of the many at-grade intersections.

11.3 Because of the above, a need for expressways has been increasingly felt in Vietnam from the economic, social, and environmental viewpoints. The main roles of expressways in Vietnam are thus envisioned as follows:

(a) **Segregate Long-distance Traffic from Local Traffic:** Urbanization in Vietnam is expected to further progress long into the future. It is also expected that industrial development will intensify and become extensive along main roads. In order to respond to the changing situation, the development of expressways to segregate nonlocal traffic is important, although existing roads will still need improvement to best suit local traffic needs. With a very significant number of motorcycles, it is also necessary to consider the use of expressways by this mode;

(b) **Facilitate Provision of Competitive Transportation Services Ensuring Efficiency, Safety, and Amenity:** Vietnam is and will be a trade-oriented economy that requires efficient and economic transportation services to lessen transportation costs and time along main transportation corridors and at gateways. For this, expressways offer a practical and realistic solution. At the same time, Vietnam intends to promote both international and domestic tourism. Safe and comfortable travel via road between home cities and tourism destinations can only be provided by expressways which, however, must provide users with necessary information and services during travel;

(c) **Serve as Strategic Means of Regional Development:** The potential impact of expressway development on regional development must be tapped to the maximum extent possible and must be weighed when their routes are selected. Expressway development should also be done in an integrated manner with urban, industrial, tourism and other developments. Adequate measures to promote local economic development through expressway development must also be worked out;

(d) **Serve as Core Transportation Corridors Integrating Key Transportation Modes:** Intermodal connectivity in Vietnam's transportation system remains weak. Because of this, the provision of high-quality and efficient transportation services has been difficult. As existing congested and substandard roads are unable to function efficiently, expressways can and must fulfill the role of roads. For this, the current expressway network plan needs to be further elaborated with due consideration of the following:

(i) Guarantee of connectivity among major cities, provincial capitals, and growth centers including major industrial zones, gateway ports and airports, all of which must be accessed by expressways within a reasonable period of time;
(ii) Realization of effective network configuration with national and major provincial roads, as well as urban roads; and
(iii) Provision of the desired quality of passenger and freight transportation services by strengthening intermodal facilities, logistics, and road user service facilities, as well as introducing IT applications.

11.2 Concept Plan

11.4 The latest expressway master plan, prepared by the MOT and approved by the Prime Minister under Decision No. 1734/QD-TTG dated 1 December 2008, includes a network of 5,753km of expressways, as illustrated in Figure 11.2.1. VITRANSS 2 adopted this plan and used it as basis in formulating the expressway development strategy.

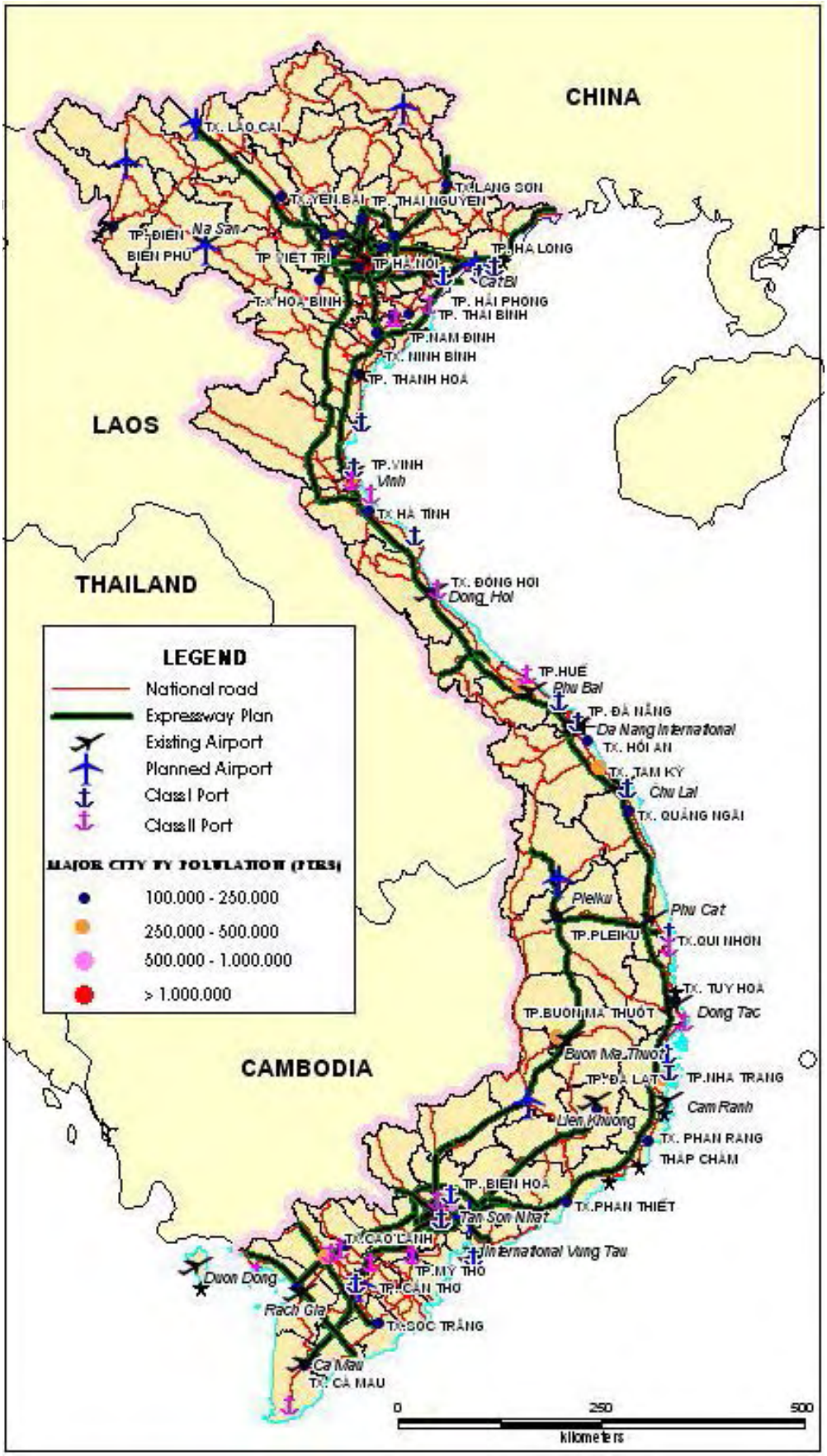
11.5 The MOT expressway master plan includes two north–south expressways which have a total length of 3,262km. The north–south expressway in the east is 1,941km and the one in the west is about 1,321km. The expressways will consist of 1,096km of four-lane sections (30%), 1,719km of four- to six-lane sections (>50%), 357km of six-lane sections (10%), 100km of six- to eight-lane sections (3%), and 40km of eight-lane sections (0.1%). The estimated cost of the expressways is almost VND 320 trillion (USD 19 billion).

Table 11.2.1 List of Expressway Projects in the MOT Master Plan

No.		Section	Length (km)	No. of Lanes	Cost (VND bil.)
North–South Expressway in the East	1	Cau Gie–Ninh Binh	50	6	9,300
	2	Ninh Binh–Thanh Hoa	75	6	12,380
	3	Thanh Hoa–Vinh	140	6	22,120
	4	Vinh–Ha Tinh	20	4-6	2,580
	5	Ha Tinh–Quang Tri	277	4	21,610
	6	Quang Tri–Da Nang	178	4	18,160
	7	Da Nang–Quang Ngai	131	4	17,820
	8	Quang Ngai–Quy Nhon	150	4	23,700
	9	Quy Nhon–Nha Trang	240	4	24,960
	10	Nha Trang–Dau Giay	378	4 6	55,940
	11	HCMC–Long Thanh–Dau Giay	55	6 8	18,880
	12	Long Thanh–Nhon Trach–Ben Luc	45	6 8	12,340
	13	HCMC–Trung Luong	40	8	13,200
	14	Trung Luong–My Thuan–Can Tho	92	6	26,250
N–S Expressway in the West	15	Doan Hung–Hoa Lac–Pho Chau	457	4 6	53,930
	16	Ngoc Hoi–Chon Thanh–Rach Gia	864	4 6	96,770
Northern Vietnam	17	Lang Son–Bac Giang–Bac Ninh	130	4 6	12,220
	18	Hanoi–Hai Phong	105	4 6	16,800
	19	Hanoi–Lao Cai	264	4 6	15,580
	20	Hanoi – Thai Nguyen	62	4 6	4,220
	21	Thai Nguyen–Cho Moi	28	4 6	2,940
	22	Lang–Hoa Lac	30	6	7,650
	23	Hoa Lac–Hoa Binh	26	4 6	2,550
	24	Bac Ninh–Ha Long	136	6	19,040
	25	Ha Long–Mong Cai	128	4 6	13,820
	26	Ninh Binh–Hai Phong–Quang Ninh	160	4	13,760
Central Vietnam	27	Hong Linh–Huong Son	34	4	2,450
	28	Cam Lo–Lao Bao	70	4	4,900
	29	Quy Nhon–Pleiku	160	4	12,000
Southern VIetnam	30	Dau Giay–Da Lat	189	4	19,280
	31	Bien Hoa–Vung Tau	76	6	12,160
	32	HCMC–Thu Dau Mot–Chon Thanh	69	6-8	20,010
	33	Can Tho–Ca Mau	150	4	24,750
	34	HCMC–Moc Bai	55	4 6	7,480
	35	Soc Trang–Can Tho–Chau Doc	200	4	24,200
	36	Ha Tien–Rach Gia–Bac Lieu	225	4	27,230
Ring Road System in Hanoi	37	Ring road No 3	56	4 6	17,990
	38	Ring road No 4	125	6 8	34,500
RR System in HCMC	39	Ring road No 3	83	6 8	20,750
		Total	5,753		766,220

Source: MOT Master Plan (No.7056/TTr-BGTVT dated 5 November 2007).
Note: This table does not include the following: Bac Ninh–Phap Van section (40km), Phap Van–Cau Gie section (30km), Noi Bai–Bac Ninh section (30 km), and Lien Khuong–Da Lat section (20km).

Figure 11.2.1 MOT Expressway Plan



Source: MOT Master Plan (No.7056/TTr-BGTVT dated 5 November 2007).

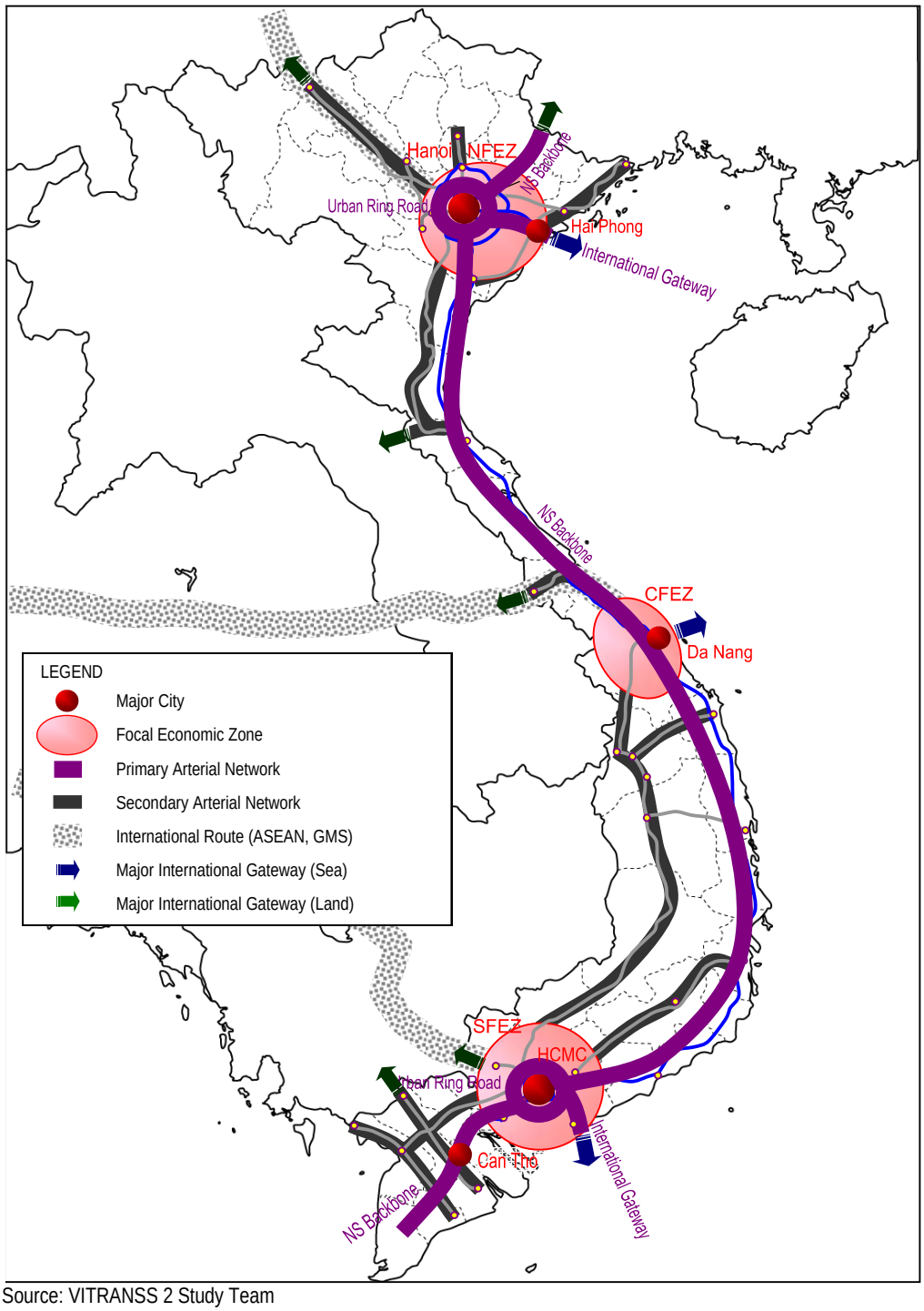
11.3 VITRANSS 2 Expressway Plan (Do-maximum Network)

11.6 The approved expressway master plan covers a comprehensive network, and many related studies are ongoing to realize the plan, as of this writing. However, the VITRANSS 2 Study Team proposes the following in order to improve the master plan.

1) Classification of Expressway Network

11.7 In the light of the function of each expressway in the whole network and the conceptual network development plan shown in Figure 11.3.1, expressways can be classified into two categories, i.e., primary and secondary.

Figure 11.3.1 Conceptual Network Development Plan

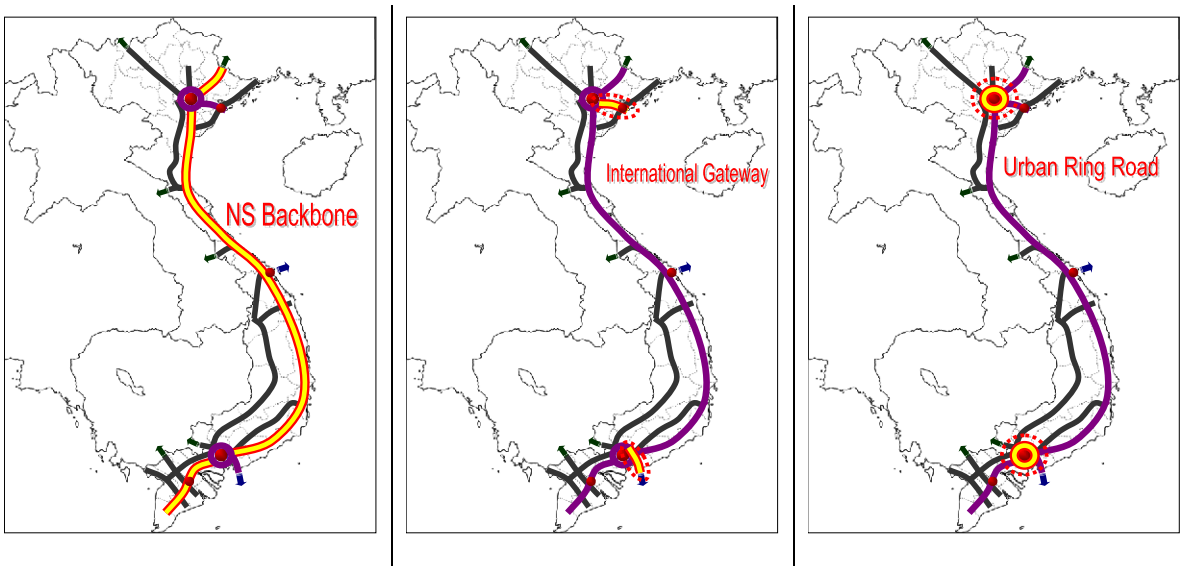


Source: VITRANSS 2 Study Team

(a) Primary Arterial Network

11.8 The Primary Arterial Network, comprising the north–south backbone, international gateways, and urban ring roads shown in Figure 11.3.2, connects the strategic ports of the country. The importance of developing and strengthening this network is further heightened by the need to promote regional development.

Figure 11.3.2 Primary Arterial Network



Source: VITRANSS 2 Study Team.

(b) Secondary Arterial Network

11.9 The remaining expressways are classified as the Secondary Arterial Network. To ensure the country's balanced development, this network is indispensable and has to be developed.

2) Proposed Four (4) Supplementary Expressway Segments

11.10 The following three (3) expressways are proposed in addition to those proposed in the MOT plan:

(a) Danang–Ngoc Hoi, 250km

11.11 The Danang–Ngoc Hoi Expressway is recommended because:

(i) Expressways should form a network, instead of stopping in Ngoc Hoi as a dead-end. This segment will provide an alternative to the coastal route, thereby contributing to the socio-economic development of the area as well, and

(ii) Pakxe (Lao PDR)–Ngoc Hoi–Danang is one of the east–west economic corridors of the Greater Mekong Subregion (GMS). Besides promoting cross-border economy, this segment is expected to contribute to the development of the entire GMS.

(b) Quang Ngai–Dak To, 170km

11.12 The Quang Ngai–Dak To Expressway is recommended because:

(i) This segment is essential to connect Lao PDR and the Dung Quat Industrial Zone (DQIZ) where an oil refinery facility started production on 22 February 2009. DQIZ needs a strong transportation infrastructure in order to distribute its products not only in Vietnam but outside as well. Trucks carrying goods produced in Lao PDR and to be

exported through the Danang Port can carry backhaul freight such as oil and other products from the DQIZ, and

(ii) The distance between Danang and Quy Nhon is 300km, a little too long not to have an east–west expressway.

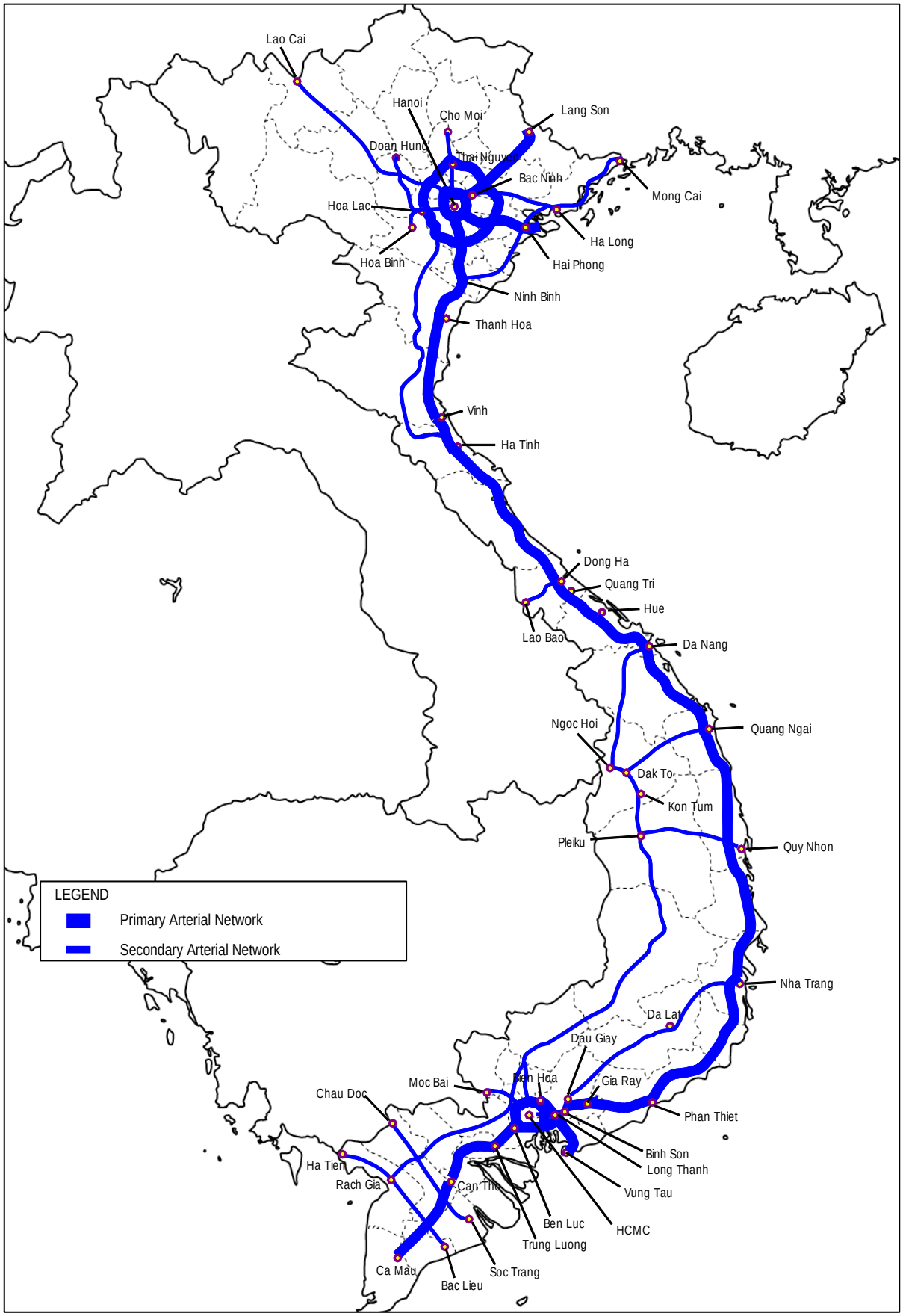
(c) Nha Tran–Da Lat, 80km

11.13 The Nha Trang–Da Lat Expressway is recommended because:

(i) Expressways should form a network; therefore Da Lat should not be a dead-end. Moreover, this segment will provide an alternative expressway to the coastal route, thereby contributing to the socio-economic development of the area as well, and

(ii) Both Nha Trang and Da Lat are famous tourist destinations in Vietnam. Reaching these cities within an hour's drive will surely contribute not only to tourism but also to regional industries.

Figure 11.3.3 VITRANSS 2 Expressway Network (Do-maximum Network)



Source: VITRANSS 2 Study Team.

Table 11.3.1 List of VITRANSS 2 Expressway Projects

No.		Section	Length (km)	Cost (USD mil.)	No. of Lanes
Primary Arterial Network					
1. NS Backbone					
1	CH07	Lang Son–Bac Giang–Bac Ninh	130	1,176.2	4
2	-	Phap Van–Cau Gie	30	Existing	4
3	CH01	Cau Gie–Ninh Binh	50	452.4	4
4	H01	Ninh Binh–Thanh Hoa	75	827.6	6
5	H02	Thanh Hoa–Vinh	140	2,128.0	6
6	H03	Vinh–Ha Tinh	20	201.5	4
7	H04	Ha Tinh–Quang Tri	277	2,641.2	4
8	H05	Quang Tri–Hue	73	711.9	4
9	H06	Hue–Da Nang	105	1,778.0	4
10	CH02	Da Nang–Quang Ngai	131	1,048.2	4
11	H07	Quang Ngai–Quy Nhon	150	1,787.8	4
12	H08	Quy Nhon–Nha Trang	240	3,390.1	4
13	H09	Nha Trang–Phan Thiet	280	2,890.2	4
14	CH03	Phan Thiet–Dau Giay	100	1,003.8	4
15	CH04	HCMC–Long Thanh–Dau Giay	55	1,110.8	6
16	H10	Long Thanh–Nhon Trach–Ben Luc	45	738.6	6
17	CH05	HCMC–Trung Luong	40	776.5	6
18	CH06	Trung Luong–My Thuan–Can Tho	92	1,510.0	6
19	H26	Can Tho–Ca Mau	150	1,755.7	4
2. International Gateway					
20	CH08	Ha Noi–Hai Phong	105	1,441.2	6
21	H21	Bien Hoa–Vung Tau	76	696.5	6
3. Urban Ring Road					
22	H30	Ring Road No.4 in Ha Noi	90	1,350.5	6
23	H31	Ring Road No.5 in Ha Noi	320	2,583.2	6
24	H32	Ring Road No.3 in HCMC	83	1,226.9	6
Secondary Arterial Network					
25	CH09	Ha Noi–Lao Cai	264	1,218.7	4
26	CH10	Ha Noi–Thai Nguyen	62	248.2	4
27	CH11	Lang–Hoa Lac	30	450.0	6
28	H11	Doan Hung–Hoa Lac–Pho Chau	457	4,813.1	4
29	H12	Ngoc Hoi–Chon Thanh–Rach Gia	864	7,974.4	4
30	H13	Thai Nguyen–Cho Moi	28	256.9	4
31	H14	Hoa Lac–Hoa Binh	26	214.0	6
32	H15	Bac Ninh–Ha Long	136	1,618.8	6
33	CH12	Ha Long–Mong Cai	128	1,254.7	4
34	H16	Ninh Binh–Hai Phong–Quang Ninh	160	1,189.4	4
35	H17	Hong Linh–Huong Son	34	302.0	4
36	H18	Cam Lo–Lao Bao	70	699.1	4
37	H19	Quy Nhon–Pleiku	160	1,615.1	4
38	H20	Dau Giay–Da Lat	189	1,871.0	4
39	H22	HCMC–Thu Dau Mot–Chon Thanh	69	996.3	6
40	H23	HCMC–Moc Bai	55	410.5	4
41	H24	Soc Trang–Can Tho–Chau Doc	200	1,439.6	4
42	H25	Ha Tien–Rach Gia–Bac Lieu	225	1,619.5	4
43	H27	Quang Ngai–Dak To	170	2,073.6	4
44	H28	Nha Trang–Da Lat	80	1,062.5	4
45	H29	Binh Son–Gia Ray	30	249.7	4
46	H29	Da Nang–Ngoc Hoi	250	3,094.2	4

Source: VITRANSS 2 Study Team

11.4 Demand Analysis

11.14 The summary of the analysis of road traffic volume under different scenarios, including indicators for freight, passenger, and vehicles, are shown in Table 11.4.1. Results clearly show that the impact of expressways on the overall road traffic would be significant, as follows:

(i) Expressways would accommodate 70% of car traffic and 49% of bus traffic in terms of passenger-kilometers, 52% of freight in terms of ton-kilometers, as well as vehicle-kilometers of the respective modes. This will improve the traffic situation on the existing modes, and

(ii) The impact of the NSHSR would be insignificant, diverting only 5% of car/bus traffic on expressways.

Table 11.4.1 Traffic Volume Indicators by Scenario

Scenario/Indicator			Car		Bus		Truck		Total
			Road	Expy.	Road	Expy.	Road	Expy.	
2008	Freight	ton/day (000)	-	-	-	-	605	-	605
		ton-km/day (million)	-	-	-	-	66	-	66
	Pax	No. of pax/day (000)	291	-	645	-	-	-	937
		pax-km/day (million)	27	-	116	-	-	-	143
	Vehicle	No. of vehicles (000)	99	-	45	-	134		278
		vehicle-km/day (million)	9	-	8	-	15		32
2030 Do-nothing	Freight	ton/day (000)	-	-	-	-	2133		-
		ton-km/day (million)	-	-	-	-	420	-	420
	Pax	No. of pax/day (000)	708	-	1792	-	-	-	2500
		pax-km/day (million)	105	-	247	-	-	-	352
	Vehicle	No. of vehicles (000)	240	-	124	-	420		784
		vehicle-km/day (million)	36	-	17	-	83		135
2030 Do-maximum	Freight	ton/day (000)	-	-	-	-	2133		2133
		ton-km/day (million)	-	-	-	-	183	198	381
	Pax	No. of pax/day (000)	739		1932		-	-	2672
		pax-km/day (million)	39	91	166	162	-	-	457
	Vehicle	No. of vehicles (000)	251		133		420		804
		vehicle-km/day (million)	13	31	11	11	36	39	142
2030 Do-maximum + NSHSR	Freight	ton/day (000)	-	-	-	-	2133		2133
		ton-km/day (million)	-	-	-	-	182	199	381
	Pax	No. of pax/day (000)	719		1880		-	-	2599
		pax-km/day (million)	37	86	158	154	-	-	435
	Vehicle	No. of vehicles (000)	244		130		420		793
		vehicle-km/day (million)	13	29	11	11	36	39	138

Source: VITRANSS 2 Study Team.

11.15 Traffic demand on expressways was estimated based on the updated database and STRADA for the following scenarios:

(i) 2008 current situation without expressways;

(ii) 2030 Do-nothing Scenario without expressways;

(iii) 2030 Do-maximum Scenario with all planned expressways implemented; and

(iv) 2030 Do-maximum Scenario with all planned expressways implemented plus NSHSR.

11.16 Results of the analysis indicate the following:

(i) The current situation shows traffic is concentrated around Hanoi and HCMC including the main corridors such as Hanoi Hai Phong and sections from HCMC toward four directions including Bien Hoa, Ba Ria Vung Tau, My Tho, and Binh Duong (see Figure 11.4.1). Congestion is also limited to these areas;

(ii) Under the Do-nothing Scenario by 2030, the situation would be different; traffic increase would be significant around not only Hanoi and HCMC, but all over the country including in upland areas (see Figure 11.4.2). Traffic congestion would become widespread; particularly in the southern half of Vietnam (see Figure 11.4.3). Areas around Hanoi and HCMC would become seriously congested;

(iii) When all planned expressways are developed, the situation by 2030 would dramatically improve. Particularly the effects of the North-South Expressway would be so significant that north south traffic would be streamlined (see Figure 11.4.4). Congestion would be limited to only some sections around Hanoi and HCMC (see Figure 11.4.5); and,

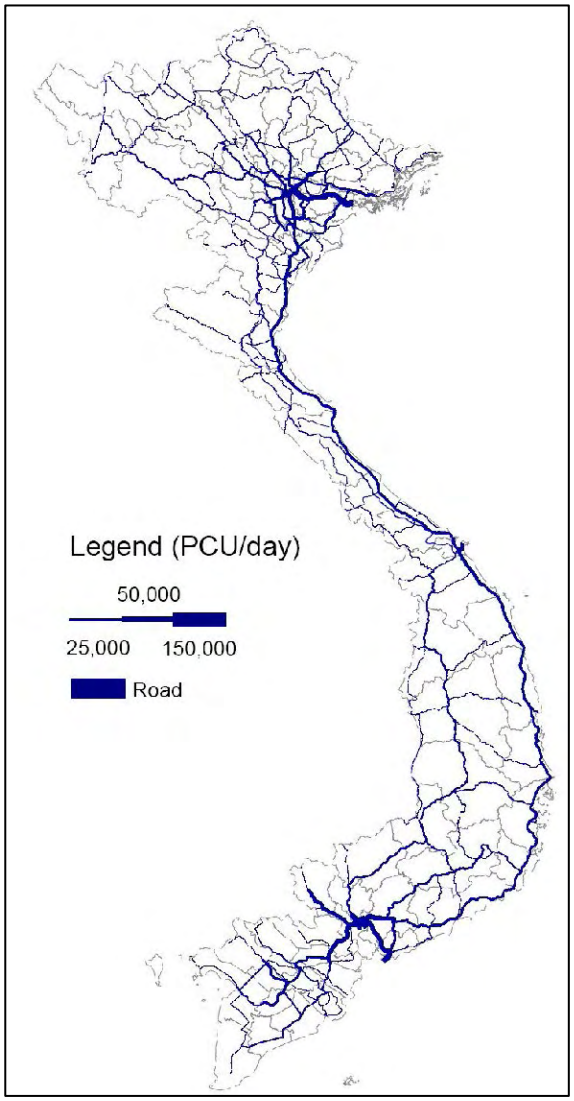
(iv) The impact of the NSHSR on road traffic distribution was also analyzed and found it insignificant.

11.17 The above analysis indicates that the current expressway plan need the following modifications:

(i) More in-depth analysis and planning for the road network including expressways around Hanoi and HCMC, and

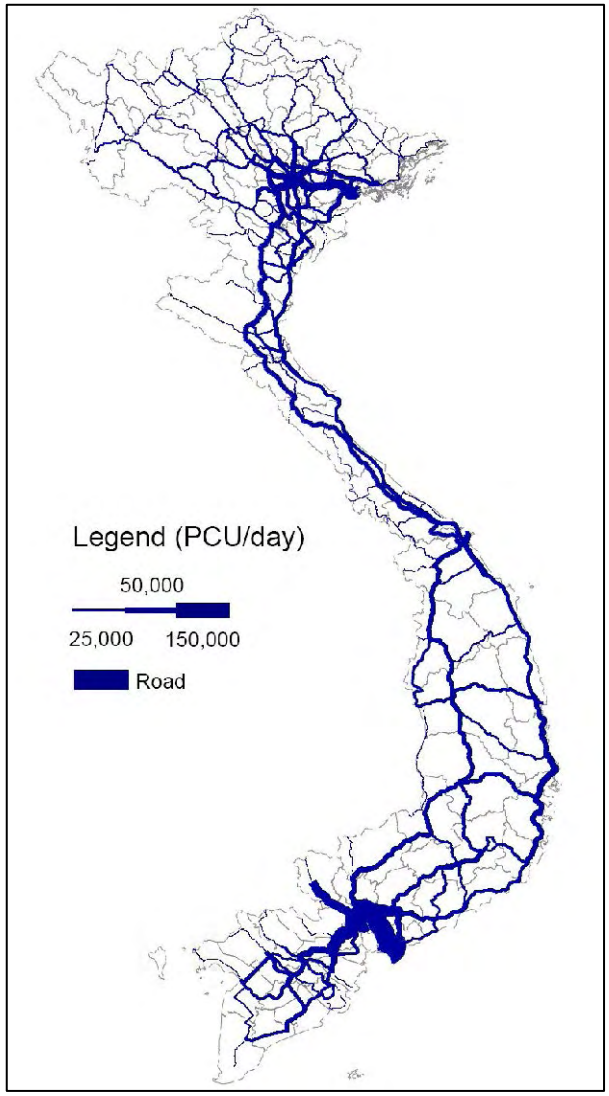
(ii) Prioritization of expressways by section, since it seems the planned expressways show an oversupply.

Figure 11.4.1 Traffic Distribution, 2008



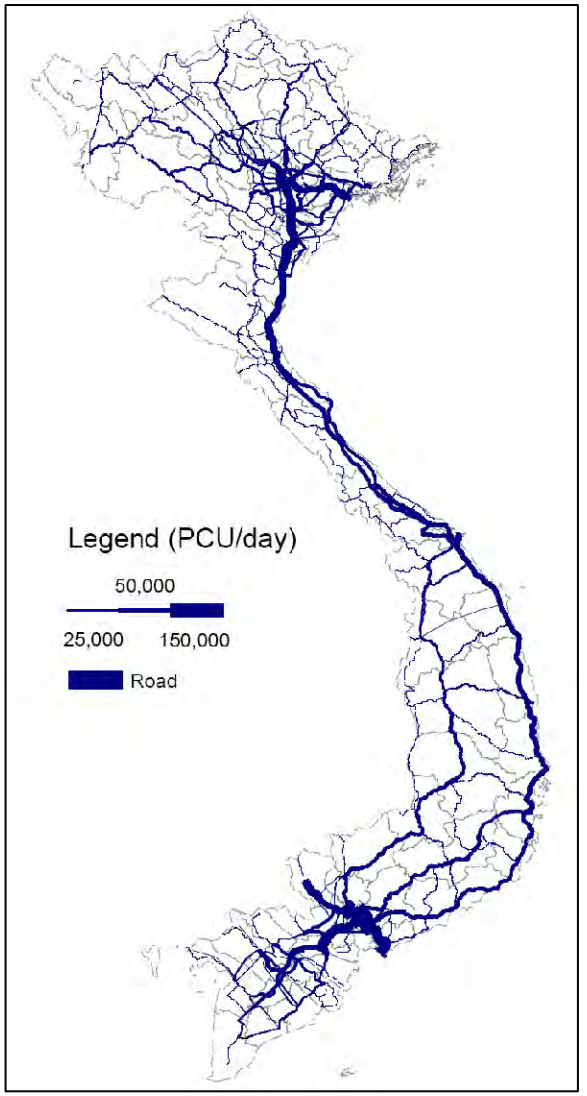
Source: VITRANSS 2 Study Team.

Figure 11.4.2 Traffic Distribution, 2030 (Do-nothing Scenario)



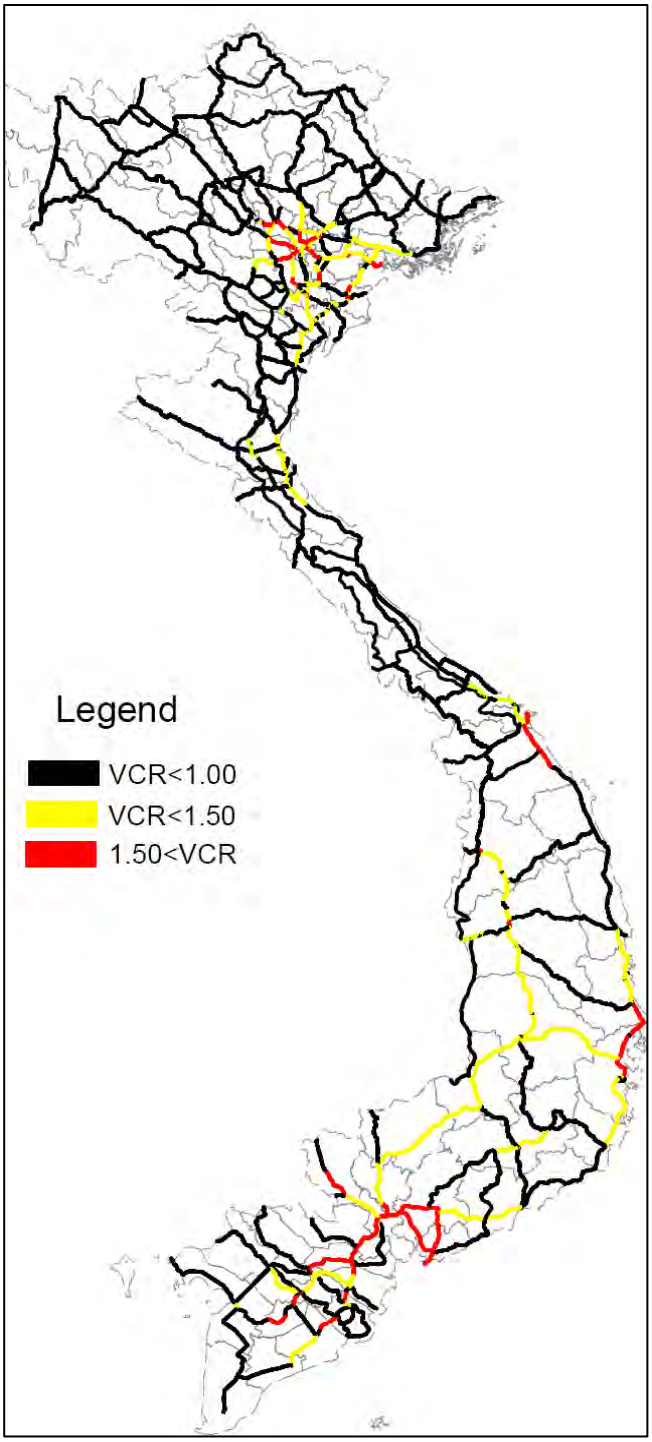
Source: VITRANSS 2 Study Team.

Figure 11.4.3 Traffic Distribution, 2030 (Do-maximum Scenario without HSR)



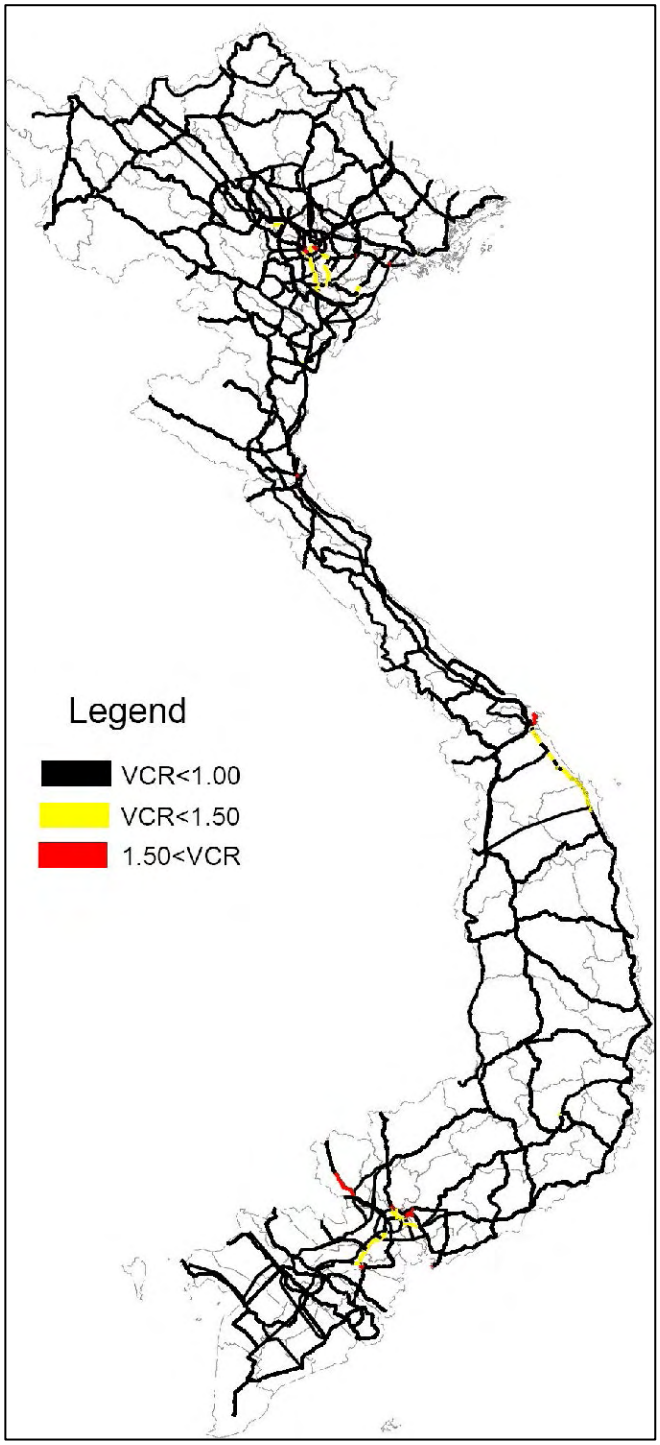
Source: VITRANSS 2 Study Team.

Figure 11.4.4 Volume–Capacity Ratio, 2030 (Do-nothing Scenario)



Source: VITRANSS 2 Study Team.

Figure 11.4.5 Volume–Capacity Ratio, 2030 (Do-maximum Scenario)



Source: VITRANSS 2 Study Team.

11.5 Preliminary Evaluation

1) Economic Evaluation

11.18 With the objective of reviewing the candidate expressway projects proposed in this chapter, economic evaluation was carried out under the following assumptions:

(i) Each project would be open for service by 2020;

(ii) Evaluation period is 30 years from 2020 to 2049;

(iii) Project cost was newly estimated by the VITRANSS 2 Study Team using the latest cost information, and assumed to be reimbursed 10% by 2016, 30% by 2017, 30% by 2018, and 30% by 2019;

(iv) Annual operating cost would be 5% of project cost;

(v) Toll was assumed at US 5 cents/pcu/km after comparison with selected countries;

(vi) Annual average growth rate of traffic would be 4.9% (the same as the overall growth of traffic by 2020─2030).

(vii) For further details, refer to Chapter 8. of this Report.

11.19 Economic benefit was taken from the savings from vehicle operating cost (VOC) and passenger time cost.

11.20 Results are presented in Table 11.5.1 and Figure 11.5.1. Some of the North-South Expressway sections and suburban sections around HCMC show EIRRs of more than 12%. This means that these sections are economically feasible. Other sections, including the HCM route sections, show lower EIRRs.

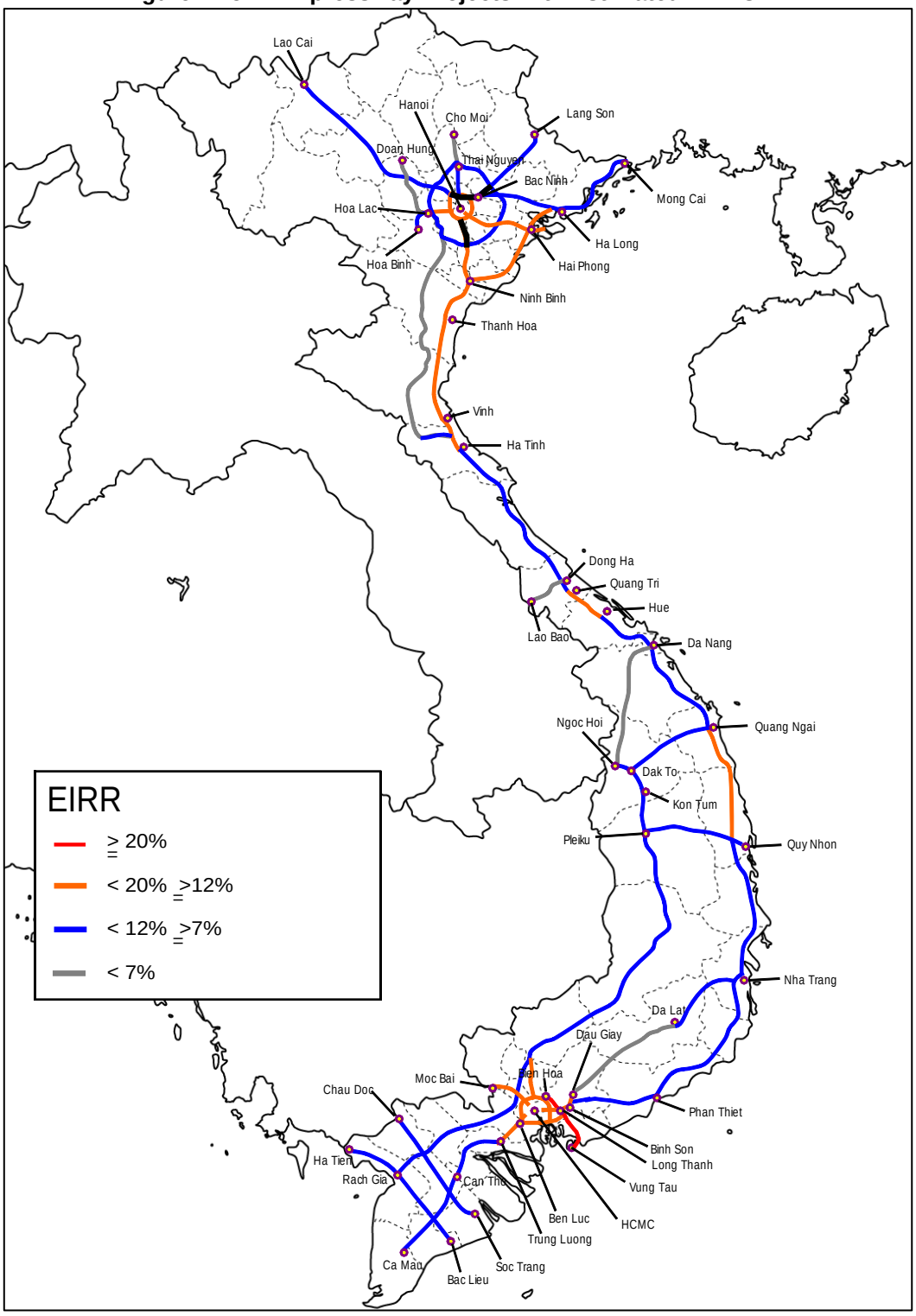
11.21 The conclusion is that the expressway development plan should be trimmed down into a less ambitious and more practical arrangement at least for the short to medium term up to 2020.

Table 11.5.1 Preliminary Economic Evaluation Results of MOT's Expressway Projects

Project Code	Section	Distance (km)	V/C Ratio	PCUs (000/day)	Benefit (USD 1000/day)			Benefit (USD 000/day/km)	Economic Cost (USD mil/km)	E-IRR (%)
					VOC	TTC	Total			
H01	Ninh Binh – Thanh Hoa	75	0.66	80.1	61.2	116.5	177.7	2.4	10.2	15.3
H02	Thanh Hoa – Vinh	140	0.47	57.2	0.6	169.2	169.8	1.2	14.1	12.1
H03	Vinh – Ha Tinh	20	0.56	45.7	1.2	30.5	31.6	1.6	9.3	17.0
H04	Ha Tinh – Quang Tri	277	0.47	38.3	7.3	143.2	150.5	0.5	8.8	9.9
H05	Quang Tri – Hue	73	0.51	41.2	4.8	56.2	61.0	0.8	9.1	12.5
H06	Hue – Da Nang	105	0.46	37.5	1.7	86.8	88.5	0.8	15.6	10.3
H07	Quang Ngai – Quy Nhon	150	0.44	35.6	5.4	142.9	148.3	1.0	11.0	10.3
H08	Quy Nhon – Nha Trang	240	0.45	36.4	6.2	156.6	162.8	0.7	13.1	8.9
H09	Nha Trang – Phan Thiet	280	0.29	23.7	22.0	100.2	122.2	0.4	9.6	8.0
H10	Long Thanh – Nhon Trach – Ben Luc	45	0.25	30.2	-24.4	124.4	100.1	2.2	15.2	15.9
H11	Doan Hung – Hoa Lac – Pho Chau	457	0.03	2.4	-34.6	260.5	225.9	0.5	9.8	6.3
H12	Ngoc Hoi – Chon Thanh – Rach Gia	864	0.20	16.0	-12.2	479.5	467.3	0.5	8.6	7.4
H13	Thai Nguyen – Cho Moi	28	0.18	14.7	1.6	10.7	12.3	0.4	8.5	5.8
H14	Hoa Lac – Hoa Binh	26	0.11	8.5	-2.2	13.9	11.7	0.4	7.6	7.3
H15	Bac Ninh – Ha Long	136	0.06	6.8	-25.8	140.1	114.2	0.8	11.1	8.9
H16	Ninh Binh–Hai Phong–Quang Ninh	160	0.15	11.8	-28.3	189.0	160.6	1.0	6.9	13.5
H17	Hong Linh – Huong Son	34	0.06	4.7	-3.0	19.9	17.0	0.5	8.3	7.4
H18	Cam Lo – Lao Bao	70	0.04	2.9	-4.5	30.3	25.8	0.4	9.3	4.9
H19	Quy Nhon – Pleiku	160	0.01	0.6	-35.8	146.8	111.0	0.7	9.4	8.9
H20	Dau Giay – Da Lat	189	0.20	16.0	10.9	69.9	80.7	0.4	9.2	5.2
H21	Bien Hoa – Vung Tau	76	0.61	74.8	38.5	319.5	358.0	4.7	8.5	24.4
H22	HCMC – Thu Dau Mot – Chon Thanh	69	0.36	44.3	-4.4	84.8	80.4	1.2	13.4	12.2
H23	HCMC – Moc Bai	55	0.46	37.1	-10.7	69.9	59.2	1.1	6.9	16.4
H24	Soc Trang – Can Tho – Chau Doc	200	0.04	3.6	-29.3	142.4	113.1	0.6	6.7	9.7
H25	Ha Tien – Rach Gia – Bac Lieu	225	0.03	2.1	-50.4	201.0	150.6	0.7	6.7	10.9
H26	Can Tho – Ca Mau	150	0.27	22.1	-28.3	159.2	131.0	0.9	10.9	9.3
H27	Quang Ngai – Dak To	170	0.00	0.1	-60.7	184.7	124.1	0.7	11.3	8.3
H28	Nha Trang – Da Lat	80	0.31	25.4	1.2	41.0	42.2	0.5	12.3	7.8
H29	Da Nang – Ngoc Hoi	250	0.16	13.3	-1.2	72.9	71.7	0.3	11.5	1.8
H30	Ring Road No.4 in Ha Noi	90	0.06	7.7	-38.4	298.3	259.9	2.9	13.9	14.5
H31	Ring Road No.5 in Ha Noi	320	0.09	10.4	-9.4	262.2	252.7	0.8	7.5	7.9
H32	Ring Road No.3 in HCMC	83	0.39	47.2	-13.8	187.3	173.5	2.1	13.7	13.7
CH01	Cau Gie – Ninh Binh	50	0.60	73.3	46.2	104.3	150.5	3.0	8.1	18.1
CH02	Da Nang – Quang Ngai	131	0.33	39.6	2.3	110.2	112.6	0.9	7.2	11.3
CH03	Phan Thiet – Dau Giiay	100	0.49	39.6	10.5	68.2	78.7	0.8	17.7	11.9
CH04	HCMC – Long Thanh – Dau Giay	55	0.92	74.9	61.6	224.2	285.8	5.2	18.2	15.5
CH05	HCMC- Trung Luong	40	0.84	67.8	22.4	167.4	189.7	4.7	17.5	15.1
CH06	Trung Luong – My Thuan – Can Tho	92	0.32	39.1	-15.3	120.3	105.0	1.1	15.2	11.3
CH07	Lang Son – Bac Giang – Bac Ninh	130	0.03	2.6	-42.1	164.9	122.8	0.9	8.4	11.8
CH08	Ha Noi – Hai Phong	105	0.41	33.7	-27.6	196.3	168.7	1.6	12.4	12.0
CH09	Ha Noi – Lao Cai	264	0.11	9.0	-32.0	208.9	176.9	0.7	4.2	11.7
CH10	Ha Noi – Thai Nguyen	62	0.23	18.7	-1.9	37.8	35.9	0.6	3.6	11.5
CH11	Lang – Hoa Lac	30	0.18	14.7	-18.6	109.5	90.9	3.0	13.5	15.0
CH12	Ha Long – Mong Cai	128	0.10	8.5	-9.0	88.3	79.4	0.6	9.1	8.0

Source: VITRANSS 2 Study Team.
Note: V/C ratio, PCUs and benefit are as of 2030. Urban traffic was taken into consideration for calculating EIRRs (see Chapter 8)

Figure 11.5.1 Expressway Projects with Estimated EIRRs



Source: VITRANSS 2 Study Team.

2) Financial Evaluation

11.22 Based on the same assumptions made in the economic evaluation, a financial analysis was conducted for the candidate expressway projects. Assumed toll rates for 2030 are USD 0.05, 0.15, and 0.145 per vehicle-kilometer for car, bus, and truck, respectively. These correspond to about 10% of the expected time cost savings of car and bus users. The toll rate of truck was assumed to be the same as that of bus. These rates vary

in proportion to the per-capita GRDP estimated for each year.

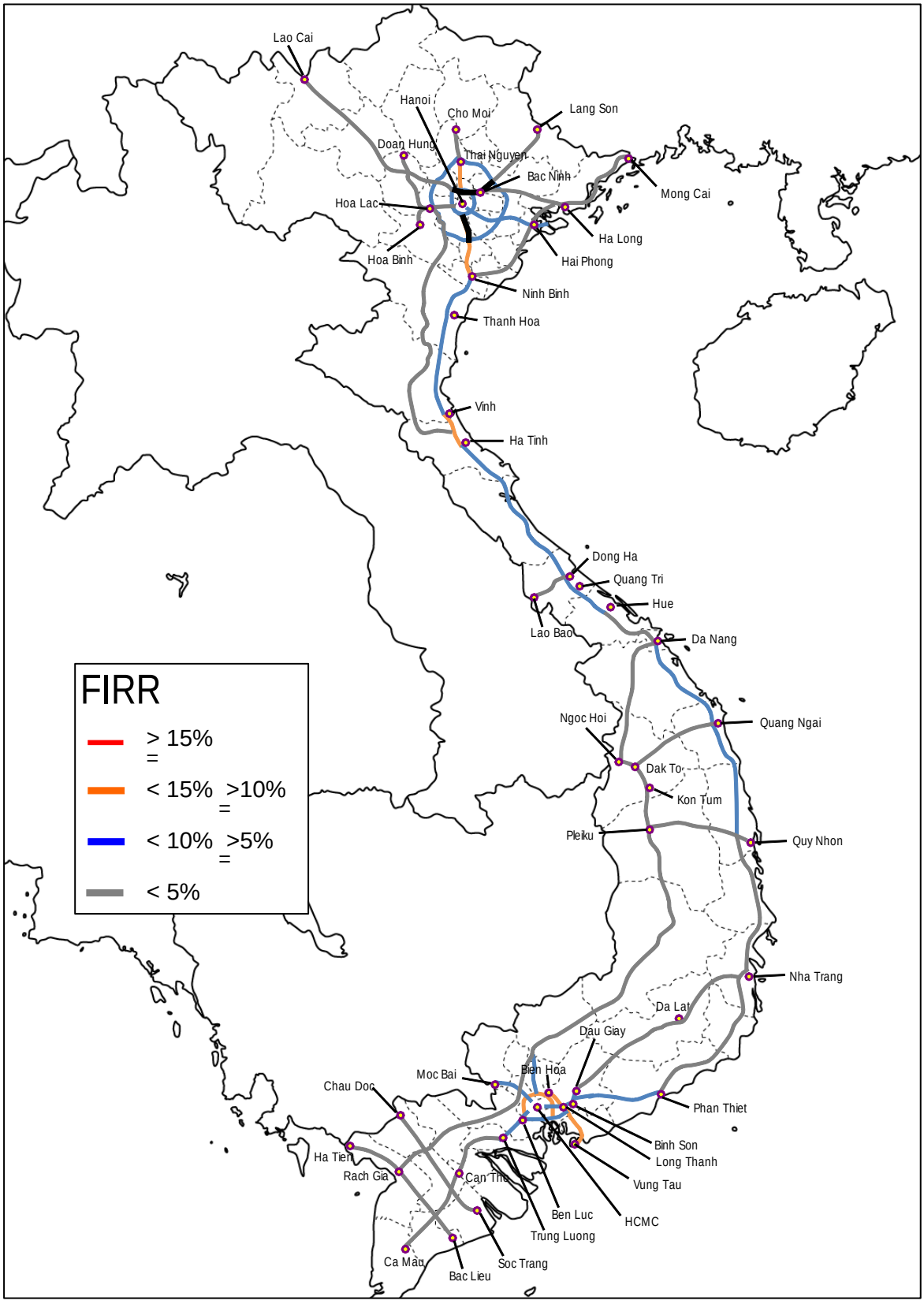
11.23 Results are presented in Table 11.5.2 and Figure 11.5.2. There is no project which shows an FIRR of more than 15%, suggesting the difficulty of BOT arrangements. However, there are many projects that could be implemented by PPP scheme, judging from the FIRRs calculated. This needs further investigation.

Table 11.5.2 Preliminary Financial Evaluation Results of MOT's Expressway Projects

Project Code	Section	Distance (km)	V/C Ratio	No of Vehicles			Project Cost (USD mil/km)	FIRR (%)
				Car	Bus	Truck		
H01	Ninh Binh – Thanh Hoa	75	0.66	8,984	104,241	25,554	11.0	8.3
H02	Thanh Hoa – Vinh	140	0.47	7,748	71,349	17,826	15.2	6.5
H03	Vinh – Ha Tinh	20	0.56	5,772	48,952	14,626	10.1	12.6
H04	Ha Tinh – Quang Tri	277	0.47	4,951	34,684	12,367	9.5	5.2
H05	Quang Tri – Hue	73	0.51	4,905	34,762	13,578	9.8	7.5
H06	Hue – Da Nang	105	0.46	5,038	41,315	11,847	16.9	3.5
H07	Quang Ngai – Quy Nhon	150	0.44	4,537	37,399	11,374	11.9	5.2
H08	Quy Nhon – Nha Trang	240	0.45	4,534	39,688	11,633	14.1	3.9
H09	Nha Trang – Phan Thiet	280	0.29	2,037	17,084	8,180	10.3	2.6
H10	Long Thanh – Nhon Trach – Ben Luc	45	0.25	9,230	109,519	5,354	16.4	5.4
H11	Doan Hung – Hoa Lac – Pho Chau	457	0.03	567	3,898	614	10.5	-
H12	Ngoc Hoi – Chon Thanh – Rach Gia	864	0.20	2,312	22,936	4,850	9.2	1.9
H13	Thai Nguyen – Cho Moi	28	0.18	1,206	16,113	4,955	9.2	1.9
H14	Hoa Lac – Hoa Binh	26	0.11	2,365	13,997	2,082	8.2	-0.6
H15	Bac Ninh – Ha Long	136	0.06	2,046	17,473	1,415	11.9	-2.9
H16	Ninh Binh–Hai Phong–Quang Ninh	160	0.15	2,768	30,044	2,790	7.4	1.0
H17	Hong Linh – Huong Son	34	0.06	1,112	12,070	1,121	8.9	-2.4
H18	Cam Lo – Lao Bao	70	0.04	686	7,446	691	10.0	-
H19	Quy Nhon – Pleiku	160	0.01	310	878	104	10.1	-
H20	Dau Giay – Da Lat	189	0.20	1,291	17,214	5,388	9.9	2.6
H21	Bien Hoa – Vung Tau	76	0.61	17,271	182,910	17,981	9.2	13.4
H22	HCMC – Thu Dau Mot – Chon Thanh	69	0.36	6,483	80,214	12,924	13.4	6.3
H23	HCMC – Moc Bai	55	0.46	9,218	84,862	8,810	7.5	8.2
H24	Soc Trang – Can Tho – Chau Doc	200	0.04	1,314	8,646	694	7.2	-3.2
H25	Ha Tien – Rach Gia – Bac Lieu	225	0.03	1,084	3,919	297	7.2	-
H26	Can Tho – Ca Mau	150	0.27	6,518	49,482	4,848	11.7	2.0
H27	Quang Ngai – Dak To	170	0.00	94	0	0	12.2	-
H28	Nha Trang – Da Lat	80	0.31	2,828	35,979	8,023	13.3	2.5
H29	Da Nang – Ngoc Hoi	250	0.16	2,064	14,507	4,085	12.4	-1.3
H30	Ring Road No.4 in Ha Noi	90	0.06	1,726	14,532	1,982	15.0	8.0
H31	Ring Road No.5 in Ha Noi	320	0.09	1,626	13,989	3,132	8.1	6.3
H32	Ring Road No.3 in HCMC	83	0.39	7,217	98,407	13,270	14.8	10.9
CH01	Cau Gie – Ninh Binh	50	0.60	9,197	105,584	22,729	9.0	12.6
CH02	Da Nang – Quang Ngai	131	0.33	5,272	43,861	12,535	8.0	8.0
CH03	Phan Thiet – Dau Giay	100	0.37	3,090	30,712	10,023	19.1	6.8
CH04	HCMC – Long Thanh – Dau Giay	55	0.92	11,473	155,016	21,085	20.2	8.8
CH05	HCMC- Trung Luong	40	0.84	14,575	174,812	16,481	19.4	8.6
CH06	Trung Luong – My Thuan – Can Tho	92	0.32	8,334	82,955	10,004	16.4	2.8
CH07	Lang Son – Bac Giang – Bac Ninh	130	0.03	1,378	5,887	312	9.0	-3.8
CH08	Ha Noi – Hai Phong	105	0.41	7,587	78,925	8,251	13.7	5.9
CH09	Ha Noi – Lao Cai	264	0.11	2,136	23,826	2,100	4.6	2.6
CH10	Ha Noi – Thai Nguyen	62	0.23	2,923	29,056	5,490	4.0	10.1
CH11	Lang – Hoa Lac	30	0.18	4,061	35,776	3,288	15.0	3.4
CH12	Ha Long – Mong Cai	128	0.10	1,761	12,755	2,347	9.8	0.5

Source: VITRANSS 2 Study Team.
Note: V/C ratio and number of vehicles are as of 2030. Urban traffic was taken into consideration for calculating FIRRs (see Chapter 8).

Figure 11.5.2 Expressway Projects with Estimated FIRRs



Source: VITRANSS 2 Study Team.

12 RECOMMENDATIONS

12.1 Recommendations for Subsectors (Preliminary)

1) Roads

12.1 The GRA should be made to grow into its intended role of becoming the road authority in Vietnam—by resolving its conflicts with VEC (with regard to overall network planning and determination of the scale of expressways) and MOC (with regard to inter-urban transportation development).

12.2 The regulatory function over toll roads should be taken out of VEC, so that the latter can focus on its main role as developer and partner of private investors in expressways.

12.3 Other key recommendations for the road subsector are the following:

(i) Institutionalize a Five-year Road Investment Program;

(ii) Create a project management bureau to formalize the status of PMUs and leverage the accumulated experiences of the staff;

(iii) Spin off the CIENCOs into joint-stock companies, one at a time, so that they can evolve into competitive civil works contractors, on arms-length relationship with the MOT and its associated agencies;

(iv) Study the possibility of merging the unit responsible for developing technical standards and that responsible for keeping the quality of construction into a “Road Technology Research and Development Institute”; and

(v) Formalize the system of using the road maintenance fund.

2) Railways

12.4 Railway projects should be given a higher proportion of resources out of the total transportation investment budget to enable it to compete with other transportation modes. However, the allocation should be limited to those corridors where railway is the more efficient energy- and cost-wise.

12.5 Instead of a shotgun approach of trying to cater to everybody, the railway sector should target market niches in which it has the best chance of becoming competitive line by railway line. Clearly, the North–South Line is the most important with potentials for container transportation. On the shorter Hanoi–Haiphong Line, massive investments may not be able to overturn its disadvantage to trucking and to buses, when the parallel expressway gets built.

12.6 VITRANSS 2 has identified a basic package of improvement works; just enough to keep existing railway assets functioning at a capacity of 50 trains for both directions a day. This can be further decomposed and prioritized to support the railway’s marketing plan. With additional funding, a second stage of railway improvements can be pursued, involving system rehabilitation and selective double tracking that will result in a step-increase in capacity and improved services. A third stage of system modernization will entail substantial technology upgrades and should be last in priority.

12.7 The HSR project is very capital-intensive and the development of a full section should be deferred beyond 2030. There are other lower-cost alternatives to improve the north–south linkage before then.

3) Ports and Shipping

12.8 The plans for the ports of Saigon, Danang, and Haiphong are under implementation. Hence, the focus should now shift to improving the connectivity of ports to roads, railways, and inland waterways. They are vital to the success or viability of the new deep-sea ports.

12.9 For example, the Lach Huyen Port complex will need a bridge (about 2.4-km long) to connect it to the mainland of Haiphong. In the south, an expressway must be provided in time for the full operation of Cai Mep–Thi Vai. The same can be said about channel dredging of the Soai Rap channel to coincide with the completion of terminals in Hiep Huoc Area, or the navigation channel to Lach Huyen. Linkages to the ports of Can Tho and My Thoi also require improvements, especially with the completion of the Quang Chanh Bo channel.

12.10 At the local level, every port area has to be planned and developed harmoniously with its surrounding communities. This can be realized through a multisectoral Port Management Board, which will be responsible for regulating and concessioning terminals, setting performance targets, maintaining harbors and common navigation channels, and providing ship traffic management around the ports.

12.11 The connectivity issue, compounded by changing trade patterns as a consequence of the global economic meltdown, warrants caution about the accelerated development of Lach Huyen Port. The rationale for developing the Van Pho Transshipment Port is even weaker, and may have become moot with the first call of a direct trans-Pacific vessel at Cai Mep Port.

12.12 Separating the ports development burden from the shipping business is recommended as a long-term direction for VINALINES. Common-user ports ought to be developed by Vinamarine, which has no shipping business to protect, and therefore impartial, in the use of berths at ports. Vinalines should concentrate on shipping and logistics.A special financing facility for domestic fleet expansion should be established and be made available to other shipping companies. This should lead to greater competition and efficiency in domestic shipping services.

12.13 The MOT and its maritime arm, VINAMARINE, have to step into the role of a “conductor” in an orchestra of diverse players. It needs to become an effective planning and regulatory body, leaving the rest of the tasks and burden to others. It can take the baton and enable a system of ports hierarchy to emerge. At the top of the hierarchy will be three international gateway ports, i.e., Cai Mep–Thi Vai, Haiphong, and Danang. More than 60% of the national capacity will be for the SFEZ, 30% for the NFEZ, and less than 10% for the CFEZ. Without the guiding hand of a Conductor, surplus capacities may coexist with shortages.

4) Inland Waterways

12.14 The subsector should make a fundamental shift in strategy. Instead of aspiring to do more, the IWT subsector should undertake a strategic retreat—by concentrating its limited resources on a core set of river corridors where it could be competitive and which it could defend and maintain adequately. The “retreat” will mean: (i) devolving responsibilities over most river ports to provinces, (ii) focusing on improving the road–river and river–seaport interfaces, (iii) leaving ferry and barge services to the private sector, and (iv) allocating its full resources on channel navigability. Instead of planning for a “do-maximum”

scenario, the subsector has to scale down its ambitions to where it can be most effective. A sustainable plan that it can adopt should entail investments of at least USD700 million but not exceeding USD1, 400 million over 10 years (from 2010–2020).

12.15 From the limited funds that it could get from the State budget, it should give highest priority to the maintenance of a core set of waterways. Rivers need to be desilted regularly, and its curvature protected, in accordance with the technical standards to which they have been classified. It is said that a 40% backlog in maintenance is occurring every year. Therefore, the subsector needs to recover lost ground by embarking on a major maintenance program in the next 10 years. In order to be effective, this needs to be empirically based, a product of regular and continuous river surveys.

12.16 To stabilize funding for waterway maintenance, the subsector should aim to establish a river maintenance fund. The National Assembly has recently approved the creation of a Road Maintenance Fund, but implementing details have yet to be formulated. The IWT should seek a share of this fund to the extent that the subsector also accounts for a large portion of the country's fuel consumption that would be subjected to levy. In addition, the subsector should harness the support of its primary customers, i.e., the industrial enterprises that locate along riverbanks and use the waterway as lifelines for their viability. With their support, two alternative sources of maintenance funds can be tapped: (i) annual fees on river fleet registration and inspection, and (ii) frontage tax on commercial and industrial properties along the rivers. The first would require a corollary improvement of the vessel registration system, while the second would need the support of local governments as it partakes of a land-use charge.

12.17 Next to asset maintenance, the safety of river navigation deserves priority. Safety can be boosted through an annual process of vessel inspection and registration, as well as a more rigorous pilot licensing and training program.

5) Aviation

12.18 Aside from building bigger terminals and/or more runways, the regional airport authorities should pursue system innovations, which require little investment to improve productivity (which results in higher throughput without new infrastructure).

12.19 It should adopt standards for airport development, including technical classification to guide planning and development of every airport in the national system, using ICAO and international best practices as templates.

12.20 The capital recovery mechanism should be reviewed and revised in the light of changes in the institutional setup. This is intended to improve the sector's financial sustainability. Also, a subsidy policy for "missionary routes" should be defined whereby an airline providing scheduled service at fares set by government below its production cost will receive a subsidy for the difference. Without the subsidy, the airline would cease to offer the service.

12.21 Caution must be exercised in the development of tourist-dependent airports, since traffic is seasonal and uncertain. The same caution should apply on a cargo hub airport (in Chu Lai) as its success hinges on the presence of large cargo volumes generated internally and on the entry of a global logistics player specializing in the business of air express delivery.

12.22 The subsector should reexamine its priorities and back this up with a realistic 10-

year capital investment program that takes into account the budget envelope. The inadequacy of investments and the need to upgrade its airports to international standards should prod the government into pursuing private sector participation (PSP). There is a window of opportunity in the development of a new passenger terminal in Noi Bai, a new cargo terminal in Noi Bai and in Tan Son Nhat, and the new Long Thanh International Airport. For the smooth development of Long Thanh, the Southern Airport Corporation (SAC) that manages TSN should be involved closely. A new joint-stock corporation with no experience in airport development has been tasked with development of Long Thanh. If SAC sees itself as being abolished or losing relevance once Long Thanh comes on-stream, it will likely be uncooperative in the transition.

6) Logistics

12.23 The most basic step to move up the country's status in logistics—from 1PL to 3PL level—is the upgrading of logistics competence. A wider appreciation of supply chain management in government and private circles is the key to subsequent reforms in policies and management practices. Organizing a public-private logistics forum, spearheaded by the freight forwarders' association, can trigger and push this agenda forward.

12.24 For its part, the government should proceed with the full-scale implementation of electronic data interchange (EDI) and paperless transaction system at Customs and border gates. The logistics industry will have no choice but to follow and adapt to this game-changing measure; then move farther up the ICT ladder into e-payments, B2B (business-to-business) transactions, and cargo visibility.

12.25 Thirdly, the government should consider amending its laws and regulations on foreign participation in logistics services. They are more restrictive than China's and will only delay the country's logistics development.

12.26 Lastly, the government should recalibrate its transportation infrastructure program by giving priority to the multimodal needs of its large—and growing—FDI enterprises. Containerization in shipping and railway should be promoted. As an added catalyst, it should establish two international logistics parks that are also multimodal transportation hubs: one in the northeast of Hanoi and the other between HCMC and Cai Mep–Thi Vai. Going beyond the traditional ICD concept, these proposed logistics parks shall encompass: (i) a free-trade zone for customs bonded warehouse operations, (ii) a product exchange and trade exhibition center, (iii) a railway container depot, (iv) a regional warehouse distribution center with cross-docking facility, and (v) advanced ICT-based logistics application systems.

12.2 Need for Further Technical Assistance

12.27 While VITRANSS 2 is unable to respond to all the important issues facing the transportation sector in Vietnam, areas that can be given possible technical assistance for further study have been identified as shown in Table 12.2.1. This tentative list will be further explained and elaborated based on subsequent discussions with relevant agencies.

Table 12.2.1 List of Possible Technical Assistance Projects

Sector	Title/ Description	Responsible Agency
1. General	• Transportation Sector Management Capacity Strengthening Projects: This intends to strengthen the transportation planning and management capacity of related subsector agencies. It will cover: (i) strategic planning, (ii) project identification and evaluation, (iii) project implementation.	• MOT and related subsector agencies
2. Roads and Road Transportation	• Road Maintenance and Asset Management Project: This intends to strengthen the road maintenance and asset management capacity of primary roads including expressways.	• MOT and GRA, VEC
3. Railway	• Project on Upgrading and Management Improvement of Existing Railways: This intends to formulate strategies and concrete steps to upgrade existing railways and improve management systems. Its main components are: (i) establishment of a method to assess the structural soundness of railway facilities and recovery systems, (ii) disaster prevention and recovery system, and (c) improvement of level crossings.	• VNR
	• Capacity Building for Railway-related Business Development: This intends to identify opportunities for various railway-related businesses and establish adequate mechanisms and management systems.	• VNR
	• Detailed Study for HSR: This intends to tackle the remaining issues of HSR, such as consistency with city planning, station location particularly in Hanoi and HCMC and operational requirement.	•
	• Hai Van Tunnel Development: This intends to study the feasibility of Hai Van tunnel both for HSR and existing VR line.	•
4. Maritime	• Port Management Strengthening Project: This intends to strengthen VINAMARINE's port management capacity. Its main components are: (i) establishment of a Port Management Body, (ii) establishment of design evaluation systems, (iii) formulation of port facilities ledgers, and (iv) revision of the maritime code.	• VINAMARINE, model sea ports
	• Van Phong Port Development:: This is a feasibility study of Van Phong Transhipment port focusing on its future potential in comparison with other port projects of the region.	•
5. Inland Waterway	• Comprehensive Inland Waterway Transportation Development and Management Plan for the Red River and Mekong River Deltas: This intends to formulate a comprehensive inland waterway network development and management plan for the two deltas	• MOT/ VINA, related Provinces
6. Aviation	• Aviation Subsector Capacity-development Projects; Its main components are: (i) enhancement of the English proficiency of pilots and air traffic controllers, (ii) enhancement of business capacity to enable Vietnamese airports to be managed commercially, and (iii) development of environmental management capacity, especially for aircraft noise monitoring and aircraft emissions.	• CAAV, VANSCORP, Airport Corporations, Airlines
7. Multimodal Transportation	• Multimodal Transportation Development Project: Its main components are: (i) institutional/ regulatory framework development, (ii) FS on the development of logistics parks in NFEZ and SFEZ, and at cross-border gateways.	• MOT. VNR
8. Transportation Environment	• Urban Transportation Air Pollution Control Plan: This intends to formulate a comprehensive, integrated plan to reduce air pollution from mobile sources in major urban areas. Its main components are: (i) policy formulation, (ii) database building and management, (iii) awareness raising, (iv) capacity building, and (v) equipment support.	• MOT, Hanoi PC, HCMC PC, Others

Source: VITTRANSS 2 Study Team.

APPENDIX 8A

Long List of Transportation Projects

APPENDIX 8A

Long List of Transportation Projects

Table 8A-1 Major Ongoing/Committed Transportation Projects (Fund source is already settled)

Subsector	Project			Original Schedule	Implementing Agency	Total Project Cost (USD mil.)	Fund Source
1. Road	Construction of new expressway	CH01	Cau Gie – Ninh Binh Expressway (50km)	06-10	• VEC	452.4	• SB • CB
		CH02	Da Nang – Quang Ngai Expressway (131km)	-20	• MOT	1048.2	• WB
		CH03	Phan Thiet – Dau Giay Expressway (100km)	-15	• BITEXCO	1003.8	• BOT[1)]
		CH04	HCMC – Long Thanh – Dau Giay Expressway (55km)	08-12	• VEC	1110.8	• ADB • JBIC
		CH05	HCMC- Trung Luong Expressway (40km)	04-09	• MOT	776.5	• GOV • SB
		CH06	Trung Luong – My Thuan – Can Tho Expressway (92km)	-10	• BIDV (BEDC)	1510.0	• BOT[1)]
		CH07	Lang Son – Bac Giang – Bac Ninh Expressway (130km)	11-14	• VEC	1176.3	• [1)]
		CH08	Ha Noi – Hai Phong Expressway (105km)	08-11	• BOT company	1441.2	• Local BOT
		CH09	Ha Noi – Lao Cai Expressway (264km)	09-12	• VEC	1218.7	• ADB • GOV
		CH10	Ha Noi – Thai Nguyen Expressway (62km)	05-10	• MOT	248.2	• JBIC
		CH11	Lang – Hoa Lac Expressway (30km)	06-09	• BT Company	450.0	• BT
		CH12	Ha Long – Mong Cai Expressway (128km)	12-15	• VEC	1254.7	• [1)]
	Construction of new road	CH13	Can Tho Bridge Construction	02-09	• MOT	284.8	• JBIC
		CH14	Border Ring No1 Construction (Hai Giang - Lao Cai) (151km)	00-10	• MOT	300.4	• GOV
		CH15	Border Ring No2 Construction (Northern Part)	01-08	• MOT	17.2	• SC • GOV
		CH16	Border Ring No2 Construction (Northwest Part, Pho Rang - Minh Thang) (160km)	04-09	• MOT	140.9	• GOV
		CH17	Border Ring No3 Construction	02-07	• MOT	30.1	• GOV
		CH18	Linh Dam Bridge Construction (NH15, Ha Tinh)(2 lane)	08-10	• VRA	13.6	• GOV
		CH19	Ong Bo Bridge Construction (NH1A, Quang Nam)(2 lane,108m)	02-09	• VRA	1.4	• GOV
		CH20	Huong Anh bridge Construction (NH1A, Quang Nam)(4lane, 250m)	08-10	• VRA	8.4	• GOV
		CH21	Dinh Vu Bridge Construction (Hai Phong)	-	• N/A	200.0	• N/A
		CH22	Vinh Thinh Bridge Construction (Ha Tay)	-	• N/A	80.0	• N/A
		CH23	45 Rural Traffic Bridges in Central and Central Highland Provinces	01-10	• VRA	32.8	• ODA
		CH24	Ben Thuy II bridge Construction (NH1&NH8B, Nghe An-Ha Tinh) (2lane, 1km)	09-11	• VRA	74.1	• Gov(Bond)
		CH25	Dong Nai bridge Construction	08-09	• VRA	121.8	• BOT company
		CH26	Cau Phung Bridge Construction (NH32)	05-10	• VRA	18.6	• Gov(Bond)
		CH27	Border Ring Road No 1 Construction (Ha Giang – Lao Cai)	10-	• VRA	67.8	• Gov(Bond)

Subsector	Project			Original Schedule	Implementing Agency	Total Project Cost (USD mil.)	Fund Source
			(151km)				
		CH28	NH279 Construction (Tuyen Quang – Bac Can) (94.5km)	07-10	• VRA	67.3	• Gov(Bond)
	Construction of bypass	CH29	NH1A Bypass (Thanh Hoa) (10km)	-	• VRA	38.3	• BOT company
		CH30	NH1A Bypass (Dong Hoi, Quang Binh) (19.3km)	-	• VRA	38.6	• BOT company
		CH31	NH1A Bypass (Ha Tinh) (16.3km)	-	• VRA	20.8	• BOT company
		CH32	NH1A Bypass (Phan Rang, Ninh Thuan) (8.3km)	-	• VRA	32.2	• BOT company
		CH33	NH2 Bypass (Vinh Yen (Vinh Yen – Vinh Phuc)) (10.6km)	08-10	• VRA	36.2	• BOT company
	Improvement of road/bridge	CH34	NH 25 Upgrading (Le Bac Bridge - To No pass) (11.5km)	07-09	• VRA	4.6	• GOV
		CH35	Mekong Delta River Infrastructure Development (NH53,N54,NH91 & PHs; WB5)	07-13	• VRA	119.5	• ODA
		CH36	NH 1 Widening (Dong Ha - Quang Tri)	-	• VRA	31.5	• BOT company
		CH37	Highway Rehabilitation Project III (NH1, Can Tho - Nam Can) (288km)	03-10	• MOT	186.0	• WB
		CH38	Bridge Rehabilitation Project - Phase III (NH1)	06-10	• MOT	84.9	• JBIC
		CH39	NH2 Upgrading (Noi Bai - Vinh Yen) (22km)	05-09	• Song Da BOT	66.8	• GOV • BOT
		CH40	NH10 Upgrading (Tan De bridge - La Uyen bridge) (5.5km)	08-10	• BOT	25.5	• BOT
		CH41	East-West Corridor Improvement (NH12A) (182.3km)	00-08	• MOT	98.9	• GOV
		CH42	NH 21B & NH21 Upgrading (Hanoi) (76km)	-	• MOT • BOT	44.2	• GOV • BOT
		CH43	Ho Chi Minh Highway Phase 2 Upgrading (Pac Bo - Dat Mui excluding Hoa Lac - Ngoc Hoi) (2,072km)	07-10	• MOT	1591.1	• GOV
		CH44	Rehabilitation Project (NH19, NH20, NH26, NH27, NH28)	03-08	• MOT	85.4	• GOV • SC
		CH45	NH 2 Improvement (Hanoi - Ha Giang) (261km)	02-09	• MOT	107.2	• GOV
		CH46	NH 3 Improvement (Hanoi - Cao Bang) (310km)	03-10	• MOT	155.3	• GOV
		CH47	NH 6 Improvement Phase 2 (Son La - Dien Bien)	04-09	• MOT	68.9	• GOV
		CH48	NH 32 Improvement (Hanoi - Lai Chau) (358km)	02-09	• MOT	178.8	• GOV
		CH49	NH 50 Improvement (HCMC - My Tho) (88km)	06-10	• MOT	148.8	• GOV
		CH50	NH 80 Improvement (My Thuan - Vam Cong) (50km)	03-09	• MOT	35.2	• GOV
		CH51	NH 60 road and bridges Improvement	00-05	• MOT	168.5	• GOV • BOT • SC
		CH52	NH 61 Improvement (Can Tho - Kien Giang)	03-06	• MOT	23.8	• GOV
		CH53	NH22B Improvement (Go Dau - Xa Ma) (73km)	03-08	• MOT	23.9	• GOV
		CH54	Secondary Road Network rehabilitation Program	02-07	• MOT	664.4	• JBIC • WB • ADB • SC

Subsector	Project			Original Schedule	Implementing Agency	Total Project Cost (USD mil.)	Fund Source
		CH55	Tertiary Road Improvement Project	02-08	• MOT	201.9	• ADB • WB
		CH56	Rural Road Projects improvement III (2,500km)	07-12	• MOT	155.6	• WB
		CH57	Improvement of Rural Bridges in Central Coast & Central Highland Provinces	01-08	• MOT	32.3	• JBIC
		CH58	Other Roads and Bridges Improvement	-	• MOT	202.0	• GOV
		CH59	NH1 Upgrading (My Thuan - Can Tho) (38.4km)	07-09	• VRA	108.4	• Gov
		CH60	Thang Long Bridge Surface Repair	08-09	• VRA	3.5	• Gov
		CH61	Road Network Improvement and Upgrading of (WB4) (Improvement component) (629km)	04-09	• VRA	310.5	• WB
		CH62	Road Network Improvement and Upgrading (WB4) (maintenance and institutional improvement component)	05-09	• VRA	112.5	• WB
		CH63	NH 1 Rehabilitation (Phase 3)	07-09	• VRA	87.4	• JICA
		CH64	Rural Traffic Project No.3 (3150km)	07-12	• VRA	155.6	• WB, UK
		CH65	Rehabilitation of Weak bridges (140 bridges) ((Phase 1)	05-09	• VRA	98.1	• JICA
		CH66	Southern Coastal Corridor Upgrading (NH80 & NH63) (225km)	09-14	• VRA	290.9	• EDCF
		CH67	NH6 Upgrading (Tuan Giao – Lai Chau) (96km)	10-	• VRA	138.8	• Gov(Bond)
		CH68	NH 27 Upgrading (98km)	05-11	• VRA	56.9	• Gov(Bond)
		CH69	NH 32 Upgrading (Vach Kim – Binh Luu) (72km)	04-08	• VRA	33.8	• Gov(Bond)
		CH70	NH 32 Upgrading (Dien – Nhon) (7km)	05-08	• VRA	57.7	• Gov(Bond)
		CH71	NH 91 Upgrading (Chau Doc-Tinh Bien) (27.3km)	09-after 10	• VRA	55.7	• Gov(Bond)
		CH72	Storm No.5 Recovery Projects on NH6 (Hoa Binh – Son La)	-09	• VRA	4.6	• Gov(Bond)
		CH73	NH 279 Upgrading (Ttan Son – Than Muoi, Dong Mo – Tu Don) (43km)	05-10	• VRA	14.8	• Gov(Bond)
		CH74	NH3B Upgrading (Xuat Hoa-Po Ma) (60km)	09-12	• VRA	79.8	• Gov(Bond)
		CH75	Weak Bridge Rehabilitation Project (Stage 2: 83 bridges)	10-	• VRA	207.5	• Gov(Bond)
		CH76	NH 31 Upgrading (Huu San – ban Chat) (61km)	-09	• VRA	59.4	• Gov(Bond)
		CH77	NH53 (not including Km56-Km60 and Km130-Km139 in WBS project) (121km)	09-11	• VRA	81.1	• Gov(Bond)
		CH78	NH8A Upgrading (Ha Tinh) (37km)	09-11	• VRA	69.2	• Gov(Bond)
		CH79	NH24 Upgrading (Pho Phong – Quang Ngai) (8km)	10-	• VRA	23.3	• Gov(Bond)
		CH80	NH24 Upgrading (Pho Phong – Kon Tum) (160km)	10-	• VRA	294.1	• Gov(Bond)
		CH81	NH25 Upgrading (Phu Yen – Gia Lai)(160km)	10-	• VRA	294.1	• Gov(Bond)
		CH82	NH15 Upgrading (Mai Chau - Hoi Xuan) (109km)	10-	• VRA	117.6	• Gov(Bond)
		CH83	NH1A Upgrading (Hoa Cam –	07-09	• VRA	32.8	• BOT company

Subsector	Project			Original Schedule	Implementing Agency	Total Project Cost (USD mil.)	Fund Source
			Hoa Phuoc, Danang) (8.4km)				
		CH84	NH20 and Other Sections Repairment and Upgrading (268km)	10-	• VRA	16.6	• BOT company
	Improvement of Traffic Safety	CH85	Road Safety Improvement Program	06-09	• NRSC	33.4	• WB
		CH86	Northern Vietnam National Roads Traffic Safety Improvement Project (NH 3, NH 5, NH 10, NH 18)	09-13	• VRA	60.7	• JICA
		CH87	Railway and Road Safety Traffic System Building	09-12	• VRA	41.7	• Gov(Bond)
					Subtotal	20,762	
2. Railway	Improvement of exisiting line for capacity expansion	CR01	Improvement & Upgrading in North-South Railway Line	07-20	• VNR	965.4	• ODA • GOV
		CR02	Improvement in Railway Routes in the North	01-20	• VNR	291.6	• ODA • GOV
	Construction of new line	CR03	Yen Vien-Pha Lai Railway Line	04-10	• VNRA	118.4	• GOV
		CR04	Ha Long- Cai Lan Raiway Line	04-10	• VNRA	58.9	• GOV
		CR05	Railway line from Chua Ve to DAP factory-Dinh Vu (Hai Phong)	07-10	• VNR	67.7	• GOV
					Subtotal	1,502.1	
3. Ports & Shipping	Expansion and upgrading of port functions	CP01	Cam Pha Seaport Channel Development	08-09	• VINAMARINE	7.0	• GOV
		CP02	Hon Gai Seaport (Cai Lan) Terminal Development (Committed Stage)	08-11	• Cai Lan International Container Terminal Company	120.0	• Cai Lan Port JSC (VINALINES Group) • SSA Holdings International Vietnam
		CP03	Hai Phong Seaport (Dinh Vu) Channel & Terminal Development	-10	• VINAMARINE • VINALINES • Vietnam Petroleum Transport JSC	411.0	• GOV • VINALINES • Pha Rung Shipbuilding Company (VINASHIN Group) • AP Moller Maersk A/S • VIPCO Vietnam • Petroleum Transport JSC (Petrolimex Group)
		CP04	Nghi Son Seaport Channel & Terminal Development		• VINAMARINE • Petrovietnam • Vietnam Electricity	24.0	• GOV • Petrovietnam • JICA • Cong Thanh Cement • Thanh Hoa Cement
		CP05	Cua Lo Seaport Channel Development (Committed Stage)	-10	• VINAMARINE	4.0	• GOV
		CP06	Vung Ang Seaport Terminal Development (Committed Stage)		-	40.0	• Formosa Plastic Group • Sun Steel Co. • TaTaSteel Global Holding Pte Ltd. • Vietnam Steel Corp. • Vietnam Cement Industries Corporation
		CP07	Dung Quat Seaport Terminal Development (Committed Stage)	-10	• Gemadept • Petrovietnam	41.0	• Gemadept • Petrovietnam
		CP08	Quy Nhon Seaport Channel & Terminal Development (Committed Stage)	-10	• VINAMARINE • Gemadept	74.0	• GOV • Gemadept

Subsector	Project			Original Schedule	Implementing Agency	Total Project Cost (USD mil.)	Fund Source
		CP09	Van Phong Seaport Terminal Development (Stage 1)		• VINALINES	190.0	• VINALINES, N/A
		CP10	Ba Ngoi Seaport (Cam Ranh) Terminal Development (Stage 1A)	-10	• VINALINES	88.0	• VINALINES
		CP11	Vung Tau Seaport (Cai Mep - Thi Vai) Channel and Terminal Development (Stage 1)	-11	• MOT • VINAMARINE • SP-PSA International Port Co., Ltd. • Cai Mep International Terminal Co., Ltd. • SP-SSA International Container Services JVC Saigon International Terminal Vietnam Ltd. • Saigon New Port Company	1675.0	• GOV • JICA • Saigon Port (VINALINES Group) • PSA Vietnam Pte Ltd. • VINALINES • AP Moller - Maersk A/S • SSA Holdings International Vietnam • Saigon Investment Construction & Commerce Co., Ltd. • Hutchison Ports Mekong Investment S.A.R.L • Saigon New Port
		CP12	Ho Chi Minh Seaport (Hiep Phuoc) Channel & Terminal Development (Stage1)	-09	• VINAMARINE • Saigon Premier Container Terminal Ltd.	204.0	• Tan Tuan Industrial Promotion Company • DP World
		CP13	Quan Chanh Bo Channel Development	-10	• VINAMARINE	198.0	• GOV
					Subtotal	3076.0	
4. Inland Waterway	Waterway Improvement	CW01	Upgrading of Northern Trans Mekong coriddor (to Class III)(253km)	-15	• VIWA	99.3	• WB • Vietnam
		CW02	Updating of Southern coastal coriddor (to Class III) (153km)	-15	• VIWA		
		CW03	Upgrading of the feeder canals in Mekong Delta region (to Class IV) (58km)	-15	• VIWA	8.5	• WB • Australia
		CW04	Upgrading of the east-west northern corridor in the northern delat regeion (to Class II)(Viet Tri - Quang Ninh) (280km)	-15	• VIWA	59.8	• WB • Vietnam
		CW05	Upgrading of the north-south western corridor in the northern delta region (to Class I) (295km)	-15	• VIWA	6.5	
		CW06	Improvement to Ninh Co River Estuary	-15	• VIWA	63.7 including CW07)	• WB • Vietnam
		CW07	Inter-connecting canal between the Day and Ninh Co River	-15	• VIWA	63.7 including CW06)	
		CW08	Improvement of Sai Gon-DongThap-Long Xuyen Route		• VIWA	4.4	• Vietnam
		CW09	Improvement of Thi-Vai-Nuoc ManCanal Route		• VIWA	3.1	• Vietnam
	Improvement of river port	CW10	Improvement of Viet Tri Port	-15	• VIWA	4.3	• WB • Vietnam
		CW11	Improvement of Ninh Phuc Port	-15	• VIWA	2.8	
		CW12	Demonstration investment for provincial port facilities in Mikong Delta region	-15	• VIWA	-	
	Landing Stages Improvement	CW13	Invesgtment of small ferry boats stages	-15	• VIWA	4.6	• WB • Vietnam
	Institutional improvement	CW14	Institutional development concerned with Mekong Delta In-	-15	• MOT VIWA	1.6	• WB

Subsector	Project			Original Schedule	Implementing Agency	Total Project Cost (USD mil.)	Fund Source
			land waterways				
		CW15	Institutional development concerned with Northern delta Region Inland waterways	-15	• MOT • VIWA	5.1	• WB
	Maintenance	CW16	Pilot maintenance project	-15	• VIWA	1.0	• WB
					Subtotal	264.6	
5. Aviation	Construction of new airport	CA01	Phu Quoc Island Airport	08-10	• SAC	56.0	• GOV
	Capacity Expansion of existing airport	CA02	Terminal Construction at Danang International Airport	08-11	• MAC	84.0	• GOV
		CA03	T2 Terminal Construction at Noi Bai International Airport	09-10	• NAC	800.0	• GOV
		CA04	Cargo Terminal Expansion at Noi Bai International Airport	09-12	• NAC	20.0	• GOV
		CA05	Runway upgrading and terminal Construction at Can Tho Airport	05-09	• SAC	23.0	• GOV
		CA06	Runway Extension and Apron Expansion at Danang International Airport	08-15	• MAC	75.0	• GOV, MAC, Private
		CA07	Passenger Terminal Expansion at Danang Internaitional Airport	15-25	• MAC	100.0	• GOV, MAC, Private
	Improvement of navigation facility	CA09	Control Tower Construction at Noi Bai International Airport	09-10	• VANSCORP	100.0	• GOV
		CA10	Terminal Building and Control Tower Construction at Cam Ranh Airport	07-09	• MAC	12.5	• GOV
					Subtotal	1320.5	
Total						26,925.2	

Note: 1) Through the discussion with MOT, it was decided to add the following 4 projects to the list because of the maturity for implementation: CH03 Phan Thiet - Gia Ray, which WB selected as one of the priority projects, CH06 Trun Luong – My Thuan – Can Tho, for which BOT by VIDB is expected for Trung Luong – My Thuan section and FS review is requested to JICA for My Thuan – Can Tho section, and CH 07 Lang Son – Bac Giang – Bac Ninh & CH12 Ha Long – Mong Cai, for which TAs for reviewing F/S and D/D are committed by ADB.

2) Regarding to IWT projects, CW01, CW02, CW03, CW08, CW09, CW12, CW14 and CW15 are the components of WB project which is "Development of Transport Infrastructure of the Mekong Delta" . On the other hand, CW04 CW05, CW06, CW07, CW10, CW11, CW13 and CW16 are the components of "Development of Transport in the Northern Delta Region".

3) Compiled by the VITRANSS 2 Study Team.

Table 8A-2 Proposed Transportation Projects

Subsector		Proj. No.	Project Title	Project Description	Proj.Cost (USD mil.)
1. Road	Construc-tion of new express-way	H01	Ninh Binh – Thanh Hoa Ex-pressway (75km)	A part of North-South expressway in the East. (75km, 6 lane)	827.6
		H02	Thanh Hoa – Vinh Expressway (140km)	A part of North-South expressway in the East. (140km, 6 lane)	2,128.0
		H03	Vinh – Ha Tinh Expressway (20km)	A part of North-South expressway in the East. (20 km, 4-6 lane)	201.5
		H04	Ha Tinh – Quang Tri Expressway (277km)	A part of North-South expressway in the East. (277km, 4 lane)	2,641.2
		H05	Quang Tri – Hue Expressway (73km)	A part of North-South expressway in the East, also a part of East-West corrider of GMS corrider network.(73km, 4 lane)	711.9
		H06	Hue – Da Nang Expressway (105km)	A part of North-South expressway in the East, also a part of East-West corrider of GMS corrider network. (105km, 4 lane)	1,778.0
		H07	Quang Ngai – Quy Nhon Ex-pressway (150km)	A part of North-South expressway in the East. (150km, 4 lane)	1,787.8
		H08	Quy Nhon – Nha Trang Ex-pressway (240km)	A part of North-South expressway in the East. (240km, 4 lane)	3,390.1
		H09	Nha Trang – Phan Thiet Ex-pressway (280km)	A part of North-South expressway in the East. (280km, 4-6 lane)	2,890.3
		H10	Long Thanh – Nhon Trach – Ben Luc Expressway (45km)	A part of North-South expressway in the East. (45km, 6-8 lane)	738.6
		H11	Doan Hung – Hoa Lac – Pho Chau Expressway (457km)	A part of North-South expressway in the West. (457km, 4-6 lane)	4,813.1
		H12	Ngoc Hoi – Chon Thanh – Rach Gia Expressway (864km)	A part of North-South expressway in the West. (864km, 4-6 lane)	7,974.4
		H13	Thai Nguyen – Cho Moi Ex-pressway (28km)	Expressway in Northern Region. (28km, 4-6 lane)	256.9
		H14	Hoa Lac – Hoa Binh Expressway (26km)	Expressway in Northern Region. (26km, 4-6 lane)	214.0
		H15	Bac Ninh – Ha Long Expressway (136km)	Expressway in Northern Region connecting with Ha Noi City and World Heritage. (136km, 6 lane)	1,618.8
		H16	Ninh Binh – Hai Phong – Quang Ninh Expressway (160km)	Expressway in Northern Region connecting with Hai Phong Port. (160km, 4 lane)	1,189.4
		H17	Hong Linh – Huong Son Ex-pressway (34km)	Expressway in Central Region connecting with coastal area and mountain area. (34km, 4 lane)	302.0
		H18	Cam Lo – Lao Bao Expressway (70km)	Eexpressway in Central Region, also a part of East-West corrider of GMS corrider network. (70km, 4 lane)	699.1
		H19	Quy Nhon – Pleiku Expressway (160km)	Expressway in Central Region connecting with North-South expressways. (160km, 4 lane)	1,615.1
		H20	Dau Giay – Da Lat Expressway (189km)	Expressway in Southern Region. (189km, 4 lane)	1,871.0
		H21	Bien Hoa – Vung Tau Express-way (76km)	Expressway in Southern Region connecting with Vung Tau Port. (76km, 6 lane)	696.5
		H22	HCMC – Thu Dau Mot – Chon Thanh Expressway (69km)	Expressway in Southern Region. (69km, 6-8 lane)	996.3
		H23	HCMC – Moc Bai Expressway (55km)	Expressway in Southern Region. (55km, 4-6 lane)	410.5
		H24	Soc Trang – Can Tho – Chau Doc Expressway (200km)	Expressway in Southern Region. (200km, 4 lane)	1,439.6
		H25	Ha Tien – Rach Gia – Bac Lieu Expressway (225km)	Expressway in Southern Region. (225km, 4 lane)	1,619.5
		H26	Can Tho – Ca Mau Expressway (150km)	Expressway in Southern Region. Lenth is (150km, 4 lane)	1,755.7
		H27	Quang Ngai – Dak To Express-way (170km)	Expressway in Central Region. (170km, 4 lane)	2,073.6
		H28	Nha Trang – Da Lat Expressway (80km)	Expressway in Southern Region. (80km, 4 lane)	1,062.5

Subsector		Proj. No.	Project Title	Project Description	Proj.Cost (USD mil.)
		H29	Da Nang – Ngoc Hoi Expressway (250km)	Expressway in Central Region. (250km, 4 lane)	3,094.2
		H30	Ring Road No.4 in Ha Noi (90km)	Ring road system in Hanoi. (90km, 4-6 lane)	1,350.5
		H31	Ring Road No.5 in Ha Noi (320km)	Ring road system in Hanoi. (320km, 6 lane)	2,583.2
		H32	Ring Road No.3 in HCMC (83km)	Ring road system in HCMC. (83km, 6-8 lane)	1,226.9
	Construc-tion of new road	H33	Economic axle-road Construction (24km)	New road in Dan Phuong - Phuc Tho - Son Tay section in Ha Tay Prov-ince. (24km).	82.8
		H34	Do Xa - Quan Son Highway Con-struction (30km)	New road in Do Xa - Quan Son section in Ha Tay Province. (30km, 4lane)	103.5
		H35	NH1A (Chi Lang - Bac Giang) Construction (Pho Gio)) (40km)	New road in Chi Lang - Bac Giang (Pho Gio) section. (40km, 4lane)	182.1
		H36	NH21 Construction (Phu Ly – Nam Dinh) (25km)	New Class-I road from Liem Tuyen intersection. (25kmm 4lane).	86.2
		H37	Vam Cong Bridge Construction (An Giang&Can Tho)	New bridge on HCM Highway.	316.0
		H38	Cao Lanh Bridge Construction (Dong Thap)	New bridge on HCM Highway.	236.0
		H39	New Coastal Road Construction (100km)	Roads along coastal area in Northern Vietnam, mainly in Thanh Hoa Prov-ince. (100km)	344.8
		H40	NH20 Extension(Da Lat – Nha Trang) (85km)	New road in NH20 (85km, 4 lane)	476.6
		H41	Hau River Bridge Construction (NH60, Soc Trang) (4lane)	New bridge on NH60 (4 lane).	500.0
		H42	Van Tien Bridge Construction (Quang Ninh)(1341m)	New bridge in Van Don, Quang Ninh Province. (Cable stayed, 1341m in length and 18m in width.)	200.0
		H43	NH47 Construction (Sam Son – Thanh Hoa City) (5km)	New road in NH47, Sam Son- Thanh Hoa city section. (5km, 4 lane)	17.2
		H44	NH14E Extension(Ha Lam along PR 613 – Binh Duong) (21.2km)	New road for the extension of NH14E. (21.2km)	47.0
		H45	Road Access to Cam Pha Port	To develop an access road connecting Cam Pha and expressway network	20.0
		H46	Road Access to Hon Gai Port	To develop an access road connecting Hon Gai and expressway network	20.0
		H47	Road Access to Hai Phong Port	To develop an access road connecting Hai Phong and expressway network	20.0
		H48	Road Access to Nghi Son Port	To develop an access road connecting Nghi Son and expressway network	30.0
		H49	Road Access to Cua Lo Port	To develop an access road connecting Cua Lo and expressway network	24.0
		H50	Road Access to Vung Ang Port	To develop an access road connecting Vung Ang and expressway network	30.0
		H51	Road Access to Quy Nhon Port	To develop an access road connecting Quy Nhon and expressway network	32.0
		H52	Road Access to Van Phong Port	To develop an access road connecting Van Phong and expressway net-work	26.0
		H53	Road Access to Nha Trang Port	To develop an access road connecting Nha Trang and expressway network	36.0
		H54	Road Access to Vung Tau Port	To develop an access road connecting Vung Tau and expressway network	20.0
		H55	Road Access to Sai Gon Port	To develop an access road connecting Sai Gon and expressway network	20.0
		H56	Road Access to Dong Nai Port	To develop an access road connecting Dong Nai and expressway network	20.0
		H57	Road Access to Can Tho Port	To develop an access road connecting Can Tho and expressway network	20.0
	Construc-tion of bypass	H58	NH1 Bypass (La Ha, Quang Ngai) (15km)	Bypass road on NH1 in Quang Ngai Province. (15km, 4 lane).	68.3
		H59	NH1A Bypass (Van Gia, Khanh Hoa) (10km)	Bypass road for diversion of thru traffic from urban area.(10km,4lane)	46.3
		H60	NH1A Bypass (Ninh Hoa, Khanh Hoa) (10km)	Bypass road for diversion of thru traffic from urban area. (10km,4lane)	34.5
		H61	NH1A Bypass (Cam Ranh, Khanh Hoa) (10km)	Bypass road for diversion of thru traffic from urban area. (10km,4lane)	44.6
		H62	NH1A Bypass (Cho Lau, Binh Thuan) (10km)	Bypass road for diversion of thru traffic from urban area. (10km,4lane)	39.8
		H63	NH1A Bypass (Phan Thiet, Binh Thuan) (10km)	Bypass road for diversion of thru traffic from urban area. (10km,4lane)	34.5

Subsector		Proj. No.	Project Title	Project Description	Proj.Cost (USD mil.)
		H64	NH1A Bypass (Duc Pho, Quang Ngai) (9.7km)	Bypass road for diversion of thru traffic from urban area. (9,7km,4lane)	36.4
		H65	NH1A Bypass (Vinh Long) (7.5km)	Bypass road for diversion of thru traffic from urban area. (7.5km,4lane)	25.9
		H66	NH14 Bypass (Ea Drang, Dak Lak)(10km)	Bypass road for diversion of thru traffic from urban area. (10km,4lane)	44.4
		H67	NH14 Bypass (Buo Ho, Dak Lak)(10km)	Bypass road for diversion of thru traffic from urban area. (10km,4lane)	44.4
		H68	NH91 Bypass (Thot Not, Can Tho)(10km)	Bypass road for diversion of thru traffic from urban area. (10km,4lane)	34.5
		H69	NH91 Bypass (An Chau, An Giang)(10km)	Bypass road for diversion of thru traffic from urban area. (10km,4lane)	34.5
		H70	NH91 Bypass (Cai Dau, An Giang)(10km)	Bypass road for diversion of thru traffic from urban area. (10km,4lane)	34.5
		H71	NH10 Bypass (Nga Son, Thanh Hoa)(10km)	Bypass road for diversion of thru traffic from urban area. (10km,4lane)	34.5
		H72	NH60 Bypass (Mo Cay, Ben Tre)(10km)	Bypass road for diversion of thru traffic from urban area. (10km,4lane)	34.5
		H73	NH60 Bypass (Ham Luong (Ben Tre – Mo Cay))(10km)	Bypass road for diversion of thru traffic from urban area.. (10km,4lane)	34.5
		H74	NH38 Bypass (Hoa Mac, An Giang)(10km)	Bypass road for diversion of thru traffic from urban area. (10km,4lane)	34.5
		H75	NH21B Bypass (Binh Da, Ha-noi)(10km)	Bypass road for diversion of thru traffic from urban area. (10km,4lane)	34.5
		H76	NH21B Bypass (Kim Bai, Ha-noi)(10km)	Bypass road for diversion of thru traffic from urban area. (10km,4lane)	34.5
		H77	NH21B Bypass (Van Dinh, Ben Tre)(10km)	Bypass road for diversion of thru traffic from urban area. (10km,4lane)	34.5
		H78	NH21B Bypass (Que, Ha Nam)(10km)	Bypass road for diversion of thru traffic from urban area. (10km,4lane)	34.5
	Improve-ment of road/ bridge	H79	NH 14 Widening (Dong Xoai - Chon Thanh)(34km)	To widen 2-lane section to 4-lane.(34km)	115.4
		H80	NH 14 Widening (Gia Lai - Kon Tum)(50km)	To widen 2-lane section to 4-lane.(50km)	184.0
		H81	NH 18A Upgrading (Mong Duong - Mong Cai)(122km)	To upgrade to required standard.(122km)	150.8
		H82	NH 51 Widening(Dong Nai - Vung Tau)(73.6km)	To widen 4-lane section to 6-lane.(73.6km)	184.1
		H83	NH8 Upgrading (Hong Linh - Cau Treo Border) (77km)	To upgrade to required standard.(77km)	164.6
		H84	NH9 Upgrading (Pho Lai (Song) - Cua Viet) (14km)	To upgrade to required standard.(14km)	21.7
		H85	NH5 Upgrading (106km)	To upgrade to required standard.(106km)	155.8
		H86	NH21 Upgrading(Son Tay - Xuan Mai) (32km)	To upgrade to required standard.(32km)	31.1
		H87	NH21 Upgrading (Nam Dinh - Thinh Long) (61km)	To upgrade to required standard.(61km)	59.4
		H88	NH22 Upgrading (HCMC - Moc Bai) (82km)	To upgrade to required standard.(82km)	82.1
		H89	NH80 Upgrading (Cau My Thuan - Xa Xia) (213km)	To upgrade to required standard.(213km)	207.3
		H90	NH 6 Widening (Ba La - Xuan Mai) (20km)	To widen 2-lane section to 4-lane.(20km)	52.7
		H91	NH6 Extension (PR 127 Lai Chau – border corridor line in Muong Te, through Pac Ma – Nam La border) (120km)	To upgrade to required standard.(120km)	180.2

Subsector		Proj. No.	Project Title	Project Description	Proj.Cost (USD mil.)
		H92	NH 20 Improvement(Dau Giay - Lien Khuong)(250km)	To improve to minimum requirement.(250km)	201.8
		H93	NH12B Upgrading (Tam Diep - Hang Tram) (46km)	To upgrade to required standard.(46km)	85.3
		H94	NH7 Upgrading (Do Luong - Con Cuong) (54km)	To upgrade to required standard.(54km)	100.1
		H95	NH19 Upgrading(Quy Nhon - NH14) (169km)	To upgrade to required standard.(169km)	357.8
		H96	NH10 Improvement (Lai Thanh - Tao Xuyen) (50km)	To improve to minimum requirement.(50km)	24.3
		H97	NH3 Improvement (Thai Nguyen - Ta Lung) (274km)	To improve to minimum requirement.(274km)	161.3
		H98	NH4A, 4B Improvement (Cao Bang - Tien Yen) (225km)	To improve to minimum requirement.(225km)	132.8
		H99	NH37 Improvement (Sao Do - Co Noi) (533km)	To improve to minimum requirement.(533km)	316.7
		H100	NH34 Improvement (Ha Giang - Cao Bang) (260km)	To improve to minimum requirement.(260km)	168.8
		H101	NH43 Improvement (Gia Phu - Pa Hang) (113km)	To improve to minimum requirement.(113km)	72.5
		H102	NH7 Improvement (Dien Chau - Do Luong) (36km)	To improve to minimum requirement.(36km)	17.5
		H103	NH12A Improvement (Vung Ang - NH1(connection to Vung Ang port), Ha Tinh) (10km)	To improve NH12A connecting to Vung Ang Port to minimum require-ment.(10km)	4.9
		H104	NH14B Improvement (Da Nang - Thanh My) (78km)	To improve to minimum requirement.(78km)	41.9
		H105	NH14D Improvement (HCM Road - Lao Border) (75km)	To improve to minimum requirement.(75km)	48.3
		H106	NH13 Improvement (Chon Thanh - Hoa Lu Border) (142km)	To improve to minimum requirement.(142km)	92.9
		H107	NH30 Improvement (An Huu - Dinh Ba Border) (121km)	To improve to minimum requirement.(121km)	58.9
		H108	NH61 Improvement(Tan Phu - Vinh Loi) (96km)	To improve to minimum requirement.(96km)	46.7
		H109	NH 40 Rehabilitation (24km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (24km)	9.8
		H110	NH217 Wideining (NH217 – NH1, Thanh Hoa) (30km)	To widen 2-lane section to 4-lane.(30km)	87.1
		H111	NH31 Rehabilitation (An Chau - Dinh Lap) (48km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (48km)	23.7
		H112	NH3B Rehabilitation (Yen Lac - That Khe) (44km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (44km)	21.7
		H113	PR507(NH47) Rehabilitation (Thuong Xuan - Kheo Border) (60km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (60km)	32.9
		H114	NH48 Rehabilitation (Thai Hoa - Kim Son) (74km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (74km)	40.6
		H115	NH32 Widening (Hanoi - Son Tay) (32km)	To widen 2-lane section to 4-lane. (32km)	84.3
		H116	NH32B Rehabilitation (Xom Giac - Muong Coi) (21km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (21km)	8.4
		H117	NH2B Rehabilitation (Vinh Yen - Tam Dao) (25km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (25km)	10.6
		H118	NH2C Rehabilitation (Vinh Yen - Son Duong) (60km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (60km)	23.7
		H119	NH23 Rehabilitation (NH2 - Phuc Yen) (27km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (27km)	10.0

Subsector		Proj. No.	Project Title	Project Description	Proj.Cost (USD mil.)
		H120	NH47 Rehabilitation(NH1 - NH15) (61km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (61km)	21.8
		H121	NH45 Rehabilitation(Pho Ria - Thanh Hoa - Yen Cat) (136km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (136km)	49.3
		H122	NH49 Rehabilitation(Cang Thuan An - HCM Road) (75km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (75km)	28.0
		H123	NH25 Rehabilitation (Tuy Hoa - HCM Road) (180km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (180km)	72.9
		H124	NH27 Rehabilitation(Phan Rang Thap Cham - Buon Ma Thuot) (276km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (276km)	113.1
		H125	NH49B Rehabilitation (Cau My Chanh - Vinh Hien, Thu Thien Hue) (89km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (89km)	31.1
		H126	NH24B Rehabilitation (NH1 - An Hai, Quang Ngai) (18km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (18km)	6.3
		H127	NH27B Rehabilitation(Tan Son - NH1) (48km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (48km)	17.3
		H128	NH1D Rehabilitation(Quy Nhon - Song Cau, Binh Dinh & Phu Yen) (33km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (33km)	11.5
		H129	NH1C Rehabilitation (Dien Khanh - Nha Trang) (17km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (17km)	5.9
		H130	NH56 Rehabilitation (Xuan Thanh - Ba Ria) (50km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (50km)	17.5
		H131	NH62 Rehabilitation (Tan An - Binh Hiep) (77km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (77km)	26.9
		H132	NH54Rehabilitation (Cai Von - Tieu Can) (167km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (167km)	58.3
		H133	NH53Rehabilitation (Vinh Long - Duyen Hai - NH54) (132km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (132km)	46.1
		H134	NH63 Rehabilitation(Minh Luong - Ca Mau) (109km)	To provide minimum, all-weather accessibility wiith the existing ROW or road width (109km)	38.1
		H135	NH1 Widening (to 4 lane,Lang Son - Hanoi) (185km)	To widen 2-lane section to 4-lane.(185km)	150.0
		H136	NH1 Widening (to 4 lane, Hanoi - Vinh) (365km)	To widen 2-lane section to 4-lane.(365km)	365.0
		H137	NH1 Widening (to 4 lane, Vinh - Danang) (650km)	To widen 2-lane section to 4-lane.(650km)	570.0
		H138	NH1 Widening (to 4 lane, Da-nang - Nha Trang) (510km)	To widen 2-lane section to 4-lane.(510km)	485.0
		H139	NH1 Widening (to 4 lane, Nha Trang - HCMC) (350km)	To widen 2-lane section to 4-lane.(350km)	280.0
		H140	NH1 Widening (to 4 lane, HCMC - Ca Mau) (385km)	To widen 2-lane section to 4-lane.(385km)	310.0
	Securing All-weather 2-lane roads on corri-dors	H141	NH279 Improvement(Tay Trang - Viet Quang) (242km)	To improve and widen 1-lane section to 2-lane. (242km)	151.2
		H142	NH6 Improvement (Moung Khen - Lai Chau) (19km)	To improve and widen 1-lane section to 2-lane. (19km)	9.8
		H143	New Road Construction(Ky Anh - Tan Son) (45km)	To construct new road (45km, 2 lane)	100.7
		H144	NH15Improvement (Tan Son - Thanh Lan) (20km)	To improve 1 lane section to 2-lane. (20km)	10.8
		H145	NH12AImprovement (Thanh Lan - Cha Lo) (7km)	To improve 1-lane section to 2-lane. (7km)	3.4
		H146	New RoadConstruction (Ngan Dua - Vi Thanh) (25km)	To construct new road (25km, 2 lane)	53.1

Subsector		Proj. No.	Project Title	Project Description	Proj.Cost (USD mil.)
		H147	New RoadConstruction (HCMC - Long Xuyen) (140km)	To construct new road (140km, 2 lane)	264.4
	Improvement of traffic safety	H148	Black Spot Improvement Plan	To review the black spot improvement guideline, implement the black spot improvement pilot project including training for engineers and capacity development, develop an exchage system for human resources and techniques/expertise related to black spot improvement system, promote understanding of black spot improvement system to the road management authorities and promote black spot improvement implementation to local governments	95.0
		H149	Traffic Safety Audit Development Plan	To revise RSA guideline, RSA pilot project, and promote RSA system to the road management authorities	40.0
		H150	Traffic Safety Corridor Development Plan	To develop the database for inventory of encroachment and road conditions, set land value based on market price and apply to land land acquition, improve the compensation system for affected people, improve the public consultation system and mandatory requirement of resettlement plan in road projects, strengthen and enforce sanctions against returning illegal dwellers, development planning focusing on heavy access sections, strengthen regulation for access from heavy traffic generating road side facilities, and legal system improvement for encroachment	40.0
		H151	Highway Traffic Safety Facility Enhancement Plan	To improve design standards and guideline basing on Vietnam's unique traffic, improve design standards and guideline basing on regional characteristics and budgetary situations, integrate design standards and development of design standard instruction, develop standard design drawing, improve traffic regulations and operation in accordance with local conditions, improve traffic regulation for arterial road, improve railway crossing, develop service roads on residential areas and urban sections, develop traffic control and information system for inter-city road, develop traffic signal and control system, improve intersections, develp passing lanes and road stations for inter-city road, improve traffic safety facilities, improve safety facilities for roads along residential areas, and improve systematic road network in residential improvement in residential and commercial zones	1,110.0
		H152	Vulnerable Road User Accident Prevention Plan	To improve pedestrian facilities along school routes and for high-risk accident areas and develop exclusive bicycle lane facilities	75.0
		H153	Expressway Safety Development Plan	To establish an efficient cooperation body between VEC and traffic police for expressway traffic control and develop traffic regulation for expressways, traffic safety measures guidelines for expressways, and advanced traffic control system (ETC) for expressways	112.5
		H154	Road Work Traffic Safety Development Plan	To develop road maintenance database, a comprehensive management system for national highways, regulations, and guidelines for safety measures during road construction and maintenance	20.0
		H155	Traffic Safety Monitoring and Maintenance Plan	To establish a monitoring and evaluation unit of road safety plan, and develop monitoring and evaluation system for local planning	35.0
		H156	Urban Road Traffic Safety Development Plan	To improve traffic regulations for urban road, develop coordinated traffic signal systems, wide area and flexible signal control systems , illegal parking prevention facilities, and an efficient parking regulation system, formulate regulations making parking facilities compulsory in every building, develop comprehensive parking system plan, public transport prioritizing facilities, promote public transport usage facilitation, and develop measures promoting traffic dispersion during peak hour and park and ride systems	272.5
			Subtotal		68,637.4
2. Railway	Improvement of existing line for capacity expansion	R01	Function-Improvement Items (Hanoi-Saigon Line)	To improve facilities (signal station, automatic level crossing & fence/barrier, depot, workshop etc) to provide 50 trains/day flequency of service on a single truck in Hanoi-Saigon Line.	2,465.3
		R02	Function-Improvement Items (Hanoi-Lao Cai Line)	To improve facilities (signal station, automatic level crossing & fence/barrier, depot, workshop etc) to provide 50 trains/day flequency of service on a single truck in Hanoi-Lao Cai Line	401.9
		R03	Function-Improvement Items (Hanoi-Dong Dang Line)	To improve facilities (signal station, automatic level crossing & fence/barrier, depot, workshop etc) to provide 50 trains/day flequency of service on a single truck in Hanoi-Dong Dang Line	116.4

Subsector		Proj. No.	Project Title	Project Description	Proj.Cost (USD mil.)
		R04	System Reinforcement Items (Hanoi-Saigon Line)	To improve exitsting track to double track (meter gage) and system in some sections of Hanoi-Saigon Line (Hanoi – Nam Dinh (86.8 km), Hue – Da Nang (83.1km;including Hai Van Tunnel), Da Nang – Quang Ngai (136 km), Trang Bone – Saigon (48.7km))	6,747.5
		R05	System Reinforcement Items & System Modernization Items (Hanoi-Dong Dang Line)	To improve existing track to electrified double track (dual gage) to Hanoi and Dong Dang section (156km)	3,431.7
		R06	System Modernization Items (Hanoi-Saigon Line)	To improve extisting track to double track (meter gage) and system in overall section of Hanoi-Saigon Line (excluding sections upgraded as double track by R04)	18,508.8
	Construc-tion of new line	R07	Trang Bone – Vung Tau New Railway Construction (SRI & SMI)	To develop a new railway (standard gage double track) between Trang Bone and Vung Tau (71.3km)	1,848.8
		R08	Hanoi-Lao Cail New Railway Constrcution (SRI &SMI)	To develop a new railway (standard gage, double track) between Lao Cai and Hanoi (280km) besides exisiting railway line.	5,671.1
		R09	Hanoi-Hai Phong New Railway Constrcution (SRI &SMI)	To develop a new railway (standard gage, double track) between Hanoi and Hai Phong (112km) besides exsititng railway line.	1,892.8
		R10	HCMC – Loc Ninh New Railway Line Construction	To develop a new railway (dual gage, single track) between HCMC and Loc Ninh (134km)	670.0
		R11	HCMC – Can Tho New Railway Line Construction	To develop a new railway (standard gage, double track) between HCMC andCan Tho (146km)	3,796.0
	Subtotal				45,549.4
3. Ports and Shipping		P01	Hon Gia Seaport (Cai Lan) Ter-minal Development	To upgrade navigation channel for Lach Huyen Area to -10.3m including construction of sand dyke, develop new deep-water terminals at Lach Huyen for container/general and liquid cargo, and convert the function of part of Hoang Dieu Terminal for other public interest in Hai Phong Sea-port	90.0
		P02	Hai Phong Seaport (Lach Huyen) Development (Stage 1, original schedule: 2010-2015)	To upgrade navigation channel for Lach Huyen Area to -10.3m including construction of sand dyke and develop new deep-water terminals at Lach Huyen for container/general and liquid cargo in Hai Phong Seaport	450.0
		P03	Hai Phong Seaport (Lach Huyen) Development (Stage 2, original schedule: 2015-2020)	To develop new deep-water terminals at Lach Huyen for container/general and liquid cargo in Hai Phong Seaport	945.0
		P04	Hai Phong Seaport (Lach Huyen) Development (Stage3, original schedule: 2020-2030)	To construct sand dyke for Nothern Channel and expand the terminal in Cua Lo seaport to handle cargo to/from the northern central zone	5,270.0
		P05	Cua Lo Seport Channel & Ter-minal Development	To expand the terminal for general cargo in Vung Ang seaport to/from the northern central zone	26.0
	Expansion and up-grading of port func-tion	P06	Vung Ang Seaport Terminal De-velopment	To construct breakwater for specialized terminal in Song Duong	50.0
		P07	Son Duong Breakwater Devel-opment	To expand the terminal for general cargo/cruise ship in Chan May seaport to handle container/general cargo to/from CFEZ	200.0
		P08	Chan May Seaport Terninal De-velopment	To expand Tien Sa Terminal, develop Tho Quang Terminal and Lien Chieu Ternimal for container/general cargo, and covert the function of Han River Terminal for other public interest in Danang Seaport	80.0
		P09	Danang Seaport Terminal Devel-opment	To construct multi-purpose terminal to handle container/general cargo to/from Dung Quat Economic Zone and the breakwater/revetment in the west part, and develop port facility for Steel Plant at Dung Quat Economic Zone in Dung Quat Seaport	258.0
		P10	Dung Quat Seaport Terminal & Breakwater/Revetment Devel-opment	To upgrade navigation channel for Lach Huyen Area to -10.3m including construction of sand dyke, develop new deep-water terminals at Lach Huyen for container/general and liquid cargo, and convert the function of part of Hoang Dieu Terminal for other public interest in Hai Phong Sea-port	340.0
		P11	Quy Nhon Seaport Terminal De-velopment	To expand the terminal at Quy Nhon, develop a terminal to handle con-tainer/general cargo at Nhon Hoi, and develop petroleum terminals to handle petroleum product at Quy Nhon in Quy Nhon Seaport for southern central zone	270.0
		P12	Van Phong International Tran-ship Terminal Development (Stage 2, original schedule:	To develop container a terminal in Van Phong seaport to handle interna-tional transhipment cargo	395.0

Subsector		Proj. No.	Project Title	Project Description	Proj.Cost (USD mil.)
			2010-2015)		
		P13	Van Phong International Transhipment Terminal Development (Stage 3, original schedule: 2015-2020)	To develop container a terminal in Van Phong seaport to handle international transhipment cargo	925.0
		P14	Nha Trang Seaport Channel & Terminal Development	To improve the North Channel for passenger ships up to 50,000 GRT and convert the function of Nha Trang Terminal into passenger terminal	1.0
		P15	Ba Ngoi Seaport (Cam Ranh) Terminal development Development (Stage 1B, original schedule: -2010)	To develop oil terminal at Cam Ranh to handle petroleum product and terminal for industrial zone at Cam Ranh in Ba Ngoi seaport	15.0
		P16	Ba Ngoi Seaport (Cam Ranh) Terminal development Development (Stage2: original schedule: 2010-2020)	To develop a oil terminal to handle petroleum product, a terminal for industrial zone and a multipurpose terminal to handle container/general cargo at Cam Ranh in Ba Ngoi seaport	265.0
		P17	Ca Na Seaport Industrial Port Facility Development	To develop of a port facility for steel plant at Doc Ham Industrial Zone in Ca Na seaport	10.0
		P18	Vung Tau Seaport (Cai Mep Thi Vai - stage2 + other) Terminal Development	To develop deep-water container terminal at Cai Mep Thi-Vai and at Den Dinh-Sao to handle container cargo and multi-purpose terminal at Cai Mep-Thi Vai to handle container/general cargo and develop a port facility for oil refinery at Long Son	980.0
		P19	Ho Chi Minh Seaport (Hiep Phuoc - Stage2 + other) Channel and Terminal Development	To upgrade navigation chalnnel for Hiep Huoc Area to accommodate vessels up to 25,000-30,000 DWT, develop new deep-water container terminal at Hiep Phuoc area to handle container cargo, convert of the function of Nha Rong-Khanh Hoi Terminal into cruise ship terminal and others, and develop new terminal which will substitute for Ben Nghe Terminal	220.0
		P20	Expansion of terminal in My Tho seaport	To expand terminal in My Tho seaport to handle general cargo to/from Mekong Delta Area	2.0
		P21	Expansion of terminal in Dong Thap seaport	To expand a terminal at Cao Lanh in Dong Thap seaport to handle general cargo to/from Mekong Delta Area	2.0
		P22	Expansion of terminal in Can Tho seaport	To expand a terminal at Cai Cui and at Tra Noc in Can Tho seaport to handle container/general cargo to/from Mekong Delta Area	25.0
		P23	Expansion of terminal in My Thoi seaport	To expand a terminal in My Thoi seaport to handle container/general cargo to/from Mekong Delta Area	5.0
		P24	Coal Fired Thermal Power Stations Port Facility Development	To develop port facilities for coal thermal power station at Cat Khanh, Ninh Thuy, Vinh Tan, Tra Vinh, Soc Trang, and Kien Luong	60.0
		P25	Industrial Terminal Development	To develop port facilities for oil refinery at Hoa Tan, My Giang and Ke Ga Cape	20.0
			Subtotal		10,904.0
4. IWT	Waterway improvement	W01	Upgrading of Quang Ninh/Hai Phong - Ha Noi Route (to ClassII) (166km)	To upgrade the 166-km section of waterway to conform to Class II standards throughout the route	38.2
		W02	Upgrading of Lach Giang - Ha Noi Route (to Class I) (192km)	To upgrade the section of 192 km to class I through the route (45.5 mill. USD); channel stabilization (125.6 mill. USD); navigation channel improvement (17.1 mill. USD); Duong Bridge improvement (21.9 mill. USD)	210.1
		W03	Upgrading of Ha Noi – Viet Tri - Lao Cai Route (to Class II III and IV) (362 km)	To upgrade the section of 362 km to class II III and IV (Hanoi to Viet Tri: class II Viet Tri to Yen Bai: class III and Yen Bai to Lao Cai: III or IV)	133.3
		W04	Improvement of Quang Ninh - Ninh Binh Route (266.5km)	To establish consistent channel conditions over 266.5-km section of waterway	61.2
		W05	Upgrading of Cua Day - Ninh Binh (to Class I)(74.0km)	To upgrade the section of 74.0 km to class I through the route	17.0
		W06	Upgrading of Quang Ninh - Pha Lai Route (to ClassII) (128km)	To upgrade the section of 128.0 km to class II through the route	29.4
		W07	Upgrading of Pha Lai - A Lu Route (to Class III) (33.0 km)	To upgrade the section of 33.0 km to class III through the route	7.6
		W08	Upgrading of Pha Lai - Da Phuc Route (to ClassIII) (87km)	To upgrade the section of 87.0 km to class III through the route	20.0
		W09	Upgrading of Viet Tri - Tuyen Quang – Na Hang Route (to	To upgrade the section of 115 km to class III and IV/V (Viet Tri to Tuyen Quang: class III and Tuyen Quang to Na Hang: class III/IV)	36.8

Subsector		Proj. No.	Project Title	Project Description	Proj.Cost (USD mil.)
			class III and IV/V) (115km)		
		W10	Improvement of Hong Đa T-Junction - Hoa Binh Port Route (58.0km)	To establish consistent channel conditions over 58-km section	13.3
		W11	Improvement of Ninh Binh-Thanh Hoa	To improve the section of Ninh Binh-Tainh Hoa Route	11.5
		W12	Various Regional/Feeder Routes	To improve several regional/feeder routes	50.0
		W13	Upgrading Cho Gao Canal Route (11km)	To improve 28.5 km section connecting the north and south routes (dredg-ing, widening, raising bridge clearance)	138.0
		W14	Improvement of Sai Gon - Kien Luong/Lap Vo canal Route (315km)	To establish consistent channel conditions over the 315-km section of the route	72.5
		W15	Improvement of Sai Gon - Kien Luong/Dong Thap Muoi area Route (334km)	To establish consistent channel conditions over 334 km of the route	76.8
		W16	Improvement of Sai Gon - Ca Mau/Xa No canal Route (336km)	To establish consistent channel conditions over 336 km of the route	77.3
		W17	Improvement of Sai Gon - Ca Mau/coastal Route (367km)	To establish consistent channel conditions over 367 km of the route	84.4
		W18	Improvement of Sai Gon - Moc Hoa Route (96km)	To establish consistent channel conditions over 96 km of the route	22.1
		W19	Improvement of Sai Gon - Ben Suc Route (89km)	To establish consistent channel conditions over 89 km of the route	20.5
		W20	Improvement of Sai Gon - Ben Keo Route (166km)	To establish consistent channel conditions over 166 km of the route	38.2
		W21	Improvement of Sai Gon - Hieu Liem Route (88km)	To establish consistent channel conditions over 88 km of the route (Im-plemented 6 years ago; need to rehabilitate after 15 years)	15.0
		W22	Improvement of Mekong river Delta – Thi Vai - Vung Tau Route (75km)	To establish consistent channel conditions over 75 km of the route	17.3
		W23	Improvement of Cua Tieu – Cambodia Route (223km)	To establish consistent channel conditions over 223 km of the route	51.3
		W24	Improvement of Dinh An estuary - Tan Chau Route (214km)	To establish consistent channel conditions over 214 km of the route	49.2
		W25	Improvement of Moc Hoa - Ha Tien (108km)	To establish consistent channel conditions over 108 km of the route	24.8
		W26	Upgrading of Phuoc Xuyen – Tien river (canal 28) (to Class III) (75km)	To upgrade the 75-km section to Class III standards	17.3
		W27	Upgrading of Rach Gia - Ca Mau (to Class III) (149km)	To upgrade the 149-km section to Class III standards	34.3
		W28	Improvement of Lach Trao-Ham Rong	To establish consistent channel conditions as Class II waterway	2.0
		W29	Improvement of Lach Sung-Len Bridge	To establish consistent channel conditions as Class III waterway	2.0
		W30	Improvement of Cua Hoi-Ben Thuy-Do Luong	To establish consistent channel conditions as Class II and III waterway	4.6
		W31	Improvement of Cua Sot – Nghen Bridge	To establish consistent channel conditions as Class III waterway	2.0
		W32	Improvement of Cua Gianh-Quang Truong	To establish consistent channel conditions as Class II waterway	2.0
		W33	Improvement of Nhat Le Estuary –Long Dai bridge	To establish consistent channel conditions as Class III waterway	2.0
		W34	Improvement of Cua Viet-Dap Tran (spillway)	To establish consistent channel conditions as Class III waterway	2.0
		W35	Improvement of Thuan An-Tuan T-junction	To establish consistent channel conditions as Class III waterway	2.3
		W36	Improvement of Hoi An –Cua	To establish consistent channel conditions as Class I and III waterway	2.3

Subsector		Proj. No.	Project Title	Project Description	Proj.Cost (USD mil.)
			Dai– Cu Lao Cham		
		W37	Improvement of Ky Ha Estuary-Hoi An – Vinh Dien T – junction - Cua Han	To establish consistent channel conditions as Class III waterway	13.8
	Mainten-ance	W38	Maintenance Dredging to reduce backlogs	Multi year program of maintenance dredging to re-establish and maintain set standards (2011-2020)	120.0
	Improve-ment of river port	W39	Improvement/upgrading of cargo port system in the northern region	To improve/upgrade/develop one(1) port for accommodation of 3,000DWT vessels, seven(7) ports for 1,000DWT, five(5) ports for 600DWT, one(1) port for 500DWT, seven(7) ports for 400DWT vessels, three(3) ports for 300DWT and seventeen(17) ports for 200DWT	130.1
		W40	Improvement/upgrading of passenger port system in the northern region	To improve/upgrade/develop four(4) ports for accommodation of 150-200seats passenger vessels and two(2) ports for 100 seats	20.0
		W41	Improvement/upgrading of cargo port system in the southern region	To improve/upgrade/develop five(5) Ports for accommodation of 5,000DWT vessels, two(2) for 3,000DWT, three for 2,000DWT, nine(9) for 1,000DWT, three(3) for 500DWT, one(1) for 400DWT and three(3) for 300DWT	20.0
		W42	Improvement /upgrading of passenger port system in the southern region	To improve/upgrad/develop sixteen (16) ports for accommodation of 100 seats passenger vessels	20.0
		W43	Improvement/upgrading of cargo port system in the central region	To improve/upgrade/develop four(4) ports for accommodation of 1,000DWT vessels, one(1) for 400DWT and one(1) for 300DWT	20.0
		W44	Selective Ports Investment Package	Investment in some ports with regional or national importance, plus assistance to provinces in ports devolution	50.0
	Landing Stage Improvement	W45	Improvement of landing stages	To improve existing facilities in qualities and in safety	2.0
	Safety Improve-ment	W46	Installment and improvement of navigation aids	To rehabilitate, improve and expand river traffic management facilities (e.g., buoys, beacons, channel marks, etc.)	5.0
		W47	Search and rescue	To improve search-and-rescue capability in north & south regions, by acquiring essential equipment and its operation	5.0
	Ship Build-ing	W48	Ship building	To build inland waterway ships	2080.0
		W49	Ship building and repair factory	To expand ship building and repair capacity	15.0
	Institution Improve-ment	W50	Organizational Reforms	To improve institutional systems including removal of overlaps between VIWA and VINAMRINE, and improve coordination with other transport sub-sectors	2.0
		W51	Capacity development	To install appropriate systems improvements in the organizational processes, supported by continous training or personnel	2.0
		W52	Database: River Surveys and Vessel Registry	To develop capability for continuous surveys of channel status (depth, width, bends, etc.) and to improve vessel registry system	20.0
			Subtotal		3913.2
5. Aviation	Construc-tion of new airport	A01	Long Thanh Airport	To construct a new international airport with the capacity of 8 to 10 mppa.	6000.0
	Capacity expansion of existing airport	A02	T1&T2 Terminal Expansion at Noi Bai International Airport	To expand T1 & T2 to be able to handle 20 mppa	900.0
		A03	T3 Terminal Construction at Noi Bai International Airport	To construct a new passenger terminal building of T3 with capacity of 15 mppa	1200.0
		A04	Runway Construction at Noi Bai International Airport	To construct a new runway at southern side of the airport	500.0
		A05	Cat Bi Airport Upgrading	To develop Cat Bi Airport to international airport with the capacity of 2 mppa and 3,200 m length runway.	300.0
		A06	Phu Bai Airport Upgrading	-	400.0
		A07	Chu Lai Airport Upgrading for Cargo Transport (Stage1: original schedule: 2009-2015)	To updage Chu Lai Airport to cargo hub airport with capacity of 1.5 million tonnes of cargo per annum.	300.0
		A08	Chu Lai Airport Upgrading for Cargo Transport (Stage2: original	To update Chi Lai Airport to cargo hub airport with capacity of 5.0 million tonnes of cargo per annum.	400.0

Subsector		Proj. No.	Project Title	Project Description	Proj.Cost (USD mil.)
			schedule: 2015-2025)		
		A09	Cam Ranh Airport Expansion	To develop the capacity to 2.65 mppa	100.0
		A10	Runway Upgrading at Na San Airport	To upgrade runway to be capable to opeate A320 and A321 aircraft with the capacity of 300 thousands passengers per annum and 2,000 tonnes of freight per annum.	60.0
		A11	Runway Improvement at Danang international Airport	Shifting of taxiway E6 to widen clearance from 75 m to 150m	-
		A12	Taixway Construction at Danang international Airport	To building a dual parallel taxiway	-
		A13	Expansion of Tan Son Nhat International Airport	To expand capacity of Tan Son Nhat International Airport to handle 25 mppa	200.0
		A14	Other Tertiary Airport Improvement	Minor improvements of several regional airports that provide access to remote areas (Na San, Dien Bien Phu, Ca Mau, Pleiku, etc)	50.0
	Improvement of navigation facility	A15	Control tower Construction at Tan Son Nhat International Airport	To construct a new control tower	50.0
		A16	Air Navigation System	Modernization of the air traffic management system	100.0
			Subtotal		10,560.0
6. Multi-modal (Logistics)	Construction of new facility for multimodal cargo handling	L01	North Logistic Park Development	To develop the LP facility which has an area of 500,000 square meters and be desighed to have the services of customs clearance for inbound and putbound shipments, warehousing of goods for regional destribution and for exports to cater to the requirement of FDI enterprises in the nearby industrial parks, cross-docking facility, consolidation and deconsolidation, customs-bonded warehouse, container transport management system, and value-added logistics servises.	199.8
		L02	South Logistic Park Development	To construct a distribution / collection center for international container traffic via international container terminal and international airport	40.0
		L03	Lao Cai Cross-border gate improvement	To Improve, expand and provide a customs clearance office, inspection area, a truck terminal, etc. for trade facilitation with China	6.0
		L04	Lang Son Cross-border gate improvement	To Improve, expand and provide a customs clearance office, inspection area, a truck terminal, etc. for trade facilitation with China	9.0
		L05	Moc Bai Cross-border gate improvement	To Improve, expand and provide a customs clearance office, inspection area, a truck terminal, etc. for reinforcement of regional logistics especially with Thailand via Laos	9.0
			Subtotal		293.8
Total					139,827.8

Note: Compiled by the VITRANSS 2 Study Team.