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REVIEW OF EXISTING
TRAFFIC DEMAND FORECAST MODEL

APPENDIX-1 REVIEW OF EXISTING TRAFFIC DEMAND FORECAST MODEL

1.1 Review of existing traffic demand forecast model

For the estimation and forecasting of current and future traffic demand in the survey area, two existing JICA Studies relevant to the survey area are available, namely, “The Study on Urban Transport Master Plan and Feasibility Study in Ho Chi Minh Metropolitan Area (HOUTRANS, 2004)” and “The Comprehensive Study on the Sustainable Development of Transport System in Vietnam (VITRANSS2, 2010)”.

Table 1.1.1 Outline of Existing JICA Studies

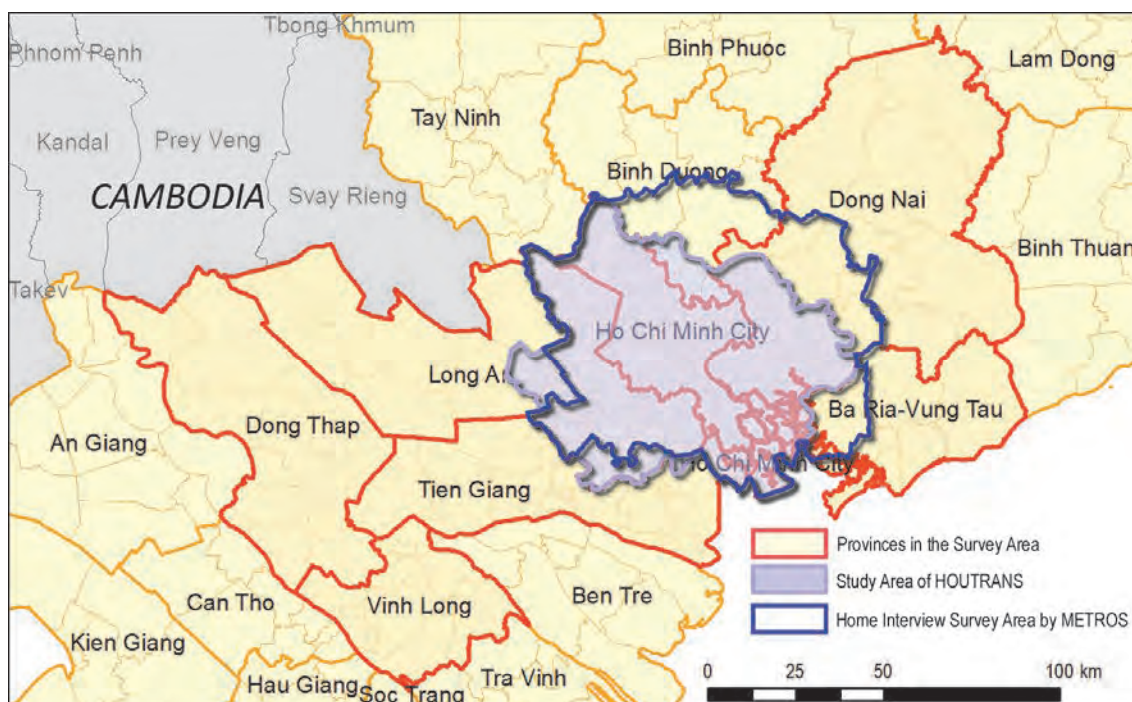
Items	HOUTRANS (2004)	VITRANSS2 (2010)
Study area	HCMC、Dong Nai (3/11 Sub-divisions), Binh Duong (2/9 Sub-divisions, Long An (8/15 Sub-divisions)	The whole of Vietnam
Base year of demand Forecast	2002	2008
Target year	2010, 2020	2020, 2030
Target demand	Person trip, trucks at logistics facilities	Person trip, cargo flow
Transport modes for demand forecast	Bicycle, Motorcycle, Car, Truck and Bus	Car, Bus, Railway and Aviation (Inland water and coastal are only for cargo)
Demand forecast model	Conventional four-step demand forecast model based on person trip (PT) survey by home interview survey (HIS) and other traffic surveys.	Conventional four-step demand forecast model based on traffic surveys relevant to road, railway and other transport modes. (intra-zonal trip and flow is not included)
Traffic analysis zone system	Minimal zone is defined by ward and several wards are integrated in accordance with distance form center of HCMC. Study area is consisted by 256 zones (HCMC is consisted by 216 zones).	Traffic analysis zone is defined by Province.
notes	PT survey contains same survey items was carried out on almost same area in the “Data Collection Survey on Railway in Major Cities in Vietnam (METROS), 2015, JICA”.	

Note: Sub-district includes District, District-level Town and Provincial city.

Source: JICA Survey Team

For the traffic demand forecast in the survey, traffic demand forecast in terms of person trip should be based on the results of person trip (PT) survey prepared by HOUTRANS and METROS on the view of demand forecast urban and surrounding area of HCMC.

Following figure indicates survey area and study area of HOUTRANS and PT survey area by METROS.



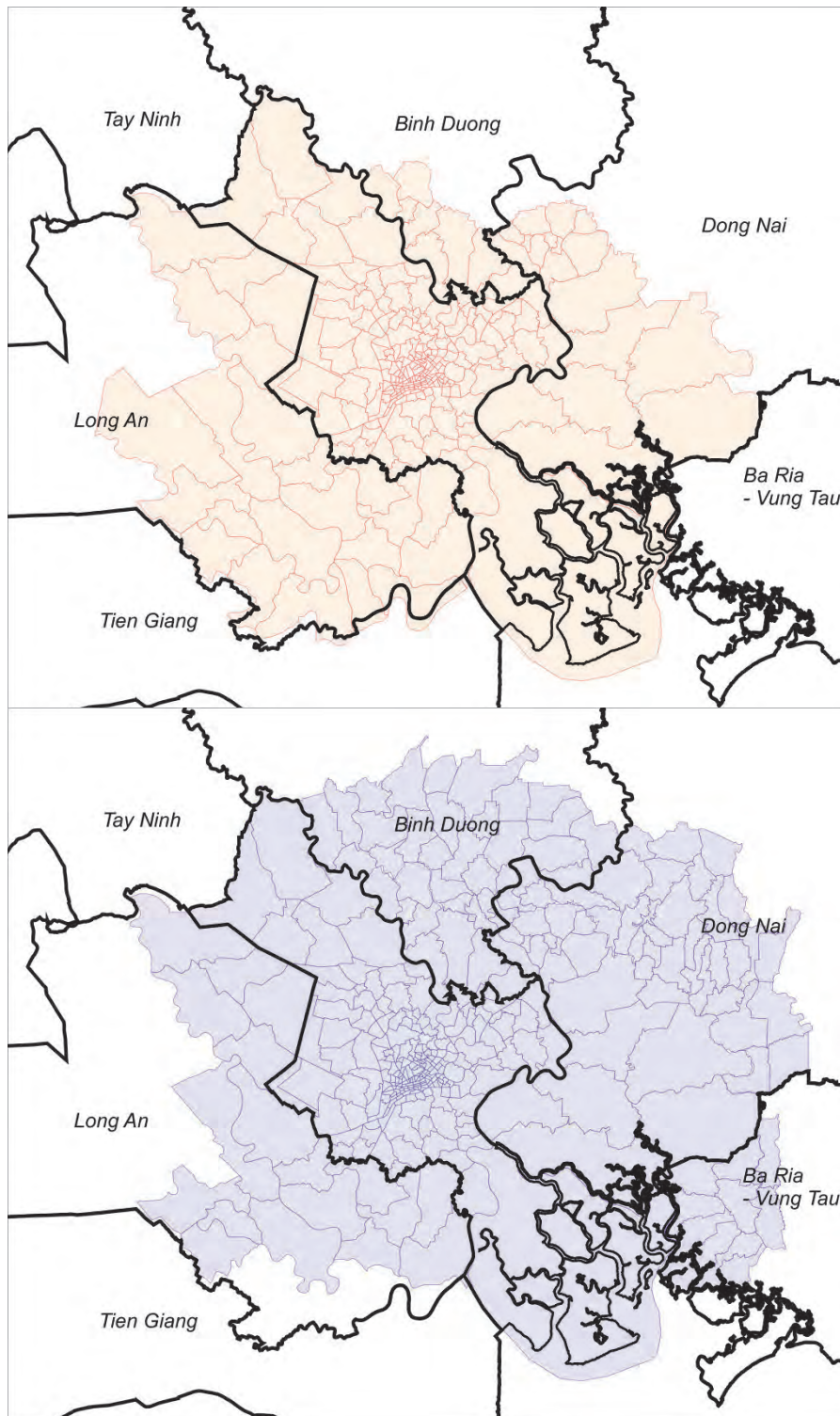
Source: JICA Survey Team

Figure 1.1.1 Survey Area and PT Survey Area by Existing Studies

In terms of traffic demand of trucks for cargo transport, truck traffic demand should be built based on the traffic survey performed in the survey, because objective of the freight demand forecast model prepared by VITRANSS2 is forecast future cargo flow in the whole of Vietnam and it is difficult to estimate intra-provincial cargo flow between international seaports, industrial zones and other facilities in the survey area. In the HOUTRANS, truck trip is estimated by roadside interview survey at major logistic facilities such as seaport and expanded for future demand by throughput of seaport. Currently, location and number of logistics facilities including seaports and industrial zones are quite different to the HOUTRANS. Truck traffic demand should be estimated based on the results of traffic survey performed in the survey.

1.1.1 Review of Traffic Analysis Zone

Traffic analysis zone (TAZ) is defined for traffic demand forecast, responded in the transport network by centroid. TAZ defined by HOUTRANS consists of 270 zones in order to contribute urban road and transport system planning of HCMC, namely, ward-based urban district of HCMC (136 zones), integrated ward-based suburban district (73 zones), outer area (56 zones) and external of study area (5 zones). A METRO follows HOUTRANS's zone system and consists of 313 zones including 275 zones in PT survey area and 38 external zones.



Source: JICA Survey Team

Figure 1.1.2 Traffic Analysis Zone by HOUTRANS (upper) and METROS (lower)

1.1.2 Review of Trip Generation Model

The PT survey carried out in 2002 by HOUTRANS includes about 20,000 households in the study area (sample ratio is about 1%). Person trip generation models prepared by HOUTRANS are estimated by multiple liner regression analysis and consist of four (4) household groups and five (5) trip purposes as shown in following tables.

Table 1.1.2 Trip Rate by HOUTRANS

Household Group	Availability of vehicle for use	Trip Purpose				
		To work	To school	Private	Business	To home
Owing Car	Available	0.897	0.172	1.466	0.406	2.125
	Not-available	0.190	0.485	0.792	0.079	1.341
Owing 2 Motorcycles	Available	0.757	0.214	0.853	0.069	1.615
	Not-available	0.180	0.378	0.718	0.020	1.207
Owing 1 motorcycle	Available	0.639	0.208	0.926	0.067	1.562
	Not-available	0.211	0.364	0.737	0.017	1.235
Population of Non-motorized HHs		0.420	0.258	0.716	0.023	1.289

Note: Trip rate by person.

Source: HOUTRANS

Table 1.1.3 Trip Production Model Parameters by HOUTRANS

Trip purpose	Variable	Household Group			
		Owing car	Owing 2 MCs	Owing 1 MC	Non-Motorized
To work	Resident primary workers	-	-	1.292	-
	Resident secondary workers	-	1.306	1.150	-
	Resident tertiary workers	-	1.179	0.875	-
	Resident workers total	1.392	-	-	1.054
	Constant	33.1	31.9	28.6	-
To school	Resident primary students	-	1.331	1.042	-
	Resident secondary students	-	1.243	1.102	-
	Resident tertiary students	-	0.927	1.388	-
	Resident student total	1.195	-	-	1.076
	Constant	-	-	-	-
Private	Populatioin	0.989	0.726	0.667	0.668
	Workers total	1.125	0.331	0.237	-
	Constant	-	-	-	106.5
Business	Secondary workers	-	0.072	0.035	-
	Tertiary workers	0.787	0.154	0.104	0.053
	Constant	55.5	32.2	178.6	22.9
To home	Population	0.077	-	0.348	0.673
	Tertiary workers	-	0.269	-	-
	Workers total	3.152	2.667	2.256	1.456
	Constant	248.1	-	1298.2	51.9

Source: HOUTRANS

Table 1.1.4 Trip Attraction Model Parameters by HOUTRANS

Trip purpose	Variable	Household Group			
		Owing car	Owing 2 MCs	Owing 1 MC	Non-Motorized
To work	Primary workers	0.174	-	1.228	1.453
	Secondary workers	2.682	1.356	1.202	0.995
	Tertiary workers	1.058	1.276	0.951	0.791
	Constant	53.7	39.5	-	6.3
To school	Primary students	-	0.997	1.085	-
	Secondary students	-	1.367	1.175	-
	Tertiary Students	-	1.286	1.000	-
	Students total	1.115	-	-	1.108
Private	Population	0.989	0.340	0.308	0.510
	Tertiary workers	1.125	1.846	2.166	0.580
	Constant	159.1	-	708	185.5
	Business	Population	-	-	-
Business	Secondary workers	-	0.097	0.051	-
	Tertiary workers	0.492	0.153	0.097	-
	Workers total	65.9	-	-	-
	Constant	-	-	171.4	21.7
To home	Population	2.040	-	1.403	1.225
	Resident workers total	0.075	1.604	-	0.238
	Constant	2.1	-	604.9	-

Source: HOUTRANS

In 2013, PT survey was carried out by METROS also includes about 20,000 households in the study area. Average trip rates in 2002 and 2013 are summarized in below.

Table 1.1.5 Estimated Trip Rate based on the PT database

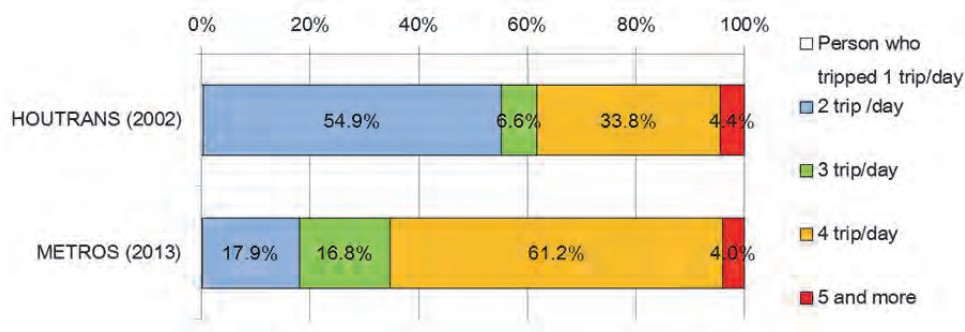
	HOUTRANS (2002)			METROS (2013)		
	HCMC	Other study area	Total	HCMC	Other study area	Total
Population ('000)	5,410	2,244	7,654	7,431	2,560	9,991
Trips ('000)	13,383	5,678	19,061	23,601	7,920	31,521
Ratio of trip maker	85%	86%	85%	91%	91%	91%
Net trip rate	2.9	2.9	2.9	3.5	3.4	3.5
Gross trip rate	2.5	2.5	2.5	3.2	3.1	3.2

Note: Study team re-calculated based on HIS database prepared by the studies, therefore, aggregated of zones included in HIS database.

Source: JICA Survey Team

Net trip rate, namely, average number of trips per day per trip maker increased from 2.9 to 3.5 in 2002 and 2013 respectively. A ratio of trip maker to total population including non-trip maker also increased from 85% to 91% in 2002 and 2013 respectively. As the results, gross trip rate, namely, average number of trips per day per person including non-trip maker increased from 2.5 to 3.2.

Increase of net trip rate is caused by change of composition of number of trips as shown in the following figure.



Note: Survey team re-calculated based on HIS database prepared by the studies.
 Source: JICA Survey Team

Figure 1.1.3 Composition of Number of Trips by Trip Maker

As shown in the following figure, increase of trip between 2002 and 2013 is originated in increase of private trip (home based and non-home based) and to home trip of private trip.



Note: Survey team re-calculated based on HIS database prepared by the studies.
 Source: JICA Survey Team

Figure 1.1.4 Net Trip Rate by Trip Purpose

1.1.3 Review of Trip Distribution Model

The following typical gravity model is adopted as person trip distribution model in the HOUTRANS.

$$T_{ij} = \kappa \cdot G_i^\alpha \cdot A_j^\beta \cdot d_{ij}^\gamma$$

Where,

T_{ij} : Number of inter-zonal trips between zone i and j ,

d_{ij} : Inter-zonal impedance between zone i and zone j ,

G_i : Trip generation of zone i ,

A_j : Trip attraction of zone j , and

$\kappa, \alpha, \beta, \gamma$: Parameters.

Table 1.1.6 Trip Distribution Model Parameters by HOUTRANS

Household Group	Availability of personal vehicle	Trip Purpose	Parameters				
			κ	α	B	γ	R^2
Owing car	Available	To work	1.392	0.332	0.309	-0.018	0.525
		To school	2.780	0.413	0.190	-0.030	0.636
		Private	0.968	0.414	0.320	-0.041	0.612
		Business	1.068	0.446	0.442	0.009	0.831
		To home	1.385	0.259	0.343	-0.017	0.489
	Not-available	To work	3.022	0.329	0.316	-0.026	0.594
		To school	0.859	0.497	0.324	-0.038	0.657
		Private	3.222	0.310	0.287	-0.030	0.617
		Business	1.000	0.000	1.000	0.000	1.000
		To home	3.149	0.268	0.263	-0.021	0.413
Owing 2 motorcycles	Available	To work	0.732	0.326	0.266	-0.290	0.351
		To school	3.587	0.249	0.164	-0.115	0.319
		Private	1.306	0.321	0.224	-0.179	0.287
		Business	2.844	0.297	0.188	0.112	0.366
		To home	0.247	0.334	0.368	-0.340	0.377
	Not-available	To work	0.634	0.283	0.369	-0.029	0.369
		To school	1.289	0.338	0.197	-0.244	0.313
		Private	0.793	0.303	0.327	-0.132	0.320
		Business	0.815	0.362	0.477	0.133	0.752
		To home	0.362	0.315	0.357	-0.271	0.310
Owing 1 motorcycle	Available	To work	0.434	0.407	0.297	-0.144	0.362
		To school	1.756	0.472	0.162	-0.032	0.540
		Private	0.290	0.474	0.303	-0.021	0.404
		Business	1.697	0.287	0.382	0.093	0.555
		To home	0.112	0.359	0.499	-0.212	0.398
	Not-available	To work	0.382	0.388	0.357	-0.048	0.416
		To school	0.291	0.396	0.357	-0.220	0.366
		Private	0.127	0.467	0.406	-0.174	0.447
		Business	0.631	0.528	0.398	0.019	0.768
		To home	0.024	0.501	0.505	-0.301	0.415
Non-motorized Households	To work	1.206	0.298	0.339	-0.081	0.471	
	To school	1.624	0.272	0.333	-0.043	0.522	
	Private	0.882	0.359	0.332	-0.022	0.468	
	Business	0.794	0.538	0.447	-0.101	0.830	
	To home	0.449	0.380	0.349	-0.145	0.405	

Source: HOUTRANS

1.1.4 Review of Modal Split Model

Modal split model prepared by HOUTRANS consists of two models, namely, dis-aggregate model for walk trip and aggregated logit model for other transport mode.

Modal split model for walk trip is estimated by five (5) trip purposes and two (2) household groups by the following formula.

$$P_{ij}^{lk} = \frac{1}{1 + e^{\alpha d_{ij} + \beta}}$$

Where,

P_{ij}^{lk} : Probability of walk trips of purpose k and ownership l between zone i and j ,

d_{ij} : Inter-zonal impedance between zone i and zone j ,

α, β : Parameters

Table 1.1.7 Walk Trip Model Parameters by HOUTRANS

Purpose	To work		To school		Private		Business		To home	
	Avail able	Not-Avail able	Avail able	Not-Avail able	Avail able	Not-Avail able	Avail able	Not-Avail able	Avail able	Not-Avail able
α	0.364	0.289	1.335	0.254	0.512	0.239	1.151	0.170	0.364	0.344
t-value	5.12	2.64	6.11	4.72	6.49	7.25	2.19	2.73	5.59	4.54
B	2.076	0.201	1.324	0.412	1.294	0.064	1.467	0.787	1.781	-0.240
t-value	4.79	1.42	2.63	1.26	4.74	1.19	1.94	2.57	4.99	-1.58
R^2	0.97	0.97	0.95	0.88	0.95	0.96	0.92	0.84	0.96	0.95

Source: HOUTRANS

Modal split model for other transport mode is also estimated by five trip purposes by the following formula.

$$P_{ij}^{mk} = \frac{e^{\lambda \cdot V_{ij}^{mk}}}{\sum_q e^{\lambda \cdot V_{ij}^{qk}}}$$

Where,

P_{ij}^{mk} : Probability of mode m for purpose k and ownership l between zone i and j ,

V_{ij}^{mk} : Indirect utility function by mode m for purpose k between zone i and zone j ,

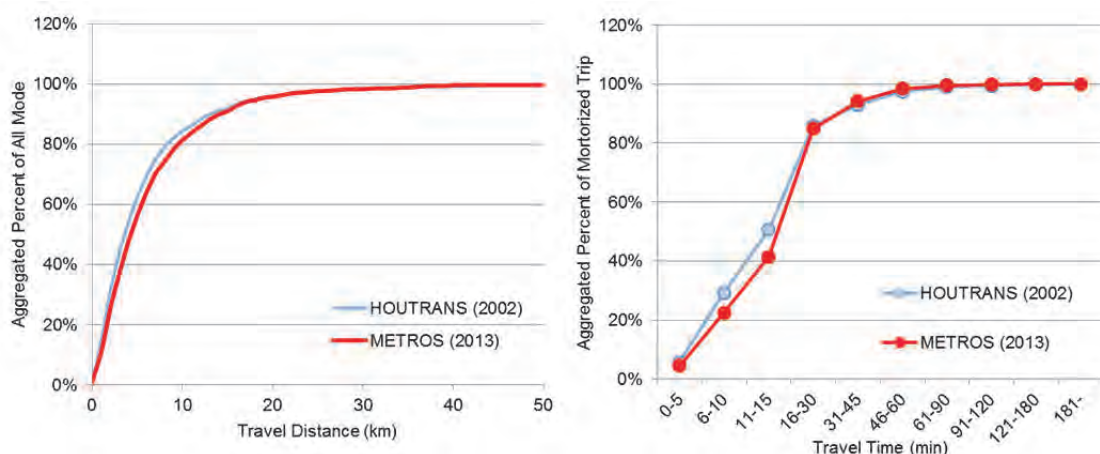
γ : Parameters.

Table 1.1.8 Modal Split Model Parameters by HOUTRANS

Model & Modal Split Model Parameters		Trip Purpose				
Mode	Parameter	To work	To school	Private	Business	To home
Bicycle	Constant	0.7000	0.7000	0.7000	0.7000	0.7000
	Time	-	-	-	-4.0144	-
	Distance	-0.1500	-0.1500	-0.1500	-0.1500	-0.1500
	VOC (VND)	-0.0069	-0.0151	-0.0116	-	-0.0108
	Single MC HH (0 or 1)	1.7450	2.0072	2.4524	-	2.2113
	No vehicle HH (0 or 1)	2.3793	2.1256	1.2833	-	1.6730
	Veh-available (0 or 1)	-0.9700	-	-2.7932	-	-1.0446
Motorcycle	Constant	-0.2600	-0.2600	-0.2600	-0.2600	-0.2600
	Time	-	-	-	-3.7722	-
	VOC (VND)	-0.0010	-0.0025	-0.0018	-	-0.0017
	Multi MC HH (0 or 1)	1.1726	0.9392	2.2827	-	1.3537
	Single MC HH (0 or 1)	1.5450	1.8338	2.7616	-	2.1930
	Veh-available (0 or 1)	2.9246	3.5250	-	-	2.4340
Car	Time	-	-	-	-6.4922	-
	VOC (VND)	0.00030	0.00093	0.00060	-	-0.00057
	Car own HH (0 or 1)	2.2974	-	-	-	2.2503
Bus	Constant	0.3250	0.3250	0.3250	0.3250	0.3250
	Bus fare	-0.00096	-0.00359	-0.00225	-0.00018	-0.00228
	Bus time	-	-	-	-9.6750	-
	Multi MC HH (0 or 1)	-1.2991	-	-	-	-
	Single MC HH (0 or 1)	-0.9346	-	-	-	-
	Veh-available (0 or 1)	-	-	-1.8453	-	-0.4152

Source: HOUTRANS

In terms of inter-zonal trip distribution, the share of short trips is decreased in 2013 from 2002 as shown in following figure. Therefore, trip distribution model for inter-zonal trip should be updated based on the results of PT data in 2013 prepared by METROS.



Note: Survey team re-calculated based on HIS database prepared by the studies.
Source: JICA Survey Team

Figure 1.1.5 Trip Length Distribution

1.1.5 Review of Assignment Model

(1) Road Network

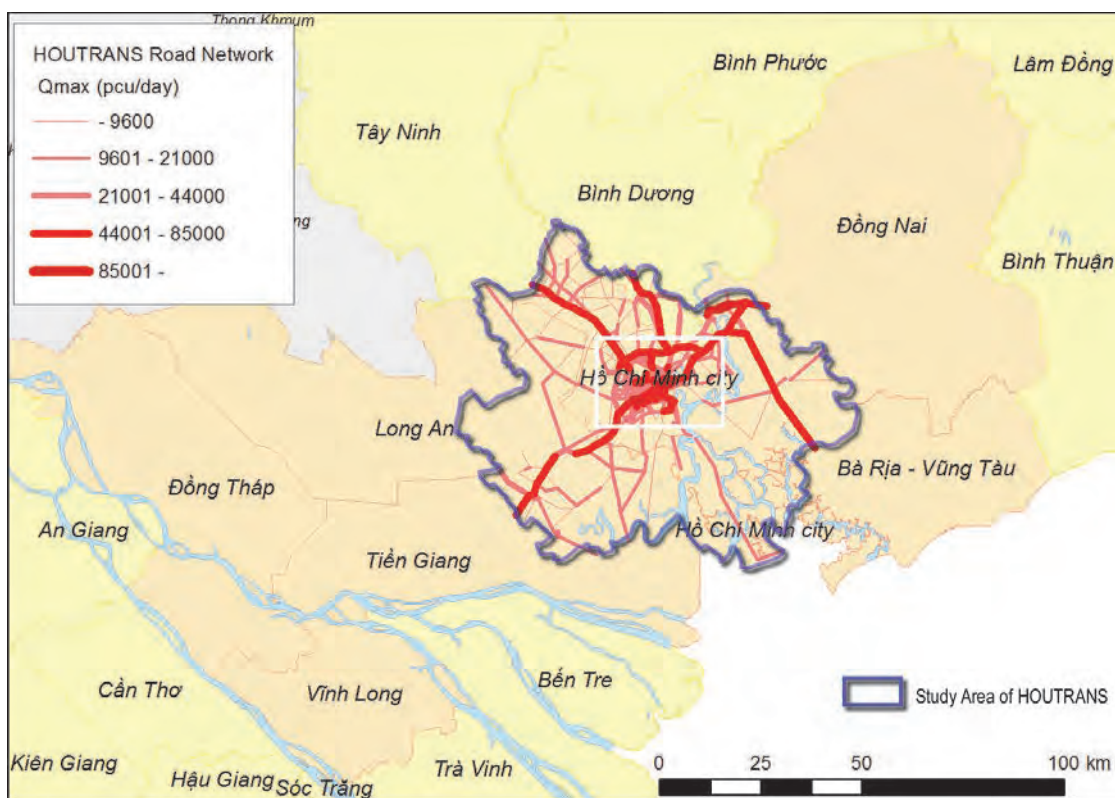
Person trip should be converted to vehicle demand by average vehicle occupancy, and vehicle demand is assigned on road network built in the computer in order to forecast current and future traffic demand. In HOUTRANS, road network is prepared in the study area and the following Q-V conditions are adopted by HOUTRANS for the assignment of traffic demand on road network.

Table 1.1.9 QV Table by HOUTRANS

Class	Urban/ Rural	Vmax	Carriage-way		Qmax pcu/day		
			Min	Max	Service Level1	Service Level2	Service Level3
Car Exclusive	Urban	80			26,000		
		100			88,000		
		100			132,000		
	Rural	70			20,000		
		80			70,000		
80				106,000			
Primary	Urban	30		<6m	16,250	17,500	20,000
		35	7m	<12m	16,250	17,500	20,000
		40	13m	<20m	56,250	63,750	70,000
		45	21m	<28m	85,000	95,000	105,000
		50	29m		112,500	126,250	141,250
	Rural	40		<6m	17,000	19,000	23,000
		45	7m	<12m	17,000	19,000	23,000
		50	13m	<20m	59,000	67,000	79,000
		55	21m	<28m	89,000	101,000	119,000
		60	29m		119,000	135,000	158,000
Secondary	Urban	30		<6m	13,750	16,250	17,500
		35	7m	<12m	13,750	16,250	17,500
		40	13m	<20m	48,750	55,000	61,250
		45	21m	<28m	73,750	83,750	92,500
		50	29m		98,750	111,250	123,750
	Rural	40		<6m	13,000	15,000	18,000
		45	7m	<12m	13,000	15,000	18,000
		50	13m	<20m	46,000	52,000	62,000
		55	21m	<28m	69,000	79,000	92,000
		60	29m		92,000	105,000	123,000
Tertiary	Urban	25		<6m	13,750	15,000	17,500
		30	7m	<12m	13,750	15,000	17,500
		35	13m	<20m	47,500	53,750	60,000
	Rural	35		<6m	9,000	11,000	13,000
		40	7m	<12m	9,000	11,000	13,000
		45	13m	<20m	33,000	37,000	44,000

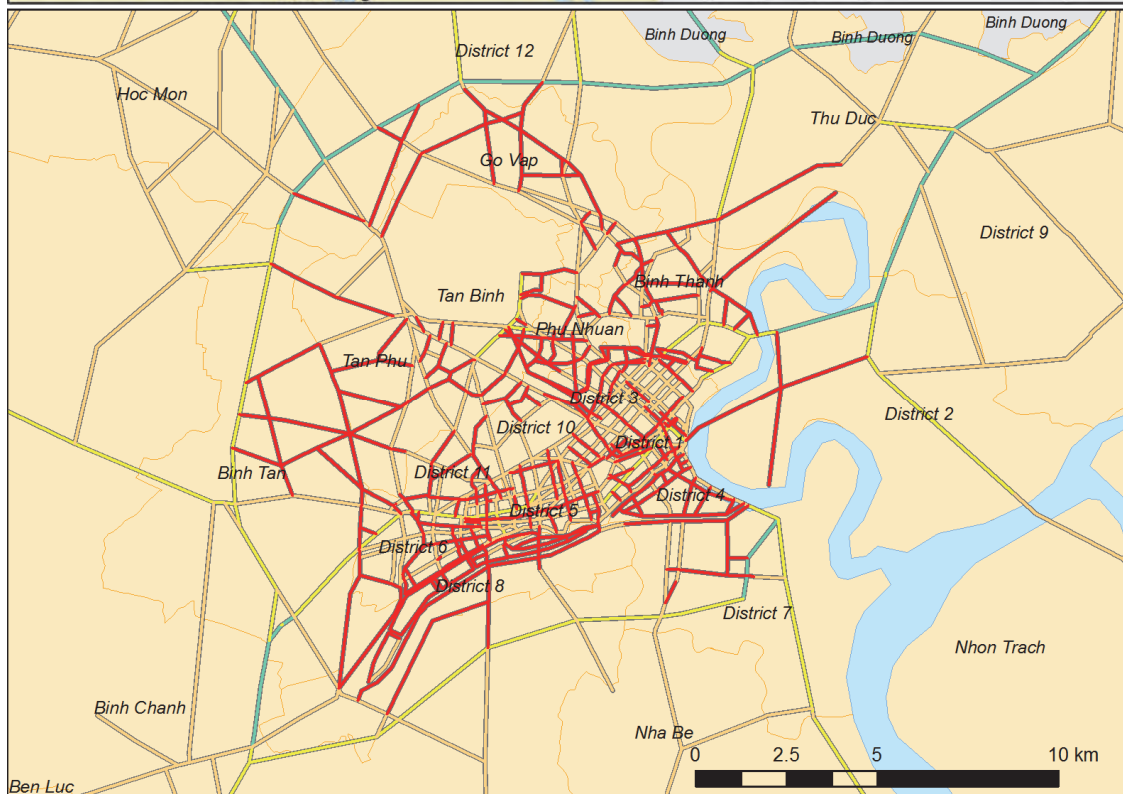
Source: HOUTRANS

In METROS, road network is prepared in whole country of Vietnam including existing future expressway and road development plan relevant to survey area. Q-V conditions of road including development plan defined by METROS, basically, follows Q-V conditions prepared by HOUTRANS with updating.



Note: Road network in 2002
 Source: HOUTRANS

Figure 1.1.6 Road Capacity of HOUTRANS Network



Note: Road network in 2002
Source: HOUTRANS

Figure 1.1.7 Free Flow Speed of HOUTRANS Network

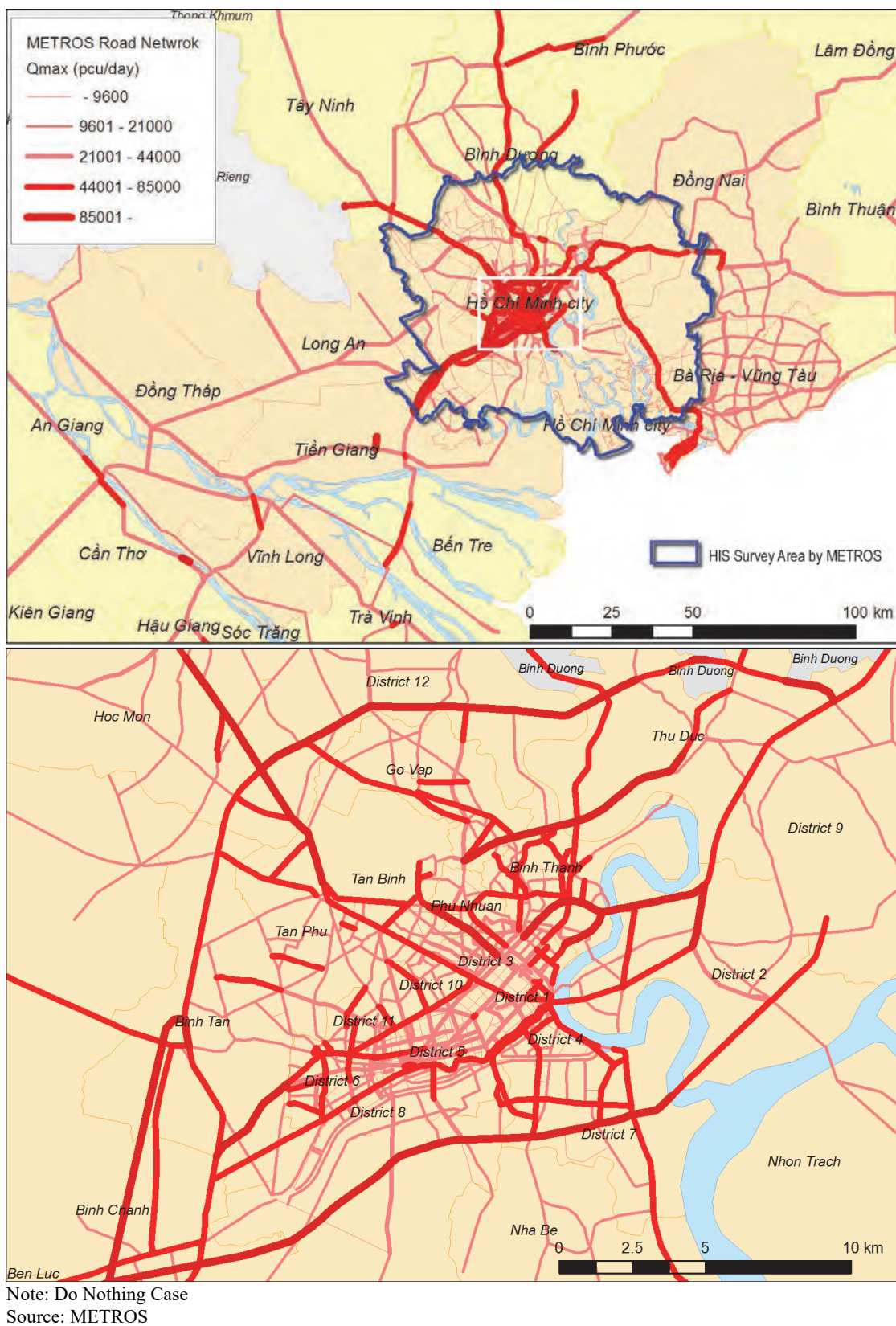


Figure 1.1.8 Road Capacity of METROS Network



Note: Do Nothing Case
 Source: HOUTRANS

Figure 1.1.9 Free Flow Speed of METROS Network

(2) Passenger Car Unit

Following table shows the passenger car unit (PCU) and average vehicle occupancy used by relevant studies in the survey area.

Table 1.1 .10 Existing PCU and Average Vehicle Occupancy

Mode	Passenger Car Unit (PCU)		Ave. Occupancy	
	HOUTRANS (2002)	HCM Outer Ring Road (2010, ADB)	HOUTRANS (2002)	HCM Outer Ring Road (2010, ADB)
Bicycle	0.2	0.2	1.1	1.1
Motorcycle	0.2	0.3	1.5	1.3
Car	1.0	1.0	2.0	2.0
Mini bus	2.0	1.5	8.2	21.6
Standard bus		2.5		36.0
Truck	2.5	2.5	2.0	2.0
Others	1.0	-	1.3	-

Source: Each study reports.

(3) Time Value of Vehicle

Time value of vehicle is a parameter for route choice in the traffic assignment model and it is used for the calculation of socio-economic benefit generated by travel time saving realized by implementation of road/bridge project in economic analysis. Following table shows the value of time adopted by existing studies relevant to road and bridge in the survey area.

Table 1.1 .11 Time Value of Existing Studies

Study	Year	Passenger	Motorcycle	Passenger Car	Mini bus	Large Bus	Small truck	Large truck	Container truck
HOUTRANS (JICA)	2002	-	0.48	0.57	0.48		N/A	N/A	N/A
	2010	-	0.98	1.29	0.98		N/A	N/A	N/A
	2015	-	1.31	1.74	1.31		N/A	N/A	N/A
	2020	-	1.74	2.36	1.74		N/A	N/A	N/A
VITRANSS2 (JICA)	2008	2.5	-	-	-	-	-	-	-
	2010	2.63	-	-	-	-	-	-	-
	2020	4.34	-	-	-	-	-	-	-
	2030	6.61	-	-	-	-	-	-	-
Study on Phuoc An Bridge Construction Project (METI)	2009		N/A	3.36	2.02		2.76		
	2010		N/A	3.5	2.11		2.88		
	2020		N/A	4.63	2.32		3.81		
	2030		N/A	7.08	3.54		5.82		
Preparing the Ho Chi Minh City Outer Ring Roads Technical Assistance Loan Project (ADB) *	2010		1.19	1.5	0.53		1.12		
	2020		1.81	2.29	0.81		1.71		
	2030		2.76	3.49	1.23		2.6		
Study on the Second My Thuan Bridge Construction Project (METI)	2010		N/A	3.8	8.1	21.8	N/A	N/A	N/A

Note: Unit is USD per hour. Time values in HCMC Outer Ring Road are time value per vehicle passenger.

Source: Each study report

(4) Vehicle Operating Cost

Vehicle operating cost is a distance-related cost for travel by vehicle and it is used for the calculation of socio-economic benefit generated by travel distance reduction and improvement of travel speed by implementation of road/bridge project for the economic analysis. Following table shows the vehicle operating cost (VOC) used in existing studies relevant to road and bridge project in the survey area.

Table 1.1.12 VOCs prepared by Existing Studies

Study	Base Year	Motor-cycle	Passenger car	Mini bus	Large bus	Small truck	Large truck	Container truck	Note
HOUTRANS (JICA)	2002	22.3	60.6	122		N/A	N/A	N/A	value at 40km/h
VITRANSS2 (JICA)	2008	N/A	169.4	249.9	375.8	340.9	370.4		value at 40km/h
Study on Phuoc An Bridge Construction Project (METI)	2009	N/A	85.0	145.5		359.0			
Preparing the Ho Chi Minh City Outer Ring Roads Technical Assistance Loan Project (ADB)	2010	49	175	370	486	353	465	651	
Study on the Second My Thuan Bridge Construction Project (METI)	2010	N/A	107.9	338		359			value at 40km/h

Note: Unit is USD per 1,000 km

Source: Each study report

The following table shows the VOCs used in relevant studies in 2016 price by GDP deflator of Vietnam prepared by World Economic Outlook Database (IMF, 2016).

Table 1.1.13 VOCs prepared by Existing Studies in 2016 Price

Study	Year	Motor-cycle	Passenger car	Mini bus	Large bus	Small truck	Large truck	Container truck	Note
HOUTRANS (JICA)	2016	53.5	145.3	292.6		N/A	N/A	N/A	value at 40km/h
VITRANSS2 (JICA)		N/A	218.3	322.0	484.3	439.3	477.3		value at 40km/h
Study on Phuoc An Bridge Construction Project (METI)		N/A	111.7	191.2		471.7			
Preparing the Ho Chi Minh City Outer Ring Roads Technical Assistance Loan Project (ADB)		61.8	220.7	466.6	612.9	445.1	586.4	820.9	
Study on the Second My Thuan Bridge Construction Project (METI)		N/A	136.1	426.2		452.7			value at 40km/h

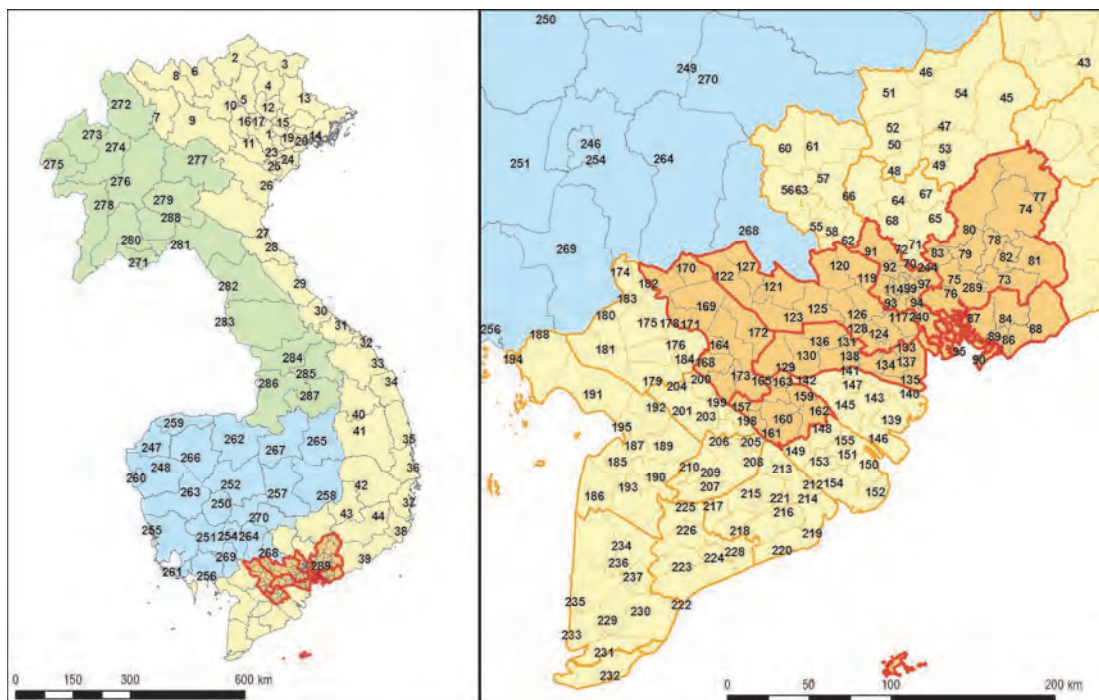
Note: VOCs are USD per 1,000 km

Source: JICA Survey Team

1.2 Rebuilding of Traffic Demand Forecast Model

1.2.1 Traffic Analysis Zone System

In the survey, TAZ covers Vietnam, Cambodia and Laos. Basically, TAZ is defined by province except survey area and vicinity province, and nine (9) major transport facilities such as seaport and airport. In total, TAZ consists of 289 zones as shown in following table.



Source: JICA Survey Team

Figure 1.2.1 Traffic Analysis Zone System

Table 1.2.1 Traffic Analysis Zone System

TAZ	Survey Area	Country	Province	District	TAZ	Survey Area	Country	Province	District	TAZ	Survey Area	Country	Province	District
1		Vietnam	Ha Noi		97	X	Vietnam	HCMC	District 2	193		Vietnam	Kien Giang	U Minh Thuong
2		Vietnam	Ha Giang		98	X	Vietnam	HCMC	District 3	194		Vietnam	Kien Giang	Ha Tien
3		Vietnam	Cao Bang		99	X	Vietnam	HCMC	District 4	195		Vietnam	Kien Giang	Bach Gia
4		Vietnam	Bac Kan		100	X	Vietnam	HCMC	District 5	196		Vietnam	Can Tho	Binh Thuy
5		Vietnam	Tuyen Quang		101	X	Vietnam	HCMC	District 6	197		Vietnam	Can Tho	Cai Rang
6		Vietnam	Lao Cai		102	X	Vietnam	HCMC	District 7	198		Vietnam	Can Tho	Ninh Kieu
7		Vietnam	Dien Bien		103	X	Vietnam	HCMC	District 8	199		Vietnam	Can Tho	O Mon
8		Vietnam	Lai Chau		104	X	Vietnam	HCMC	District 9	200		Vietnam	Can Tho	Thoi Not
9		Vietnam	Son La		105	X	Vietnam	HCMC	District 10	201		Vietnam	Can Tho	Co Do
10		Vietnam	Yen Bai		106	X	Vietnam	HCMC	District 11	202		Vietnam	Can Tho	Phong Dien
11		Vietnam	Hoa Binh		107	X	Vietnam	HCMC	District 12	203		Vietnam	Can Tho	Thoi Lai
12		Vietnam	Thai Nguyen		108	X	Vietnam	HCMC	Go Vap	204		Vietnam	Can Tho	Vinh Thanh
13		Vietnam	Lang Son		109	X	Vietnam	HCMC	Tan Binh	205		Vietnam	Hau Giang	Chau Thanh
14		Vietnam	Quang Ninh		110	X	Vietnam	HCMC	Tan Phu	206		Vietnam	Hau Giang	Chau Thanh A
15		Vietnam	Bac Giang		111	X	Vietnam	HCMC	Binh Thanh	207		Vietnam	Hau Giang	Long My
16		Vietnam	Phu Tho		112	X	Vietnam	HCMC	Phu Nhuan	208		Vietnam	Hau Giang	Phung Hiep
17		Vietnam	Vinh Phuc		113	X	Vietnam	HCMC	Thu Duc	209		Vietnam	Hau Giang	Vi Thuy
18		Vietnam	Bac Ninh		114	X	Vietnam	HCMC	Binh Tan	210		Vietnam	Hau Giang	Vi Thanh
19		Vietnam	Hai Duong		115	X	Vietnam	Long An	Ben Luc	211		Vietnam	Soc Trang	Chau Thanh
20		Vietnam	Hai Phong		116	X	Vietnam	Long An	Can Duoc	212		Vietnam	Soc Trang	Cu Lao Dung
21		Vietnam	Hung Yen		117	X	Vietnam	Long An	Can Giuoc	213		Vietnam	Soc Trang	Kc Sach
22		Vietnam	Thai Binh		118	X	Vietnam	Long An	Chau Thanh	214		Vietnam	Soc Trang	Long Phu
23		Vietnam	Ha Nam		119	X	Vietnam	Long An	Duc Hoa	215		Vietnam	Soc Trang	My Tu
24		Vietnam	Nam Dinh		120	X	Vietnam	Long An	Duc Hue	216		Vietnam	Soc Trang	My Xuyen
25		Vietnam	Ninh Binh		121	X	Vietnam	Long An	Moc Hoa	217		Vietnam	Soc Trang	Nga Nam
26		Vietnam	Thanh Hoa		122	X	Vietnam	Long An	Tan Hung	218		Vietnam	Soc Trang	Thanh Tri
27		Vietnam	Nghe An		123	X	Vietnam	Long An	Tan Thanh	219		Vietnam	Soc Trang	Tran De
28		Vietnam	Ha Tinh		124	X	Vietnam	Long An	Tan Tru	220		Vietnam	Soc Trang	Ving Chau
29		Vietnam	Quang Binh		125	X	Vietnam	Long An	Thanh Hoa	221		Vietnam	Soc Trang	Soc Trang
30		Vietnam	Quang Tri		126	X	Vietnam	Long An	Thu Thua	222		Vietnam	Bac Lieu	Dong Hai
31		Vietnam	Thua Thien Hue		127	X	Vietnam	Long An	Ving Hung	223		Vietnam	Bac Lieu	Gia Rai
32		Vietnam	Da Nang		128	X	Vietnam	Long An	Tan An	224		Vietnam	Bac Lieu	Hoa Binh
33		Vietnam	Quang Nam		129	X	Vietnam	Tien Giang	Cai Be	225		Vietnam	Bac Lieu	Hong Dan
34		Vietnam	Quang Ngai		130	X	Vietnam	Tien Giang	Cai Lay	226		Vietnam	Bac Lieu	Phuoc Long
35		Vietnam	Binh Dinh		131	X	Vietnam	Tien Giang	Chau Thanh	227		Vietnam	Bac Lieu	Vinh Loi
36		Vietnam	Phu Yen		132	X	Vietnam	Tien Giang	Cho Gao	228		Vietnam	Bac Lieu	Bac Lieu
37		Vietnam	Khanh Hoa		133	X	Vietnam	Tien Giang	Go Cong Dong	229		Vietnam	Ca Mau	Cai Nuoc
38		Vietnam	Ninh Thuan		134	X	Vietnam	Tien Giang	Go Cong Tay	230		Vietnam	Ca Mau	Dam Doi
39		Vietnam	Binh Thuan		135	X	Vietnam	Tien Giang	Tan Phu Dong	231		Vietnam	Ca Mau	Nam Can
40		Vietnam	Kon Tum		136	X	Vietnam	Tien Giang	Tan Phuoc	232		Vietnam	Ca Mau	Ngoc Hien
41		Vietnam	Gia Lai		137	X	Vietnam	Tien Giang	Go Cong	233		Vietnam	Ca Mau	Phu Tan
42		Vietnam	Dak Lak		138	X	Vietnam	Tien Giang	My Tho	234		Vietnam	Ca Mau	Thoi Binh
43		Vietnam	Dak Nong		139		Vietnam	Ben Tre	Ba Tri	235		Vietnam	Ca Mau	Tran Van Thoi
44		Vietnam	Lam Dong		140		Vietnam	Ben Tre	Binh Dai	236		Vietnam	Ca Mau	U Minh
45		Vietnam	Binh Phuoc	Bu Dang	141		Vietnam	Ben Tre	Chau Thanh	237		Vietnam	Ca Mau	Ca Mau
46		Vietnam	Binh Phuoc	Bu Dop	142		Vietnam	Ben Tre	Cho Lach	238	X	Vietnam	Cat Lai Container Terminal	
47		Vietnam	Binh Phuoc	Bu Gia Map	143		Vietnam	Ben Tre	Gieng Trom	239	X	Vietnam	Cai Mep - Thi Vai Port	
48		Vietnam	Binh Phuoc	Chon Thanh	144		Vietnam	Ben Tre	Mo Cay Bac	240	X	Vietnam	Hiep Phuoc Port	
49		Vietnam	Binh Phuoc	Dong Phu	145		Vietnam	Ben Tre	Mo Cay Nam	241	X	Vietnam	Dong Nai Port	
50		Vietnam	Binh Phuoc	Hon Quan	146		Vietnam	Ben Tre	Thanh Phu	242	X	Vietnam	Tan Son Nhat International Airport	
51		Vietnam	Binh Phuoc	Loc Ninh	147		Vietnam	Ben Tre	Ben Tre	243	X	Vietnam	Saigon Station	
52		Vietnam	Binh Phuoc	Binh Long	148		Vietnam	Tra Vinh	Cang Long	244	X	Vietnam	Bien Hoa Station	
53		Vietnam	Binh Phuoc	Dong Xoai	149		Vietnam	Tra Vinh	Cau Ke	245	X	Vietnam	Di An Station	
54		Vietnam	Binh Phuoc	Phuoc Long	150		Vietnam	Tra Vinh	Cau Ngang	246		Cambodia	Phnom Penh	
55		Vietnam	Tay Ninh	Ben Cau	151		Vietnam	Tra Vinh	Chau Thanh	247		Cambodia	Banteay Meanchey	
56		Vietnam	Tay Ninh	Chau Thanh	152		Vietnam	Tra Vinh	Duyen Hai	248		Cambodia	Battambang	
57		Vietnam	Tay Ninh	Duong Minh Chau	153		Vietnam	Tra Vinh	Tieu Can	249		Cambodia	Kampong Cham	
58		Vietnam	Tay Ninh	Go Dau	154		Vietnam	Tra Vinh	Tra Cu	250		Cambodia	Kampong Chhnang	
59		Vietnam	Tay Ninh	Hoa Thanh	155		Vietnam	Tra Vinh	Tra Vinh	251		Cambodia	Kampong Speu	
60		Vietnam	Tay Ninh	Tan Bien	156	X	Vietnam	Vinh Long	Binh Minh	252		Cambodia	Kampong Thom	
61		Vietnam	Tay Ninh	Tan Chau	157	X	Vietnam	Vinh Long	Binh Tan	253		Cambodia	Kampot	
62		Vietnam	Tay Ninh	Trang Bang	158	X	Vietnam	Vinh Long	Long Ho	254		Cambodia	Kandal	
63		Vietnam	Tay Ninh	Tay Ninh	159	X	Vietnam	Vinh Long	Mang Thit	255		Cambodia	Koh Kong	
64		Vietnam	Binh Duong	Bau Bang	160	X	Vietnam	Vinh Long	Tam Binh	256		Cambodia	Kep	
65		Vietnam	Binh Duong	Bac Tan Uyen	161	X	Vietnam	Vinh Long	Tra On	257		Cambodia	Kratie	
66		Vietnam	Binh Duong	Dau Tseng	162	X	Vietnam	Vinh Long	Vang Liem	258		Cambodia	Monkuliri	
67		Vietnam	Binh Duong	Phu Gao	163	X	Vietnam	Vinh Long	Vang Long	259		Cambodia	Oddar Meanchey	
68		Vietnam	Binh Duong	Ben Cat	164	X	Vietnam	Dong Thap	Cao Lanh	260		Cambodia	Psailin	
69		Vietnam	Binh Duong	Di An	165	X	Vietnam	Dong Thap	Chau Thanh	261		Cambodia	Preah Sihanouk	
70		Vietnam	Binh Duong	Tluon An	166	X	Vietnam	Dong Thap	Hong Ngu	262		Cambodia	Preah Vilhear	
71		Vietnam	Binh Duong	Tan Uyen	167	X	Vietnam	Dong Thap	Lai Vung	263		Cambodia	Pursat	
72		Vietnam	Binh Duong	Thu Dau Mot	168	X	Vietnam	Dong Thap	Lap Vo	264		Cambodia	Prey Veng	
73	X	Vietnam	Dong Nai	Cam My	169	X	Vietnam	Dong Thap	Tam Nong	265		Cambodia	Ratanakiri	
74	X	Vietnam	Dong Nai	Dinh Quan	170	X	Vietnam	Dong Thap	Tan Hong	266		Cambodia	Siem Reap	
75	X	Vietnam	Dong Nai	Long Thanh	171	X	Vietnam	Dong Thap	Thanh Binh	267		Cambodia	Sung Treng	
76	X	Vietnam	Dong Nai	Nhon Trach	172	X	Vietnam	Dong Thap	Thap Muoi	268		Cambodia	Svay Rieng	
77	X	Vietnam	Dong Nai	Tan Phu	173	X	Vietnam	Dong Thap	Sa Dec	269		Cambodia	Takeo	
78	X	Vietnam	Dong Nai	Thong Nhat	174		Vietnam	An Giang	An Phu	270		Cambodia	Tboung Khmum	
79	X	Vietnam	Dong Nai	Trang Bom	175		Vietnam	An Giang	Chau Phu	271		Lao PDR	Vientian Capital	
80	X	Vietnam	Dong Nai	Vinh Cau	176		Vietnam	An Giang	Chau Thanh	272	X	Lao PDR	Phongsaly	
81	X	Vietnam	Dong Nai	Xuan Loc	177		Vietnam	An Giang	Cho Moi	273	X	Lao PDR	Luangnamtha	
82	X	Vietnam	Dong Nai	Long Khanh	178		Vietnam	An Giang	Phu Tan	274	X	Lao PDR	Oudomxay	
83	X	Vietnam	Dong Nai	Bien Hoa	179		Vietnam	An Giang	Thoi Son	275	X	Lao PDR	Bokeo	
84	X	Vietnam	Ba Ria Vung Tau	Chau Duc	180		Vietnam	An Giang	Tinh Bien	276	X	Lao PDR	Luanprabang	
85	X	Vietnam	Ba Ria Vung Tau	Dat Do	181		Vietnam	An Giang	Tri Ton	277	X	Lao PDR	Huaphanh	
86	X	Vietnam	Ba Ria Vung Tau	Long Dien	182		Vietnam	An Giang	Tan Chau	278	X	Lao PDR	Xayabury	
87	X	Vietnam	Ba Ria Vung Tau	Tan Thanh	183		Vietnam	An Giang	Chau Doc	279	X	Lao PDR	Xiengkhuang	
88	X	Vietnam	Ba Ria Vung Tau	Xuyen Moc	184		Vietnam	An Giang	Long Xuyen	280	X	Lao PDR	Vientiane	
89	X	Vietnam	Ba Ria Vung Tau	Ba Ria	185		Vietnam	Kien Giang	An Bien	281	X	Lao PDR	Borikhamxay	
90	X	Vietnam	Ba Ria Vung Tau	Vung Tau	186		Vietnam	Kien Giang	An Minh	282	X	Lao PDR	Khammuane	
91	X	Vietnam	HCMC	Cu Chi	187		Vietnam	Kien Giang	Chau Thanh	283	X	Lao PDR	Savannakhet	
92	X	Vietnam	HCMC	Hoc Mon	188		Vietnam	Kien Giang	Giang Thanh	284	X	Lao PDR	Saravane	
93	X	Vietnam	HCMC	Binh Chanh	189		Vietnam	Kien Giang	Gieng Rieng	285	X	Lao PDR	Sekong	
94	X	Vietnam	HCMC	Nha Be	190		Vietnam	Kien Giang	Go Quao	286	X	Lao PDR	Champassack	
95	X	Vietnam	HCMC	Can Gio	191		Vietnam	Kien Giang	Hon Dat	287	X	Lao PDR	Attapeu	
96	X	Vietnam	HCMC	District 1	192		Vietnam	Kien Giang	Tan Hiep	288	X	Lao PDR	Xaisomboun	
										289	X	Vietnam	LTIA	

Source: JICA Survey Team

1.2.2 Estimation of trip generation model

It is difficult to prepare all explanatory variables used in the trip generation models built by HOUTRANS for the survey area because covering area of PT survey conducted by HOUTRANS and METROS is small proportion of the survey area.

Trip generation model, therefore, is estimated by liner regression of trip production, attraction and population in urban/rural based on the PT database in 2013 prepared by METROS.

$$G_i = \alpha \cdot PopU_i + \beta \cdot PopR_i + C$$

Where,

G_i : Trip production or attraction of zone i ,

$PopU_i$: Urban population of zone i ,

$PopR_i$: Rural population of zone i ,

α, β : Coefficients, and

C : Constant.

Table 1.2.2 Parameters of Generation Model

	α	B	C	Adj.R ²
Trip production	2.87 (16.5)	2.33 (8.57)	131,200 (2.10)	0.897
Trip attraction	2.87 (16.4)	2.33 (8.49)	131,691 (2.09)	0.900

Note: t-value is in parenthesis.

Source: JICA Survey Team

1.2.3 Estimation of trip distribution model

In the survey, zone system is defined by sub-division level such as district in order to collect socio-economic information in the survey area, therefore, trip distribution models should be modified.

Based on the results of PT survey prepared by METROS, intra-zonal trip ratio is estimated by following formula.

$$I_i = \alpha \cdot \ln(Z_i) + \beta$$

Where,

I_i : Intra-zonal trip ratio for zone i ,

Z_i : Area (km²) of zone i , and

α, β : Parameters,

Table 1.2.3 Estimated Intra-zonal Distribution Model parameters

Parameters	Coefficient	t-value
α	0.0745	9.8
β	0.496	16.0
adjusted R ²	0.754	

Source: JICA Survey Team

Based on the results of PT survey in 2013 prepared by METROS, inter-zonal trip, zonal trip production and attraction, distance between origin and destination by sub-division level zone system are computed and following trip distribution model for inter-zonal trip is estimated.

$$T_{ij} = \kappa \cdot P_i^\alpha \cdot A_j^\beta \cdot d_{ij}^\gamma$$

Where,

T_{ij} : Number of inter-zonal trips between zone i and j ,

d_{ij} : Inter-zonal impedance (km) between zone i and zone j ,

P_i : Inter-zonal trip production of zone i ,

A_j : Inter-zonal trip attraction of zone j , and

$\kappa, \alpha, \beta, \gamma$: Parameters

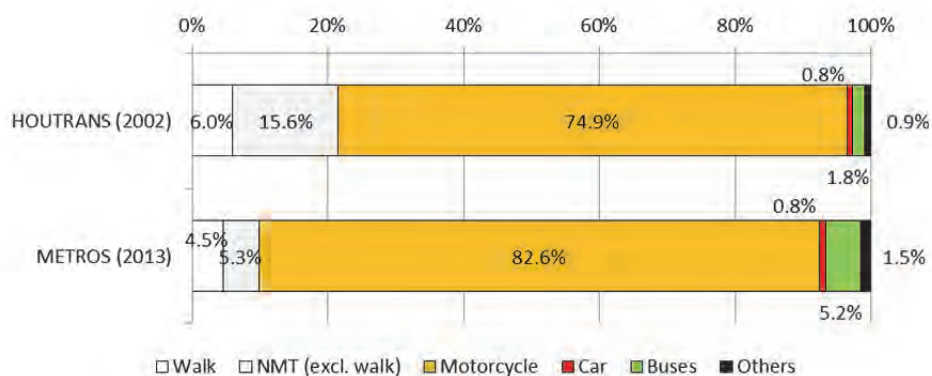
Table 1.2.4 Estimated Inter-zonal Distribution Model parameters

Parameters	Coefficient	t-value
κ	0.0647	-3.86
α	0.498	15.21
β	0.503	15.19
γ	-0.508	-9.11
adjusted R ²	0.517	

Source: JICA Survey Team

1.2.4 Estimation of modal split model

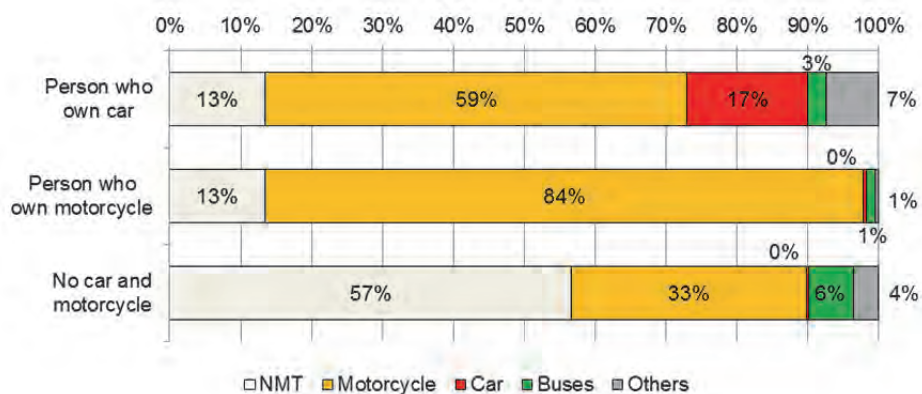
As the result, estimated modal share based on the PT survey is dominated by motorcycle and share of motorcycle increased 74.9% to 82.6% between 2002 and 2013. The share of non-motorized mode such as bicycle decreased to 5.3% in 2013 from 15.6% in 2002. In accordance with extension of bus service, share of buses, especially ordinary bus, increased to 5.2% in 2013.



Note: Survey team re-calculated based on HIS database prepared by the studies.
 Source: JICA Survey Team

Figure 1.2.2 Modal Share of Inter-zonal Trip

Following figure shows the modal share by personal vehicle availability based on the results of PT survey in 2013 by METROS. Person who owns a car but tripped by motorcycle is 59%, it is considered that vehicle availability and actual trip mode is different.



Note: Survey team re-calculated based on HIS database prepared by the studies.
 Source: JICA Survey Team

Figure 1.2.3 Modal Share by Personal Vehicle Availability

For the estimation of modal split model, intra-zonal trip and inter-zonal trip are built separately.

Modal split model for intra-zonal trip is estimated by METROS PT survey results as shown in following formula.

$$P_i = \alpha \cdot \ln(Z_i) + \beta$$

Where,

P_i : Modal share of zone i ,

Z_i : Area (km²) of zone i , and

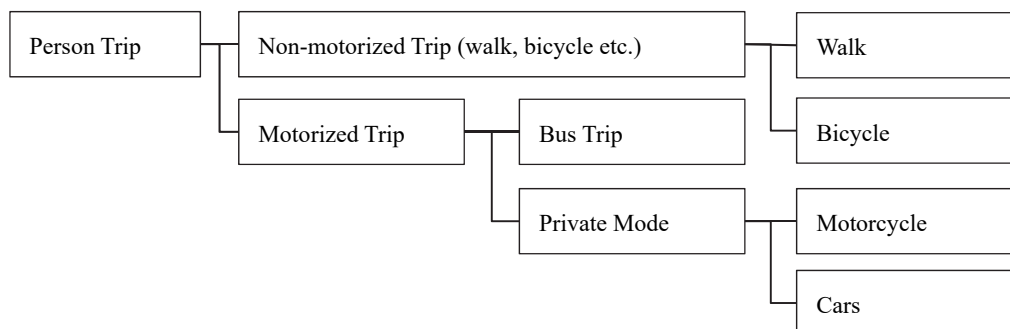
α, β : Parameters

Table 1.2.5 Modal Split Model Parameters for Intra-zonal Trip

Parameter	NMT	Motorcycle	Bus
α	0.514	0.469	-0.00024
t-value	22.253	21.893	-0.119
B	-0.052	0.047	0.0034
t-value	-7.784	7.611	6.878
Adj. R ²	0.722	0.712	0.768

Note: Share of car is estimated by other three modes
Source: JICA Survey Team

Modal split model for inter-zonal trip is estimated by following model structure.



Source: JICA Survey Team

Figure 1.2.4 Modal Split Model Structure for Inter-zonal Trip

Modal split model for NMT is estimated by METROS PT survey results as shown in following aggregated logit model.

$$P_{ij}^{NMT} = \frac{\alpha}{1 + \beta \cdot e^{\gamma \cdot d_{ij}}}$$

$$P_{ij}^{MT} = 1 - P_{ij}^{NMT}$$

Where,

P^{NMT}_{ij} :Probability of NMT between zone i and zone j ,

P^{MT}_{ij} : Probability of motorized mode between zone i and zone j ,

d_{ij} : Distance (km) between zone i and zone j , and

α, β, γ : Parameters

Table 1.2.6 Modal Split Model Parameters for NMT

Parameters	Coefficient
α	1.141
β	0.107
γ	-0.918
Adj. R ²	0.798

Source: JICA Survey Team

Modal split model for bicycle in NMT is estimated by following aggregated logit model.

$$P^{Bc}_{ij} = \frac{\alpha}{1 + \beta \cdot e^{\gamma \cdot d_{ij}}}$$

$$P^{Wk}_{ij} = 1 - P^{Bc}_{ij}$$

Where,

P^{Bc}_{ij} :Probability of bicycle between zone i and zone j ,

P^{Wk}_{ij} :Probability of walk trip between zone i and zone j ,

d_{ij} : Distance between zone i and zone j , and

α, β, γ : Parameters

Table 1.2.7 Modal Split Model Parameters for Bicycle

Parameters	Coefficient
α	1.000
β	62.908
γ	0.670
Adj. R ²	0.654

Source: JICA Survey Team

Modal split model for bus in the motorized trip is estimated as following aggregated logit model by METROS PT survey results.

$$P_{BS} = \frac{\exp(U_{BS})}{\exp(U_{BS}) + \exp(U_{PM})}$$

$$P_{PM} = 1 - P_{BS}$$

Where,

P_{BS} : Probability of bus,

P_{PM} : Probability of private vehicle (motorcycle and car),

U_{BS} : Utilities of bus, and

U_{PM} : Utilities of private vehicle.

Utilities of bus and private vehicle are estimated as follows,

$$U_{BS} = 0.489 \times T_{BS} - 0.0007 \times C_{BS} \quad (R^2=0.650)$$

$$U_{PM} = 0.489 \times T_{PM} - 0.0007 \times C_{PM} + 1.294$$

Where,

T_{BS} : Travel time by bus,

C_{BS} : Bus fare (VND),

T_{PM} : Travel time by private vehicle, and

C_{PM} : VOC and parking fee of private vehicle (VND).

Modal split model for motorcycle is also estimated by aggregated logit model.

$$P_{MC} = \frac{\exp(U_{MC})}{\exp(U_{MC}) + \exp(U_{PC})}$$

$$P_{PC} = 1 - P_{MC}$$

Where,

P_{MC} : Probability of motorcycle,

P_{PC} : Probability of car,

U_{MC} : Utilities of motorcycle, and

U_{PC} : Utilities of car.

Utilities of motorcycle and car are estimated by following formula.

$$U_{MC} = -0.191 \times T_{MC} - 0.00035 \times C_{MC} + 2.167 \quad (R^2=0.690)$$

$$U_{PM} = -0.191 \times T_{PM} - 0.00035 \times C_{PM}$$

Where,

T_{MC} : Travel time by motorcycle,

C_{MC} : VOC and parking fee of motorcycle (VND),

T_{PC} : Travel time by car, and

C_{PC} : VOC and parking fee of car (VND).

1.2.5 Updating of Traffic Assignment Model

(1) Road Network for Traffic Assignment

Road network for the demand forecast in the survey is built by current road network including expressway, national road and major provincial road in Vietnam and national road in Cambodia and Laos. Q-V conditions of road link are basically defined by Q-V conditions of METROS with updating of road network.

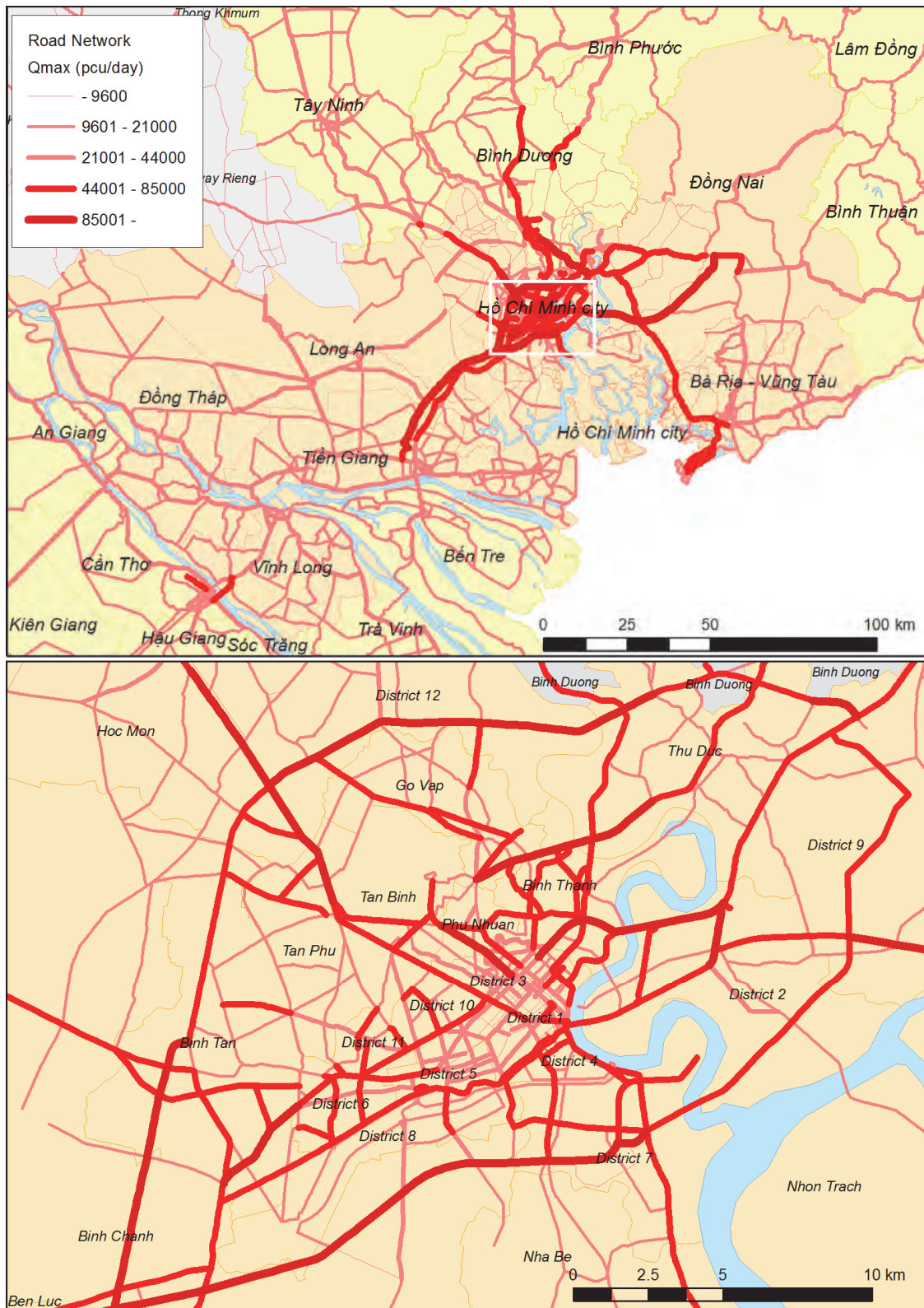


Figure 1.2.5 Current Road Capacity in 2016

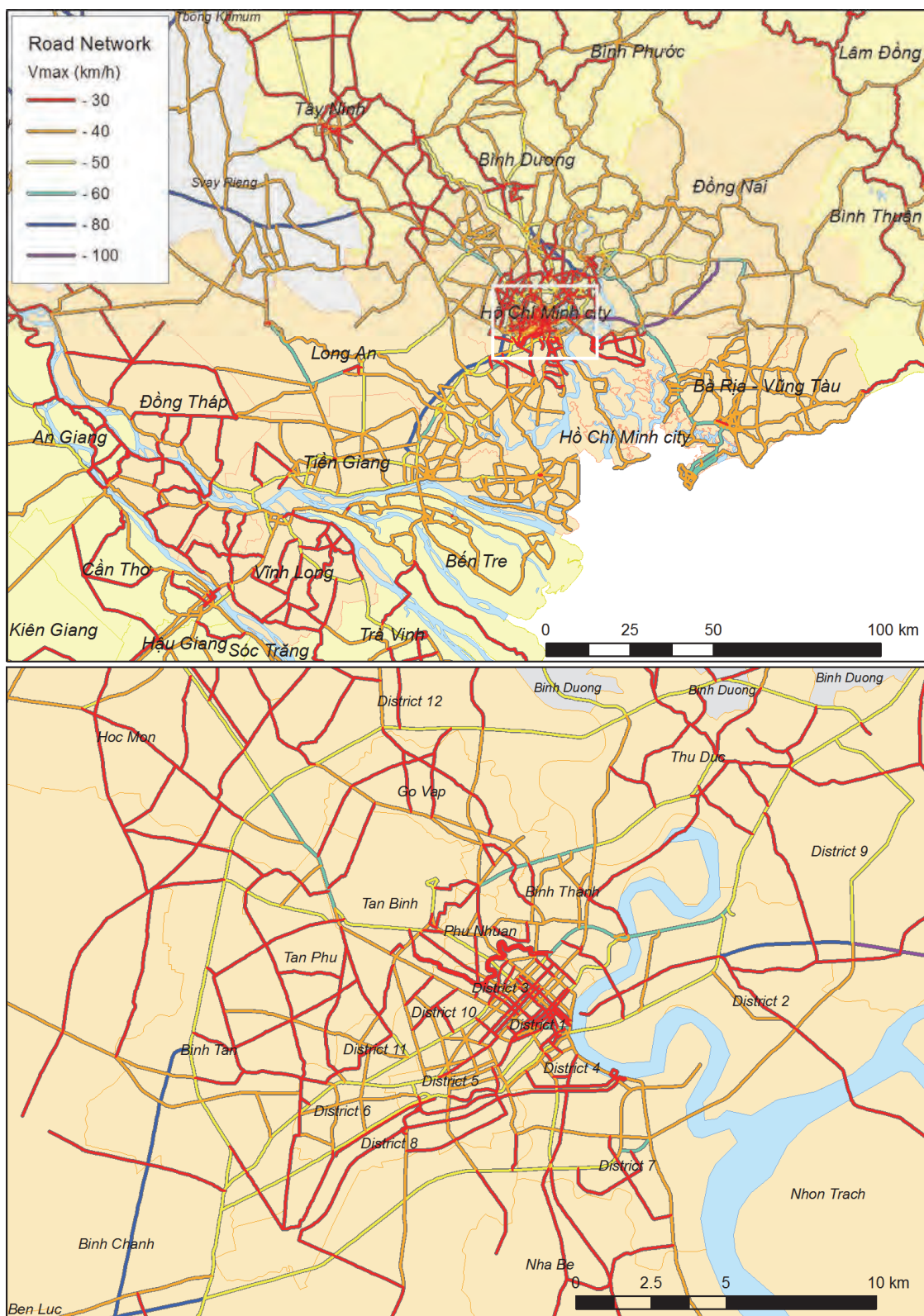


Figure 1.2.6 Free Flow Speed in 2016

(2) Passenger Car Unit

Considering existing Passenger Car Unit (PCU) prepared by existing studies, PCUs used in HCMC Outer Ring Road Study (ADB, 2010) is adopted as basis because of vehicle classification of the survey. Following table shows the PCUs in the survey and average vehicle occupancy based on the roadside interview survey performed in 2016.

Table 1.2.8 PCU and Average Vehicle Occupancy in 2016

Mode	PCU	Ave. Occupancy
Bicycle	0.2	1.1
Motorcycle	0.3	1.5
Car	1.0	2.9
Mini bus	1.5	15.2
Standard bus	2.5	30.0
2 Axles truck	2.0	1.8
3+ Axles truck	2.5	1.8
Trailer	2.75	1.6

Source: JICA Survey Team

(3) Updating of Time Value

Time value for vehicle passenger in the survey is calculated by personal monthly income by trip mode based on the PT database in 2013 prepared by METROS, and estimated time value in 2016 by GDP deflator. In terms of trucks, time value of loading cargo is included in time value per vehicle.

Table 1.2.9 Time Value in 2016

Mode	Value of Time (USD/hour/passenger)		Ave. vehicle occupancy (2016)	Gross Time value of cargo (USD/hour/vehicle)	Value of Time (USD/hour/vehicle)
	2013	2016			
Bicycle	0.72	0.71	1.1	-	0.8
Motorcycle	1.61	1.58	1.5	-	2.4
Car	3.79	3.72	2.9	-	10.8
Mini bus	1.18	1.16	15.2	-	17.6
Large bus			30.0	-	34.8
2 Axles truck	2.41	2.37	1.8	1.1	5.4
3+ Axles truck			1.8	5.5	9.7
Trailer			1.6	6.9	10.7

Note: Time value of vehicle passenger is calculated by same method with HCMC Outer Ring Road (ADB, 2010), namely, 22 working days per month and 8 working hours per day.

Source: JICA Survey Team

Time value of loading cargo of trucks is computed by following formula to estimate opportunity cost of cargo. Interest rate is 0.26% for USD transactions based on overnight rate of State bank of Vietnam.

$$OC = \frac{Vc}{Wc} \times Lw \times Ir$$

Where,

OC: Opportunity cost of cargo per truck,

Vc: Value of cargo,

Wc: Weight of cargo,

Lw: Average gross loading weight per truck, and

Ir: Interest rate (short-term prime lending rates of banks).

Table 1.2.10 Time Value of Cargo per Truck

Type of Commodity	USD/ton (2016)	Loading weight based commodity share by truck			Average value of cargo per ton by commodity		
		2 axles truck	3+ axles truck	Trailer	2 axles truck	3+ axles truck	Trailer
1 Live Animal & Animal Products	3,291	5%	2%	1%	158	69	30
2 Fish and Aquatic Products	5,970	5%	1%	4%	298	39	238
3 Vegetable and Fruits	2,403	7%	6%	4%	178	139	90
4 Grain and Grain Products	396	1%	1%	1%	5	4	2
5 Other Agricultural Products (ex. Plantation Product)	835	9%	7%	7%	72	57	54
6 Foodstuff, Beverage and Animal Food	1,185	20%	8%	5%	239	95	60
7 Petroleum, Oil and Gas	596	4%	19%	6%	27	114	34
8 Coal, Ore, Stone and Sand	89	3%	5%	2%	2	4	2
9 Cement, Construction Material (incl. steel - frame)	741	9%	10%	19%	67	71	142
10 Fertilizer (incl. Urea)	339	2%	2%	0%	6	7	1
11 Garment, Textiles and fabric	11,154	2%	27%	2%	243	3,016	257
12 Wood and Wood Products	1,040	7%	3%	11%	77	35	115
13 Paper and Printed Matter	1,128	4%	1%	1%	46	10	9
14 Metal and Metal Products (excl. construction material)	1,035	4%	3%	24%	43	32	253
15 Industrial Material, Chemicals	2,499	8%	2%	5%	205	50	114
16 Household articles, miscellaneous	3,783	6%	1%	3%	239	48	121
17 Machinery and Parts, Transportation	32,595	3%	2%	5%	903	807	1,720
Average value of loading cargo (USD/ton)		100%	100%	100%	2,807	4,596	3,243
Gross loading cargo per truck (ton/truck including empty truck)					3.7	11.0	19.7
Average value of loading cargo (USD/vehicle including empty truck)					10,316	50,552	63,814
Time value of cargo per truck (incl. empty truck) USD/hour					1.1	5.5	6.9

Note: Value of cargo per ton is calculated by import and export in 2014 of Vietnam prepared by UN Comtrade and adjusted to 2016 price by GDP deflator. Average loading weight by truck and commodity is based on the results of roadside interview survey in 2016.

Source: JICA Survey Team

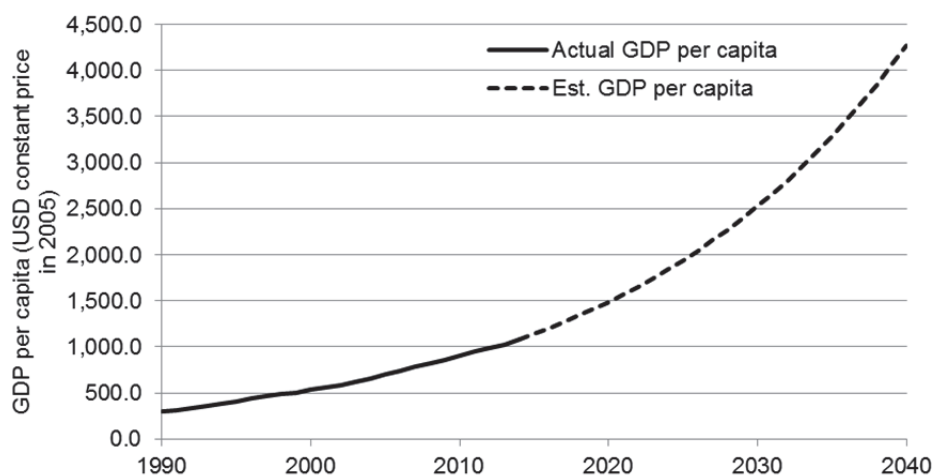
Based on estimated current time value by type of vehicle, future time values are forecasted by annual growth rate of GDP per capita and current value of time by vehicle type. Growth rate of GDP per capita is estimated by following regression model.

$$\log(GDPc) = 107 \times \log(Year) - 350.5 \quad (R^2=0.997)$$

Where,

GDPc : GDP per capita (USD constant price in 2005), and

Year : Year.



Source: HOUTRANS

Figure 1.2.7 Forecasted Future GDP per Capita of Vietnam

As the result, future time value by type of vehicle is decided as shown in following table. Time value is used for calculation of socio-economic benefit generated by travel time saving by implementation of the project.

Table 1.2.11 Time Value for Economic Evaluation

Year	Time Value (USD/hour/vehicle)						
	Motorcycle	Car	Mini bus	Large bus	2 Axles truck	3+ Axles truck	Trailer
2016	2.4	10.8	17.6	34.8	5.4	9.7	10.7
2020	2.9	13.4	21.8	43.1	6.7	12.1	13.3
2030	5.0	22.7	37.0	73.0	11.3	20.4	22.5
2040	8.4	38.3	62.5	123.4	19.1	34.6	38.0

Source: JICA Survey Team

(4) Updating of Vehicle Operating Cost

VOCs prepared by HCMC Outer Ring Road is estimated by aggregate of detail cost items and same vehicle classification with the survey, therefore, VOCs prepared by HCMC Outer Ring Road with updating to 2016 price by GDP deflator are adopted.

Table 1.2.12 VOCs in 2016

	Base Year	Motorc ycle	Passeng er car	Mini bus	Large bus	Small truck	Large truck	Contain er truck
Vehicle Operating Cost (USD/1,000 km)	2016	62	221	467	613	445	586	821

Source: JICA Survey Team

付 録 2

SUMMARY OF TRAFFIC SURVEY

APPENDIX-2 SUMMARY OF TRAFFIC SURVEY

Traffic survey consists of three components, namely, traffic count survey, roadside interview survey and travel speed survey are planned and performed in order to understand current traffic situation and prepare indicator of project evaluation in the study area. Traffic survey was carried out in Tuesday – Thursday of March – April 2016.

2.1 Traffic Count Survey

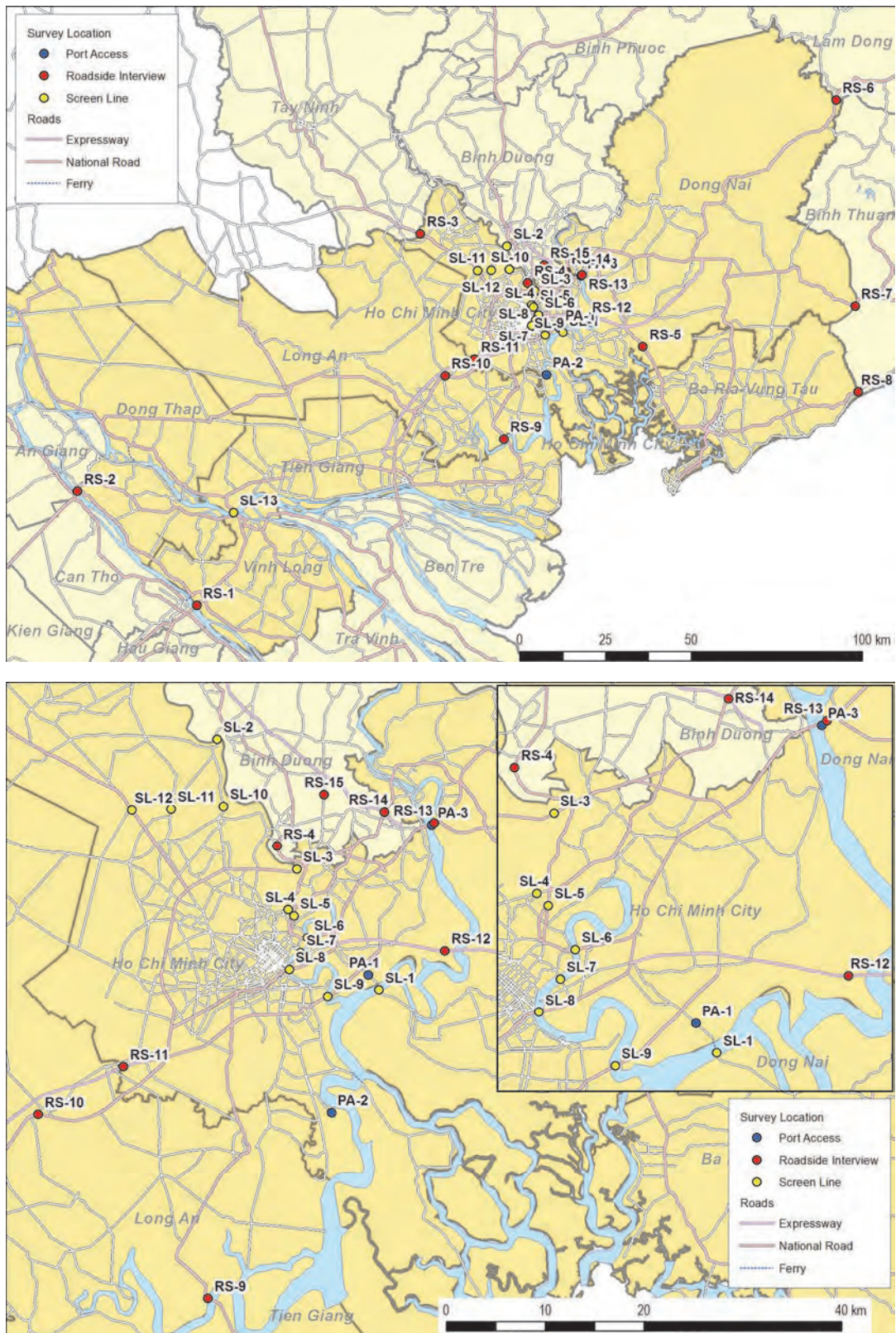
Traffic count survey consists of traffic count at screen line such as river, and traffic count at the roadside interview survey location. The survey is carried out during survey period and observed number of vehicle through survey location by direction and seven (7) vehicle categories (motorcycle, passenger cars, mini bus, large bus, 2 axles truck, 3 and more axles rigid truck and trailer).

Table 2.1.1 Traffic Count Survey Location

Survey Location	Survey Period	Survey Date
SL-1-Pha Cat Lai (Ferry) -NHA Be Revier	6:00 – 18:00 (12 hours)	Thu 3/03/16
SL-2-Cau Phu Cuong Bridge -Sai Gon River		Tue 8/03/16
SL-3-Binh Phuoc Bridge -Sai Gon River		Thu 10/03/16
SL-4-Binh Loi -Sai Gon River		Thu 10/03/16
SL-5-Binh Trieu-Sai Gon River		Wed 9/03/16
SL-6-Cau Sai Gon -Sai Gon River		Wed 16/03/16
SL-7-Cau Thu Thiem -Sai Gon River		Thu 3/03/16
SL-8-Ham Thu Thiem-Sai Gon River		Thu 10/03/16
SL-9-Cau Phu my -Sai Gon River		Tue 15/03/16
SL-10-Cau Rạch Tra -Kenh Xang		Tue 8/03/16
SL-11-Đồ Văn Dậy-Kenh Xang		Tue 8/03/16
SL-12-Cầu Bông-Xuyên Á-Kenh Xang		Tue 8/03/16
SL-13-Cau My Thuan -Tien River		Thu 10/03/16
RS-1-Can Tho Bridge -Vinh Long – Can Tho	6:00 – 22:00 (16 hours)	Tue 29/03/16
RS-2-Pha Vam Cong (ferry) -An Giang – Dong Thap		Thu 17/03/16
RS-3-Xeyen A -Tay Ninh – Ho Chi Minh		Thu 24/03/16
RS-4-Binh Duong -Thu Dau Mot – Ho Chi Minh		Wed 23/03/16
RS-5-Cau Thai Thien -Dong Nai – Ba Ria Vung Tau		Thu 17/03/16
RS-6-QL20 -Dong Nai – Lam Dong		Wed 6/04/16
RS-7-QL 1A -Dong Nai – Binh Thuan		Thu 7/04/16
RS-8-QL 55 -Ba Ria Vung Tau – Binh Thuan		Thu 7/04/16
RS-9-NH 50 -My Loi Bridge		Wed 16/03/16
RS-10-NH 1A (24hr count) -Ben Luc Bridge		24 hours
RS-11-Ho Chi Minh – Trung Luong -Toll gate	6:00 – 22:00 (16 hours)	Wed 30/03/16
RS-12-Ho Chi Minh – Long Thanh Dau Giay -Toll gate		Tue 15/03/16
RS-13-Xa Lo Ha Noi (24hr count) -Dong Nai river	24 hours	Tue 22/03/16
RS-14-Quoc Lo 1K-Toll gate	6:00 – 22:00 (16 hours)	Tue 29/03/16
RS-15-Song Than IP -Toll gate		Tue 5/04/16
PA-1-Access Road to Cat Lai -Nguyen Thi Dinh	6:00 – 18:00 (12 hours)	Tue 5/04/16
PA-2-Access Road to Hiep Phuoc Port -Rach Dop		Wed 30/03/16
PA-3-Access to Dong Nai Domestic Port --		Wed 23/03/16

Note: Traffic count survey at port access is only for cargo trucks.

Source: JICA Survey Team



Source: JICA Survey Team

Figure 2.1.1 Traffic Count Survey Location

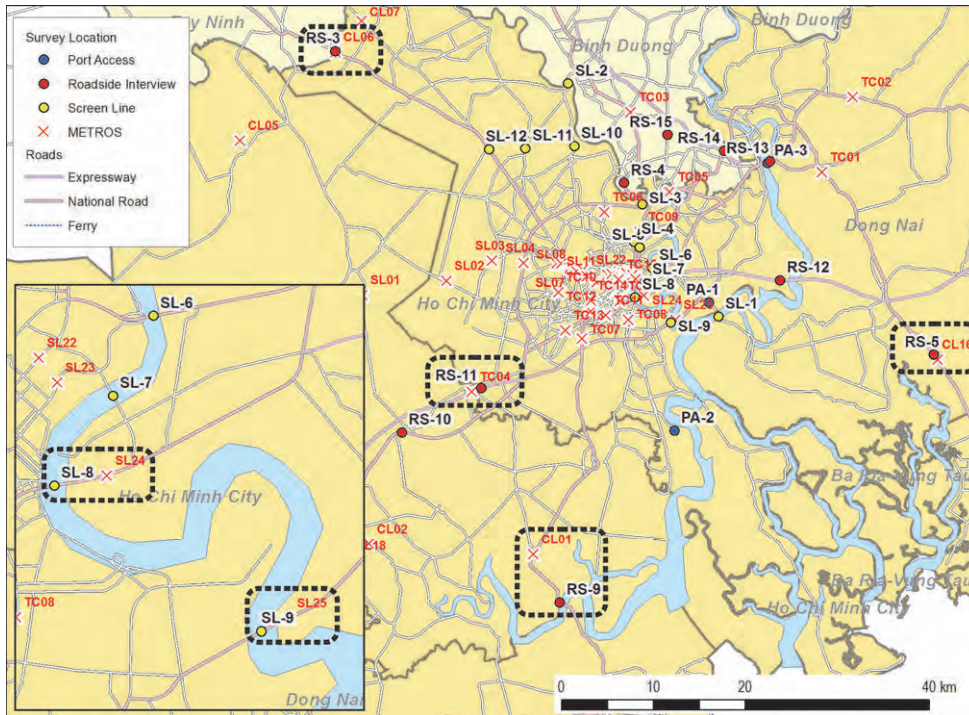
Table 2.1.2 Results of Traffic Count Survey

Loc ation	Direction	Survey Hours	Motor cycle	Cars	Mini Bus	Large Bus	2axles Truck	3+axles Truck	Trailer	Total (vehicle)
SL-01	Inbound	12	13,068	445	43	124	338	0	0	14,018
SL-01	Outbound	12	12,085	423	66	23	275	1	0	12,873
SL-02	Inbound	12	17,487	1,477	207	95	2,628	495	64	22,453
SL-02	Outbound	12	17,985	1,519	190	100	2,657	367	98	22,916
SL-03	Inbound	12	36,027	2,613	555	578	8,266	2,081	1,196	51,316
SL-03	Outbound	12	40,118	2,670	682	753	8,490	2,068	1,374	56,155
SL-04	Inbound	12	128,092	7,544	446	146	3,078	68	3	139,377
SL-04	Outbound	12	83,910	6,785	338	104	2,796	84	3	94,020
SL-05	Inbound	12	123,012	8,638	1,347	631	2,505	20	0	136,153
SL-05	Outbound	12	127,630	8,456	1,085	1,080	2,384	44	0	140,679
SL-06	Inbound	12	66,815	13,097	991	1,334	1,772	196	6	84,211
SL-06	Outbound	12	83,375	17,511	1,403	1,147	1,942	120	6	105,504
SL-07	Inbound	12	30,821	4,554	353	192	746	261	10	36,937
SL-07	Outbound	12	25,552	3,582	299	210	603	252	13	30,511
SL-08	Inbound	12	57,030	8,997	992	213	2,376	0	0	69,608
SL-08	Outbound	12	43,250	9,853	1,287	355	2,510	1	0	57,256
SL-09	Inbound	12	15,763	2,051	214	19	1,304	1,259	1,411	22,021
SL-09	Outbound	12	15,777	2,354	215	21	1,470	896	1,574	22,307
SL-10	Inbound	12	15,046	657	26	4	651	46	2	16,432
SL-10	Outbound	12	14,591	701	43	0	701	26	0	16,062
SL-11	Inbound	12	16,013	744	110	124	2,203	126	1	19,321
SL-11	Outbound	12	14,460	767	100	117	2,175	68	2	17,689
SL-12	Inbound	12	26,620	3,944	802	509	4,011	641	408	36,935
SL-12	Outbound	12	27,632	4,229	761	573	4,057	725	367	38,344
SL-13	Inbound	12	8,048	2,412	1,075	476	2,094	593	233	14,931
SL-13	Outbound	12	8,987	2,316	972	604	2,130	547	211	15,767
RS-01	Inbound	16	20,669	2,852	893	433	2,452	822	205	28,326
RS-01	Outbound	16	18,998	2,940	726	455	2,297	536	146	26,098
RS-02	Inbound	16	6,709	734	419	305	612	260	13	9,052
RS-02	Outbound	16	5,780	729	258	193	544	155	10	7,669
RS-03	Inbound	16	12,972	2,443	614	401	1,764	475	491	19,160
RS-03	Outbound	16	13,812	2,697	673	408	1,735	382	471	20,178
RS-04	Inbound	16	35,805	6,853	1,278	398	2,615	626	361	47,936
RS-04	Outbound	16	39,702	7,133	1,414	484	2,833	667	379	52,612
RS-05	Inbound	16	16,941	4,103	1,185	552	2,846	1,157	1,669	28,453
RS-05	Outbound	16	17,754	4,344	1,233	586	2,810	1,148	1,567	29,442
RS-06	Inbound	16	4,313	497	184	185	536	444	35	6,194
RS-06	Outbound	16	4,169	648	188	203	489	395	28	6,120
RS-07	Inbound	16	6,233	931	352	298	1,368	641	322	10,145
RS-07	Outbound	16	7,008	972	345	419	1,243	761	269	11,017
RS-08	Inbound	16	1,610	197	46	44	193	79	6	2,175
RS-08	Outbound	16	1,840	221	57	54	173	77	10	2,432
RS-09	Inbound	16	4,732	422	39	57	334	19	6	5,609
RS-09	Outbound	16	5,709	432	39	83	305	22	5	6,595
RS-10	Inbound	24	25,113	1,608	711	566	2,573	2,198	974	33,743
RS-10	Outbound	24	25,238	1,594	776	649	2,301	2,628	977	34,163
RS-11	Inbound	16	0	5,720	1,318	1,060	2,959	528	387	11,972
RS-11	Outbound	16	0	5,914	1,402	1,367	2,597	462	375	12,117
RS-12	Inbound	16	0	5,924	1,294	377	1,694	450	996	10,735
RS-12	Outbound	16	0	6,150	1,277	320	1,344	600	894	10,585
RS-13	Inbound	24	50,003	6,386	1,351	1,655	9,701	3,752	3,562	76,410
RS-13	Outbound	24	49,630	6,566	1,716	1,399	9,689	4,154	3,912	77,066
RS-14	Inbound	16	52,476	3,901	324	159	2,555	672	171	60,258
RS-14	Outbound	16	53,086	3,603	339	178	2,586	751	156	60,699
RS-15	Inbound	16	47,004	788	68	76	1,816	417	1,657	51,826
RS-15	Outbound	16	47,302	730	89	72	1,637	454	1,368	51,652
PA-01	Inbound	12	-	-	-	-	3,715	677	3,828	8,220
PA-01	Outbound	12	-	-	-	-	2,055	540	3,155	5,750
PA-02	Inbound	12	-	-	-	-	569	216	208	993
PA-02	Outbound	12	-	-	-	-	475	218	209	902
PA-03	Inbound	12	-	-	-	-	9	0	125	134
PA-03	Outbound	12	-	-	-	-	7	0	109	116

Source: JICA Survey Team

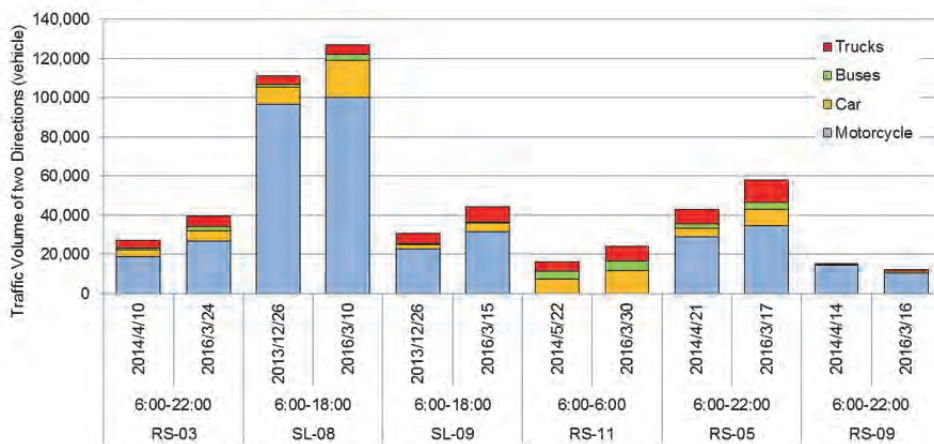
In the METROS, traffic count survey including cordon line and screen line was carried out at 59 road sections in 2013 – 2014. Following figures shows the survey location in METROS near traffic count survey in 2016 and comparison of traffic volume.

In comparison with traffic volume of six (6) survey location in METROS database and survey in 2016, average annual growth rates of traffic are 6% for motorcycle, 37% for cars, 23% for buses and 20% for trucks.



Source: JICA Survey Team

Figure 2.1.2 Traffic Count Survey Location in 2016 and METROS



Source: JICA Survey Team

Figure 2.1.3 Observed Traffic Volume in METROS and Survey Results in 2016

2.2 Roadside Interview Survey

Roadside interview survey was carried out at cordon which is a boundary of the study area, major radial roads of HCMC and access roads to major three (3) ports. Following table summarizes sample ratio of roadside interview survey to expanded 24 hours traffic volume.

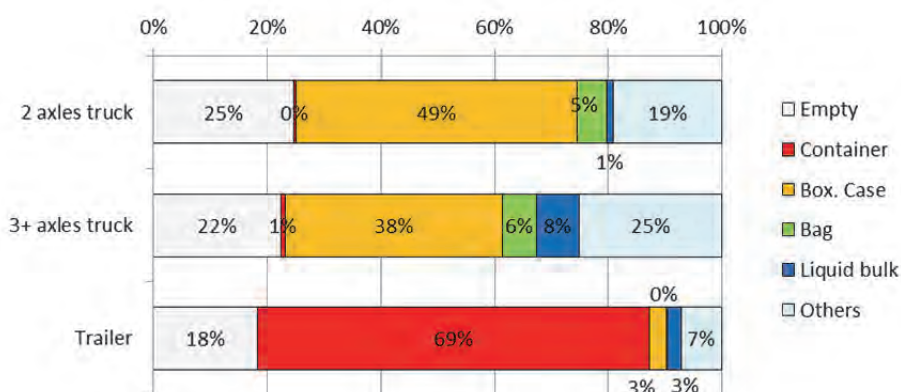
Table 2.2.1 Sample Ratio of Roadside Interview Survey

Location	Motorcycle	Cars	Buses	Trucks
RS-01	4%	15%	22%	18%
RS-02	6%	19%	27%	28%
RS-03	0.4%	14%	22%	16%
RS-04	1%	7%	16%	15%
RS-05	3%	15%	22%	21%
RS-06	3%	22%	27%	26%
RS-07	4%	20%	26%	23%
RS-08	14%	24%	52%	26%
RS-09	0%	34%	47%	46%
RS-10	N/A	N/A	N/A	N/A
RS-11	-	10%	26%	13%
RS-12	-	16%	23%	27%
RS-13	0%	16%	22%	21%
RS-14	0%	17%	26%	23%
RS-15	0%	13%	28%	24%
PA-01	-	-	-	7%
PA-02	-	-	-	3%
PA-03	-	-	-	21%

Note: Interview survey at RS-10 was not permitted by Long An Police. RS-11 and RS-12 are on the expressway.

Source: JICA Survey Team

In terms cargo trucks, as shown in following figure, empty truck ratio of 2 axles truck is 25%, 3 and more axles truck is 22% and 18% for trailers. Container transport is dominated by trailers.



Source: JICA Survey Team

Figure 2.2.1 Composition of Loading Package by Type of Truck

Based on the analysis on the results of roadside interview survey, average vehicle occupancy which is a number of passengers including driver are summarized as shown in the following

table. Average loading weight of truck excluding empty truck is also shown in the following table.

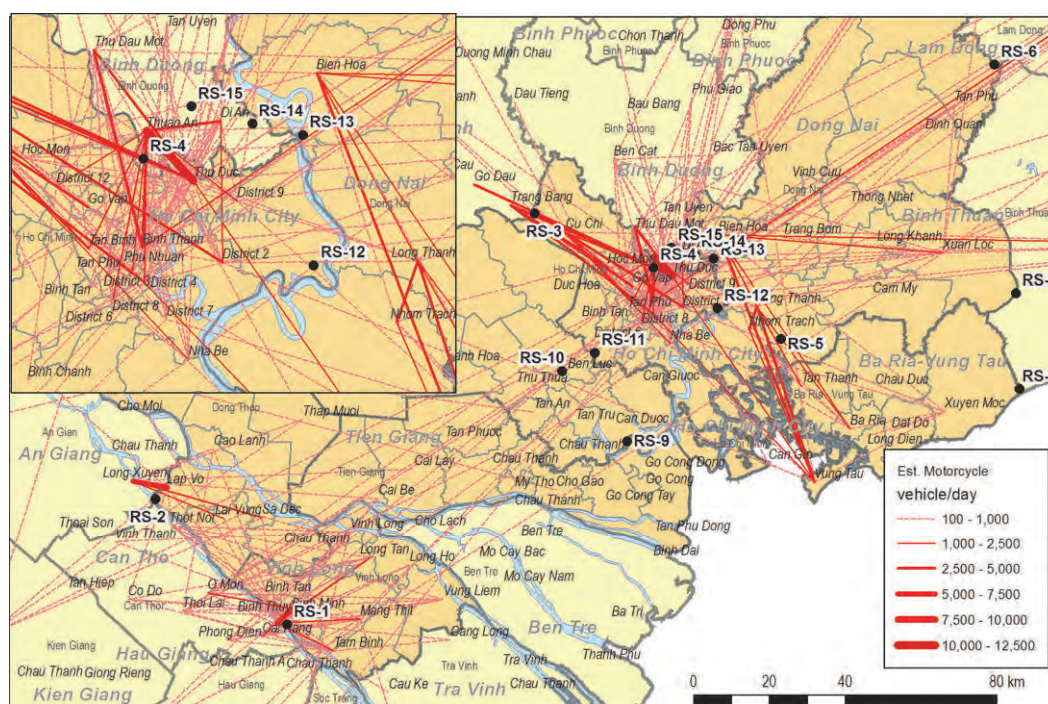
Table 2.2.2 Average Vehicle Occupancy

Mode	Average vehicle occupancy	Average Loading ton (excl. empty truck)	Average Loading ton (incl. empty truck)
Motorcycle	1.5	-	-
Car	2.9	-	-
Mini bus	15.2	-	-
Large bus	30.0	-	-
2 axles truck	1.8	4.9	3.7
3+ axles truck	1.8	14.1	11.0
Trailer	1.6	24.0	19.7

Source: JICA Survey Team

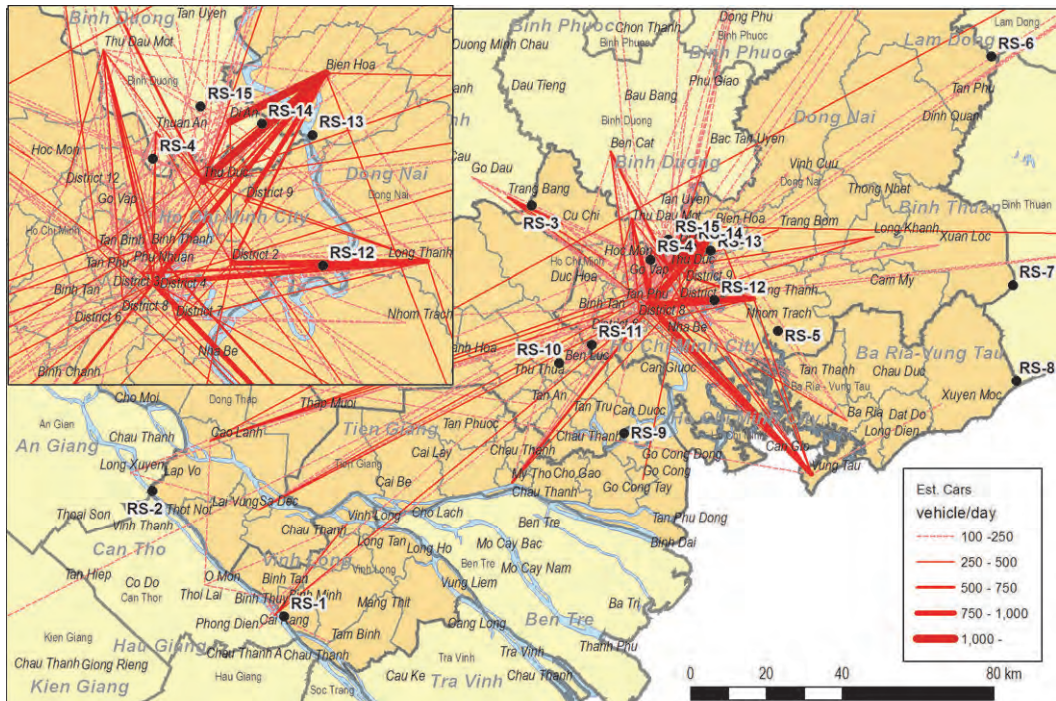
Based on the roadside interview survey and traffic count survey, vehicular ODs are estimated as shown in following figures.

In terms of motorcycle, because of difficulties of interview survey at suburban of HCMC and no motorcycles on the expressway, ratio of samples and accuracy are low.



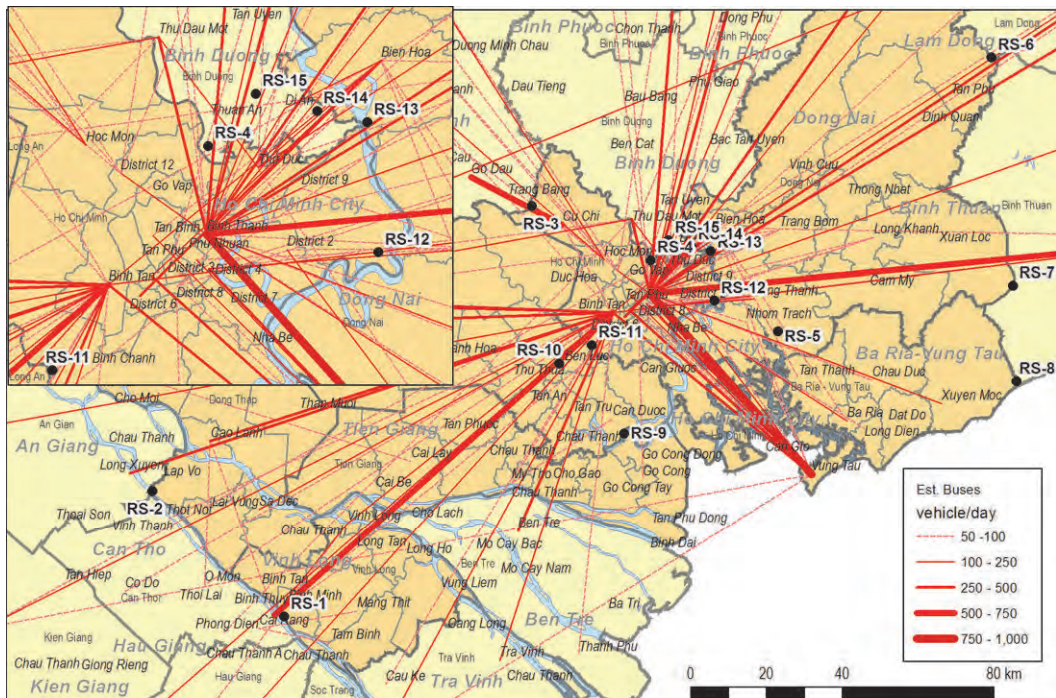
Note: Interview survey at RS-10 was not permitted by Police. Traffic volume is total of both directions.
Source: JICA Survey Team

Figure 2.2.2 Estimated Motorcycle Trip based on the Roadside Interview Survey



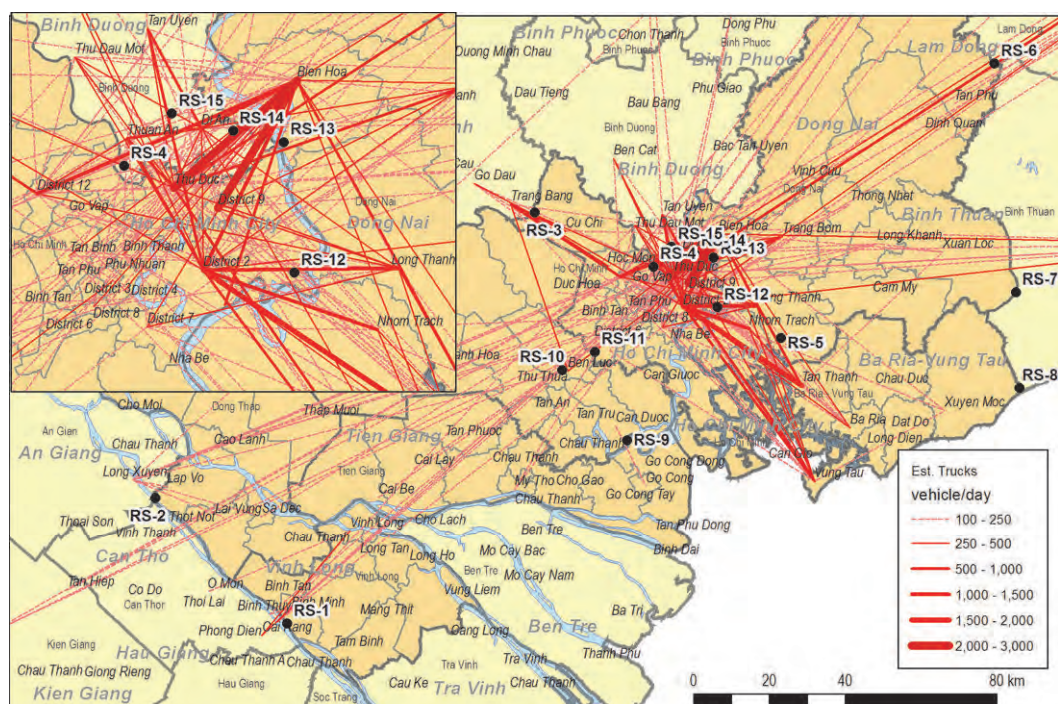
Note: Interview survey at RS-10 was not permitted by Police. Traffic volume is total of both directions.
 Source: JICA Survey Team

Figure 2.2.3 Estimated Car Trip based on the Roadside Interview Survey



Note: Interview survey at RS-10 was not permitted by Police. Traffic volume is total of both directions.
 Source: JICA Survey Team

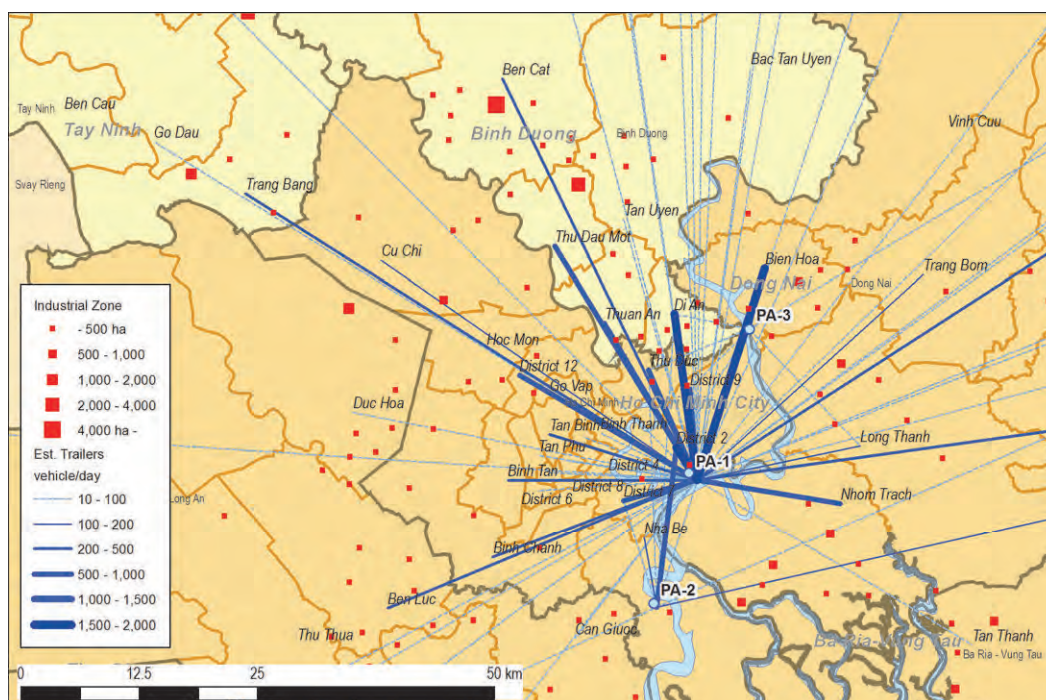
Figure 2.2.4 Estimated Bus Trip based on the Roadside Interview Survey



Note: Interview survey at RS-10 was not permitted by Police. Traffic volume is total of both directions.
Source: JICA Survey Team

Figure 2.2.5 Estimated Truck Trip based on the Roadside Interview Survey

As the results of truck interview survey on the port access roads, trucks, especially trailer trip is dominated by Cat Lai port (PA-01) in accordance with volume of throughput as shown in the following figure.



Note: Traffic volume is total of both directions.
Source: JICA Survey Team

Figure 2.2.6 Estimated Trailer Trip based on Interview at Port Access

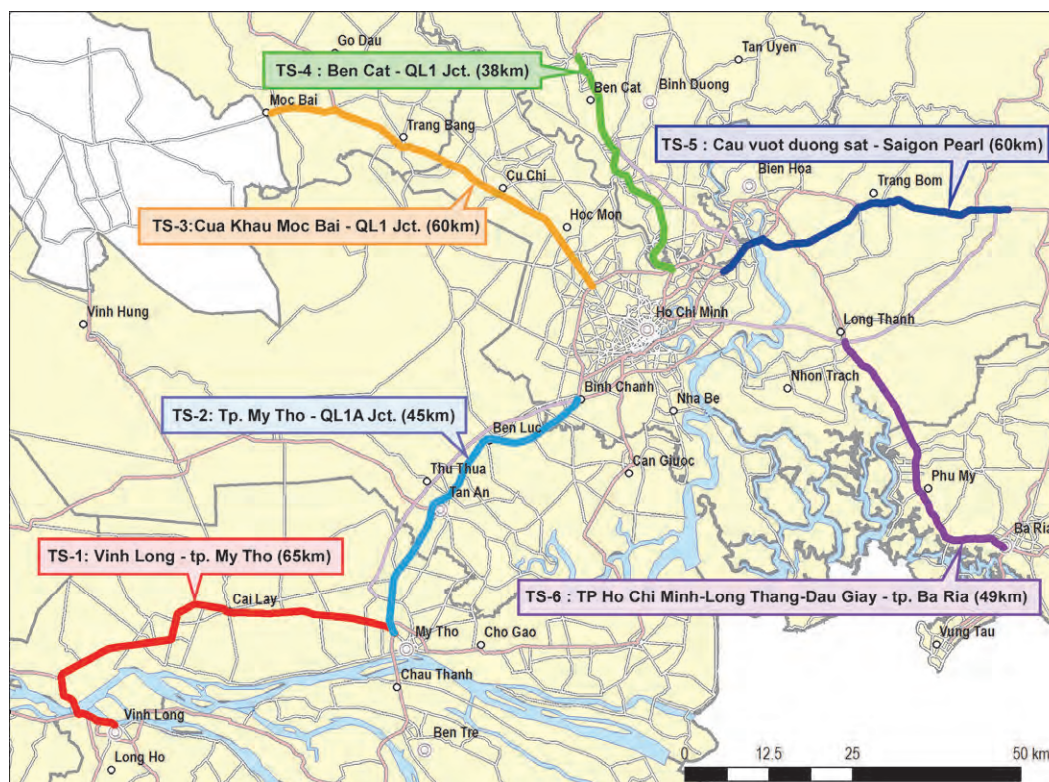
2.3 Travel Speed Survey

Travel speed survey was carried out by passenger car equipped GPS receiver at 6 routes of major radial roads as shown in the following figure and table. Travel speed survey was carried out during Tuesday-Thursday in AM and PM peak for two (2) runs by direction.

Table 2.3.1 Travel Speed Survey Date

Survey Route	Survey Date
TS-1-Vinh Long – tp. My Tho -65km	Wed 9/03/16
TS-2-Tp. My Tho – QL1A Jct. -45km	Wed 23/03/16
TS-3-Cua Khau Moc Bai – QL1 Jct. -60km	Tue 8/03/16
TS-4-Ben Cat – QL1 Jct. -38 km	Tue 15/03/16
TS-5-Cau vuot duong sat – Saigon Pearl -60km	Wed 6/04/16
TS-6-TP Ho Chi Minh-Long Thang-Dau Giay – tp. Ba Ria -49km	Thu 17/03/16

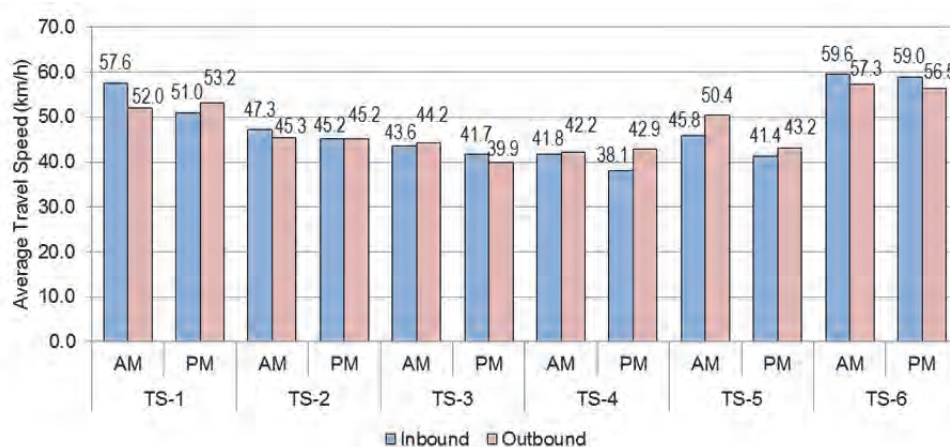
Source: JICA Survey Team



Source: JICA Survey Team

Figure 2.3.1 Travel Speed Survey Routes

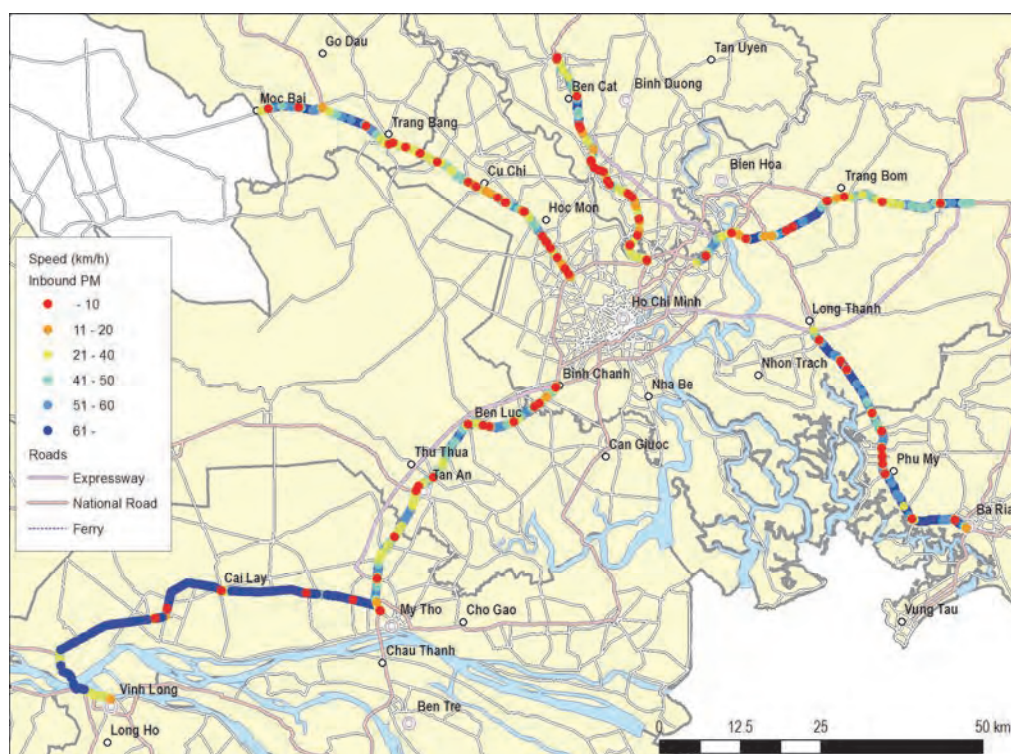
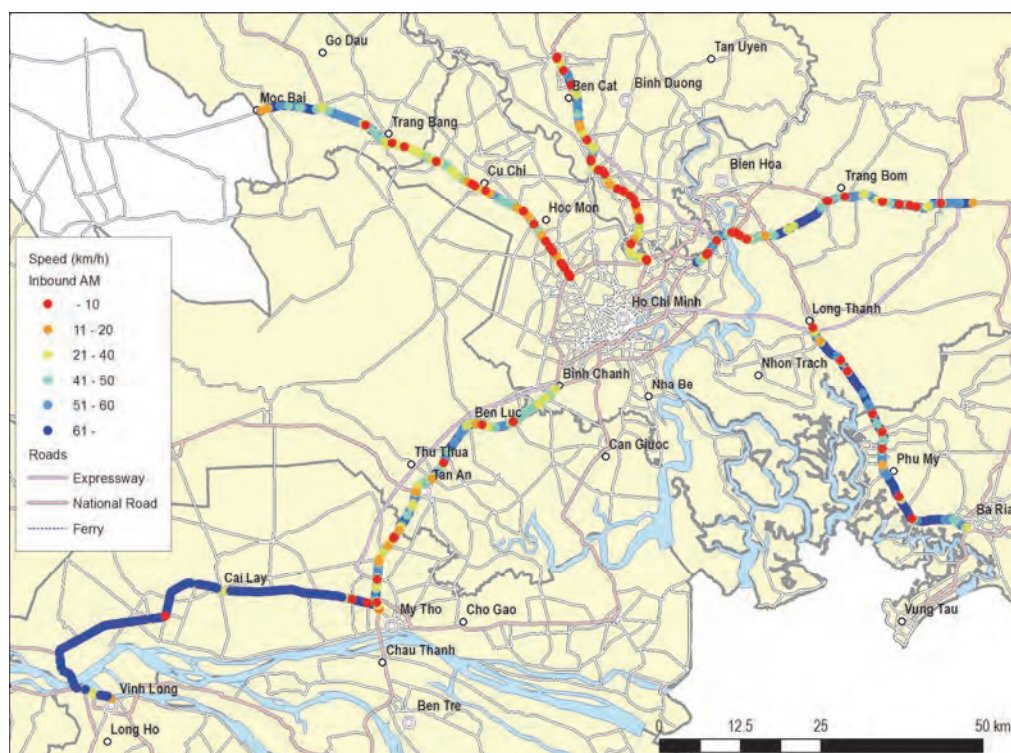
As the results of travel speed survey, average travel speeds by survey route are shown in the following figure.



Note: Travel speeds are average of two (2) runs by survey period and direction.
 Source: JICA Survey Team

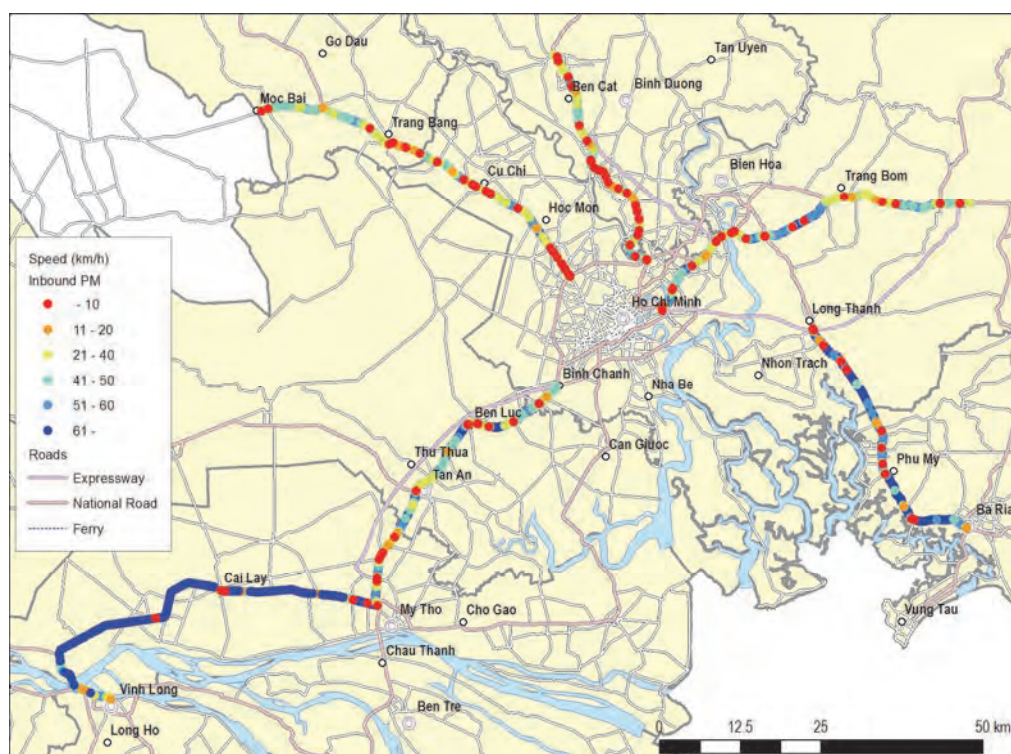
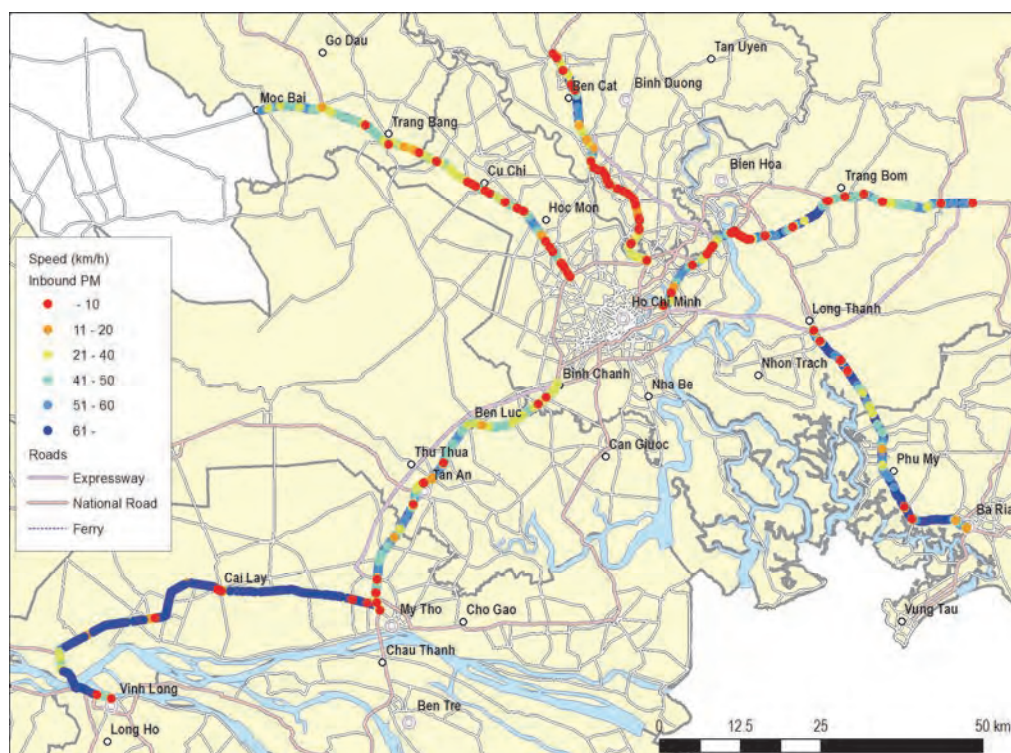
Figure 2.3.2 Average Travel Speed by Survey Route and Period

The following figures show the speed reduction point measured by on-board GPS.



Note: Point with lower speed is indicated above higher speed point.
 Source: JICA Survey Team

Figure 2.3.3 Average Travel Speed in AM (upper: inbound, lower: outbound)



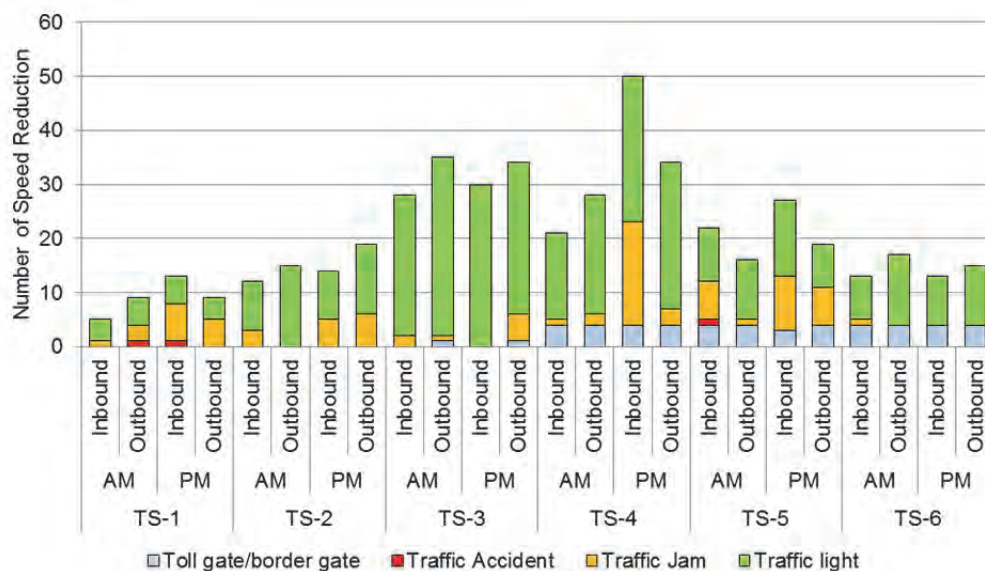
Note: Point with lower speed is indicated above higher speed point.
Source: JICA Survey Team

Figure 2.3.4 Average Travel Speed in PM (upper: inbound, lower: outbound)

The following figure shows the major reason of speed reduction during travel speed survey. Average travel speed on route TS-3 (Cua Khau Moc Bai – QL1 Jct.) is lower than other routes, however, speed reduction on TS-3 is mainly caused by traffic signal and traffic jam is merely observed.

On route TS-1 (Vinh Long – tp. My Tho) and route TS-5 (Cau vuot duong sat – Saigon Pearl) traffic accidents were observed during travel speed survey, problem of traffic safety is recognized.

On route TS-4 (Ben Cat – QL1 Jct.), TS-5 and TS-6 (TP Ho Chi Minh-Long Thang-Dau Giay – tp. Ba Ria), stops at toll gates are observed. Electric Toll Collection System (ETC) will be developed on not only Expressway but also other BOT road section in Vietnam, speed reduction at toll gate is expected to be reduced in future.



Note: Total of two runs
Source: JICA Survey Team

Figure 2.3.5 Number of Observed Speed Reduction by Reason

付 録 3

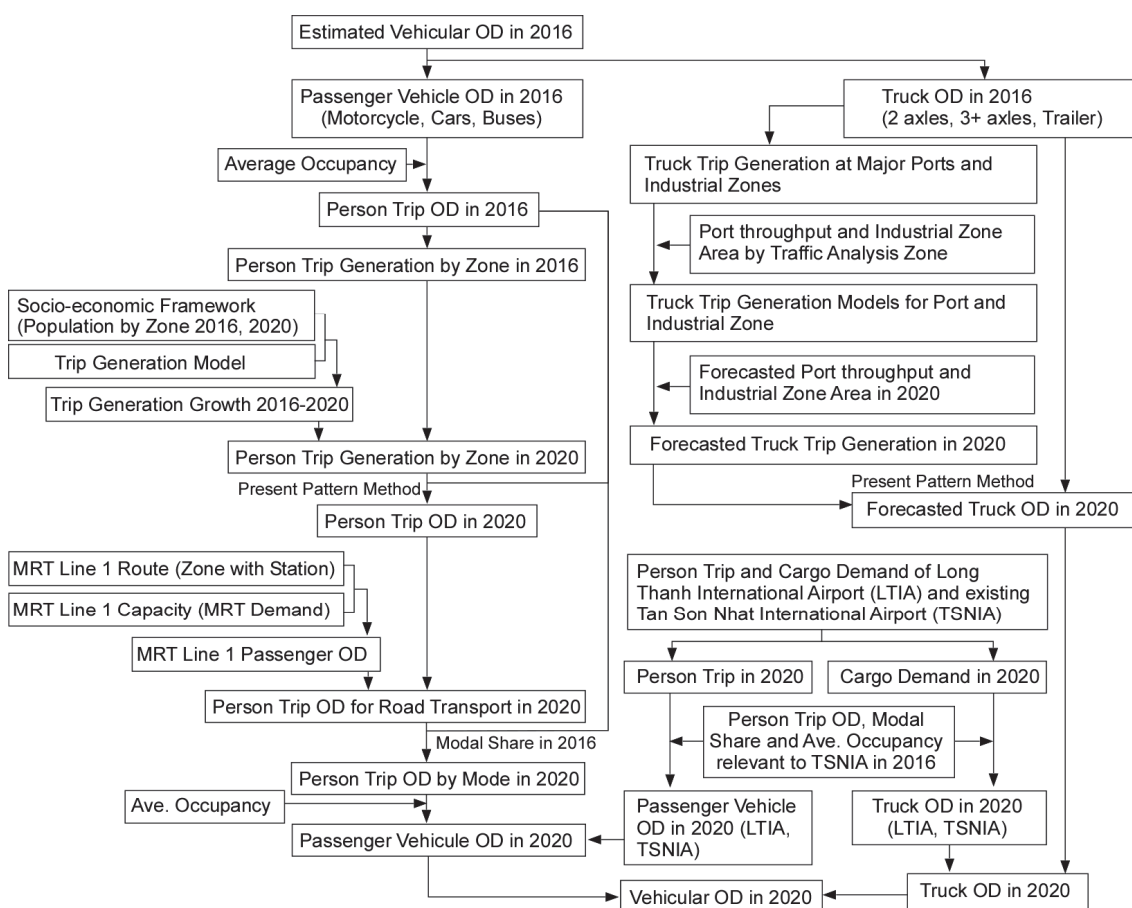
FUTURE TRAFFIC DEMAND FORECAST

APPENDIX-3 FUTURE TRAFFIC DEMAND FORECAST

3.1 Methodology

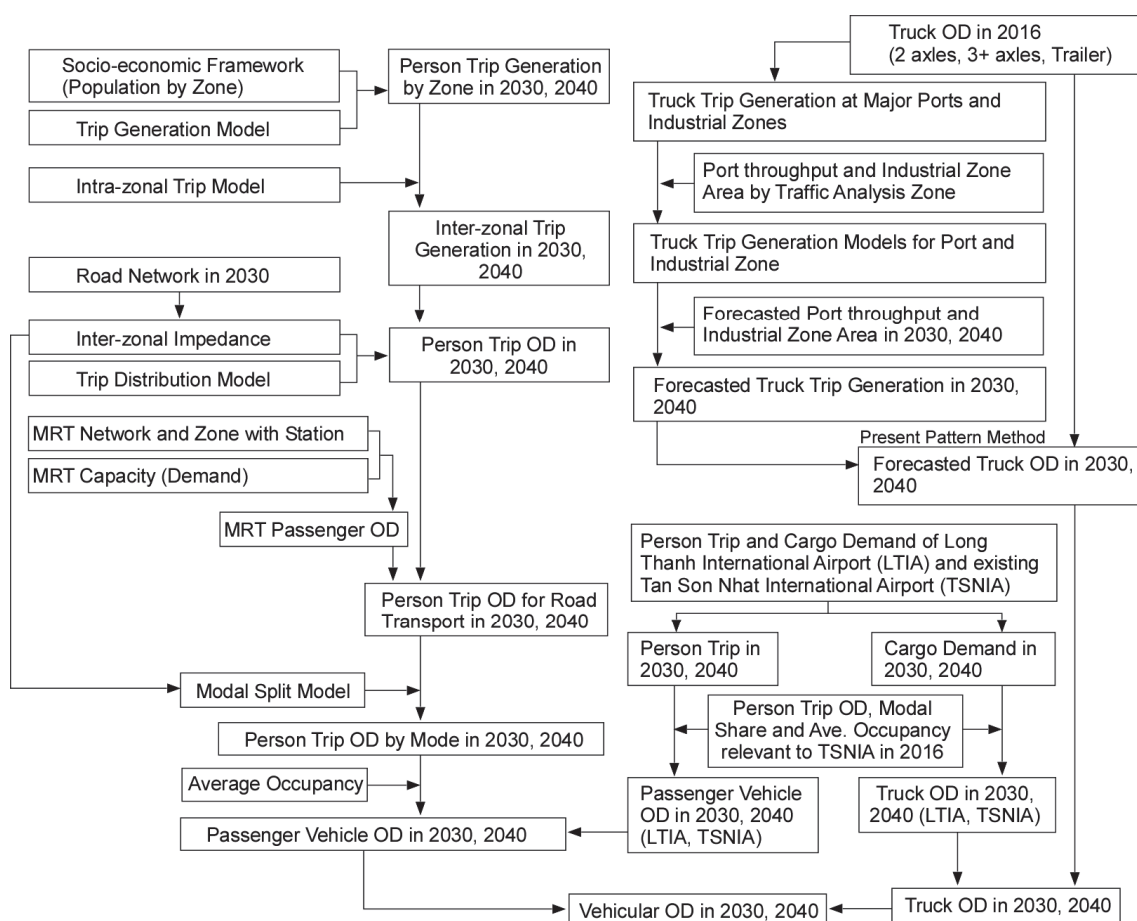
Future traffic demand is forecasted by following work flows. Basically, passenger vehicle demand such as motorcycle, cars and buses in 2020 is computed by present pattern method based on estimated current vehicular OD in 2016. Future passenger vehicle demand in 2030 (and 2040 for the economic evaluation) is computed by demand forecast models estimated by METROS PT survey results.

Future demand of trucks is estimated by present pattern method taking account of truck generation at major sea ports and industrial zones.



Source: JICA Survey Team

Figure 3.1.1 Work Flow of Demand Forecast in 2020

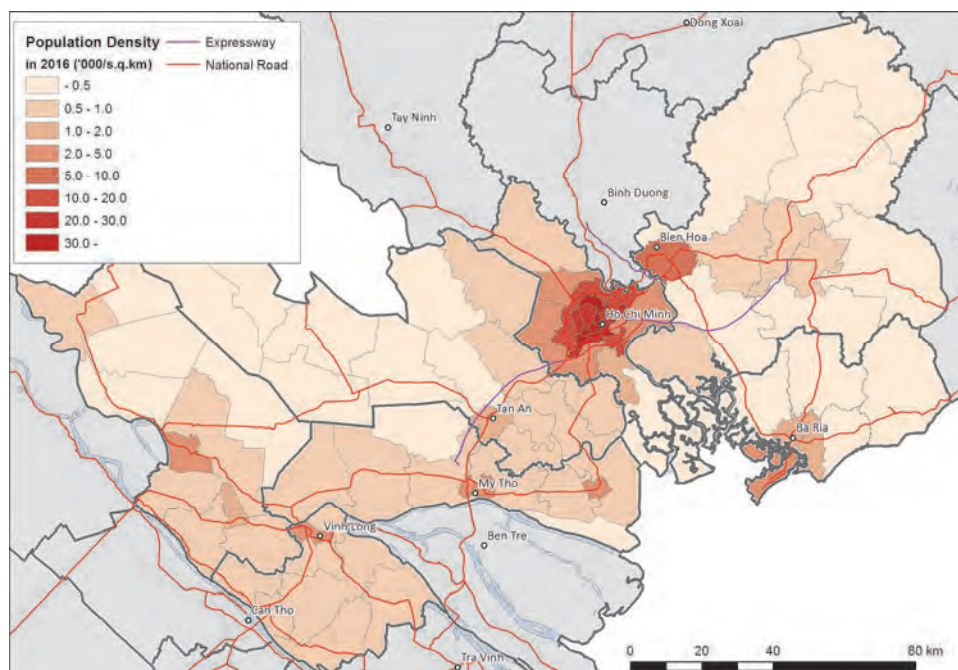


Source: JICA Survey Team

Figure 3.1.2 Work Flow of Demand Forecast in 2030 and 2040

3.2 Trip Generation of Passenger Vehicle

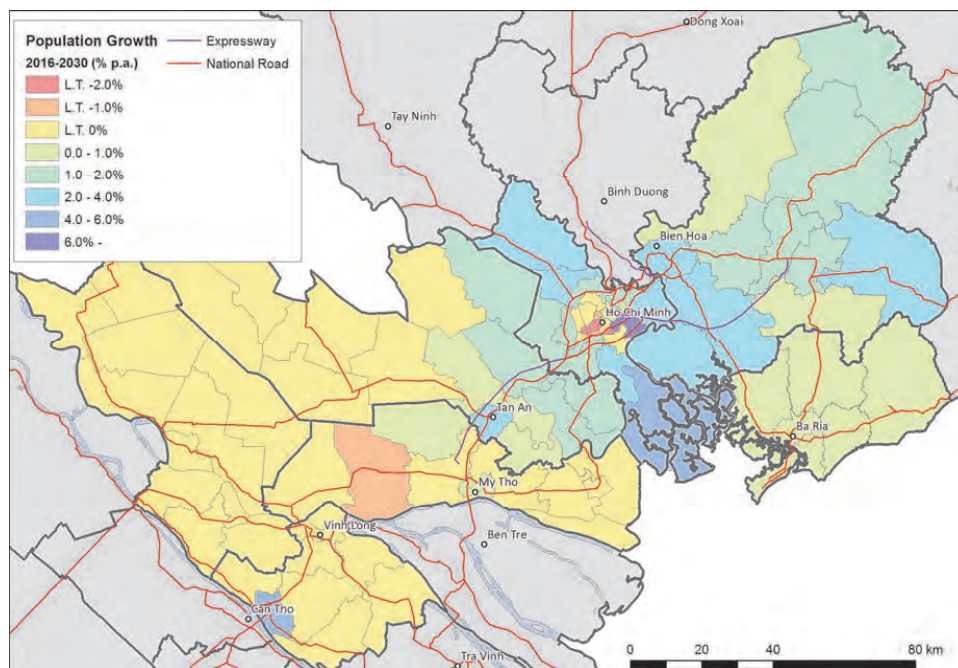
Current population in the survey area is estimated by as shown in the following figure. Population concentrates within 30km from center of HCMC and other provincial centers such as Bien Hoa, Ba Ria, Vung Tau, Vinh Long, My Tho and Tan An.



Source: JICA Survey Team

Figure 3.2.1 Estimated Population Density in 2016

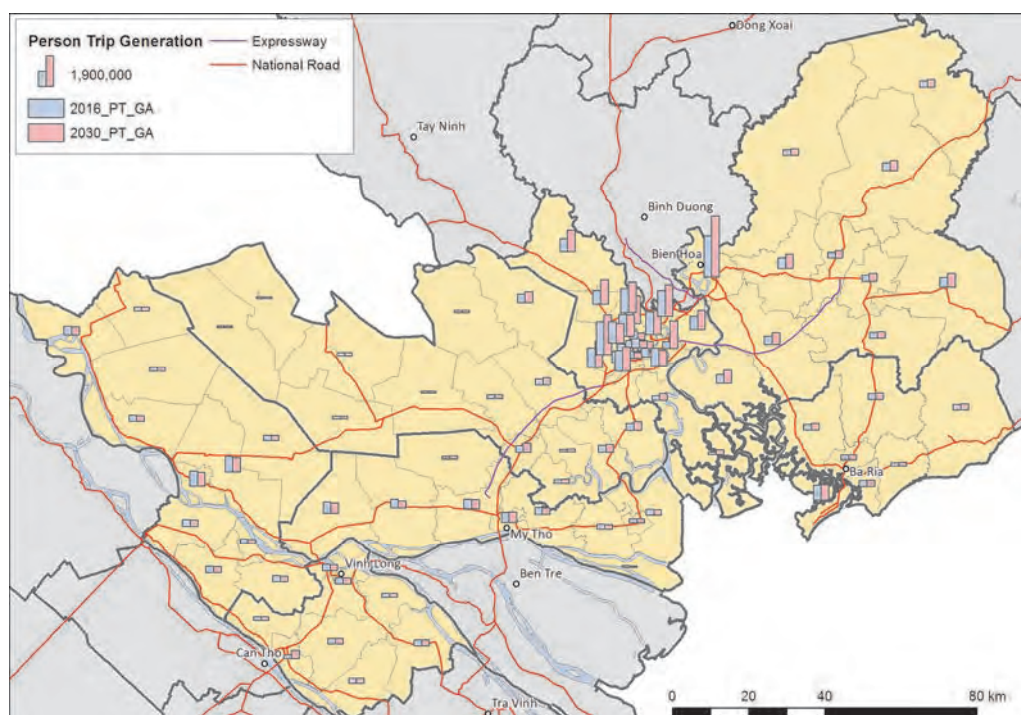
As the results of forecasting future population framework, as shown in the following figure, the “donut” phenomenon of population is expected in the center of HCMC, and population in the suburbs with in 50km from center of HCMC is expected to increase. In other province, concentration of population into provincial center and vicinity area will proceed.



Source: JICA Survey Team

Figure 3.2.2 Forecasted Annual Population Growth Rate between 2016 and 2030

Based on the population framework, namely, urban and rural population by traffic analysis zone, future person trip generation is forecasted by person trip generation model. In accordance with forecasted future population growth, person trip generation in surrounding area of center of HCMC is expected to growth highly as shown in the following figure.



Source: JICA Survey Team

Figure 3.2.3 Forecasted Person Trip Generation in 2016 and 2030

Table 3.2.1 Future Person Trip relevant to Survey Area

million person trip per day				Annual Growth Rate		
2016	2020	2030	2040	2016-2020	2020-2030	2030-2040
27.8	29.7	34.1	37.2	1.7%	1.4%	0.9%

Note: Person trip relevant to survey area including trips to/from out of survey area.

Source: JICA Survey team

Based on future trip generation, person trip distribution, namely, person trip OD is estimated. Person trip OD in 2020 is computed by present pattern method based on estimated person trip generation and current person trip distribution in 2016. Person trip distribution in 2030 and 2040 are estimated by person trip generation in 2030 and trip distribution model including inter-zonal impedance which is computed by future road network.

3.3 Public Transport Network

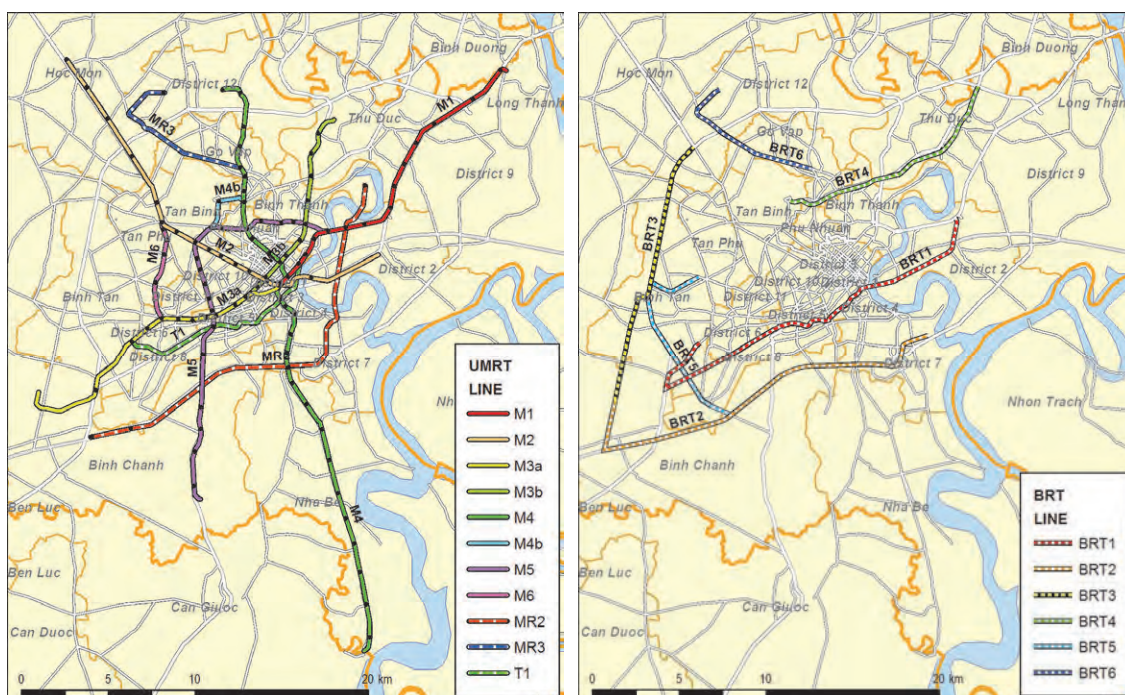
Major urban public transport plans are summarized in below. MRT Line 1 project have started in 2008 and it is under construction as of 2016. Line 1 elevated section (Ba Son - Suoi Tien) is expected to be precedent opened in 2019 and entire Line 1 is expected to be opened in 2020.

Line 2 (Phase 1) project have started in 2010 and expected to be opened in 2018 in original plan, however, open year was postponed until 2020 in 2015 and furthermore completion of the project is considered that 4-5 years behind schedule because of problem on land acquisition and progress delay.

Table 3.3.1 Urban Public Transport Projects

Line		Section	Length (km)	Schedule	
MRT	Line 1	Ben Thanh - Suoi Tien	19.7	Open in 2020	
	Line 2	Phase 1	Tham Luong - Ben Thanh	11.3	Open in 2023-24
		Phase 2	Ben Thanh - Thu Thiem	9.0	
		Phase 3	Tay Ninh (An Suong) Bus Terminal – Tay Bac Cu Chi Industrial Park	28.0	
	Line 3A	Ben Thanh - Tan Kien	9.7		
	Line 3B	Nga 6 Cong Hoa - Hiep Binh Phuoc	12.1		
	Line 4	Thanh Xuan - Hiep Phuoc Port	35.7		
	Line 4B	CV Gia Dinh - Tan Son Nhat - Lang Cha Ca	3.5		
	Line 5	Phase 1	Nga Tu Bay Hien - Saigon Bridge	8.9	
		Phase 2	New Can Giuoc Bus Terminal – Nga Tu Bay Hien	14.5	
Line 6	Ba Queo - Phu Lam R/A	6.1			
LRT/ Monorail	T1	Tramway Line 1			
	MR2	Monorail Line 2			
	MR3	Monorail Line 3			
BRT	Line 1	Vo Van Kiet-Mai Chi Tho	23.0	It will be replaced by T1	
	Line 2	Nguyen Van Linh from New Mien Tay bus station to Phu My bridge	24.0	It will be replaced by MR2	
	Line 3	RR.2 from An Suong intersection to New Mien Tay bus station	19.0		
	Line 4	Tan Son Nhat-Binh Loi	14.5		
	Line 5	Thoai Ngoc Hau-RR.1 to Nguyen Van Linh street	8.7		
	Line 6	Quang Trung	8.5	It will be replaced by MR3	

Source: METROS



Source: JICA Survey Team

Figure 3.3.1 Urban Public Transport Network Plan

For the demand forecast, MRT passenger should be reduced passenger vehicle demand on the road, therefore, future MRT network and demand area assumed as shown in the following table.

Project investment for MRT Line 1 was approved in 2006 and project started in 2008, it is expected to open in 2020 and carry 620 thousand passengers per day. Project Construction Investment Report for Metro Line 2 was also approved by HPC in 2010, however, the project cost increased more than 1.51 times of preliminary project cost estimated in 2008 and revised investment report should be prepared and submit to National Assembly. Thus MRT Line 2 is expected to open until 2030.

Basic design for MRT Line 3a and 3b are basically approved except Old Mien Tay Bus Terminal - Tan Kien Station Section, however, project cost of Line 3 also increases 1.5 times of preliminary cost estimation, therefore, Line 3 is expected to open around 2030.

Other MRT Lines are under preparation of basic design or Project's Standard Framework, therefore, it is difficult to open until 2030 in this survey.

It is assumed that MRT passenger demand close to capacity, thus MRT daily passenger in 2020 is equal to the capacity of MRT Line 1. The capacity of MRT Line 2 and Line 3 are not able to be confirmed, thus it is assumed that the capacity of each lines are equal to the capacity of Line 1 in the survey.

Table 3.3.2 Assumed Future Urban Public Transport Service in the Survey

Line		Length (km)	Service	
			2020	2030
MRT	Line 1	19.7	Yes	Yes
	Line 2	48.3	No	Yes
	Line 3A	9.7	No	Yes
	Line 3B	12.1	No	Yes
MRT Passenger (*000 pax per day)			620	186

Source: JICA Survey team



Source: JICA Survey Team

Figure 3.3.2 Assumed Future Urban Public Service in the Survey

To forecast road transport traffic demand, MRT passenger should be reduced from person trip demand. Based on assumed MRT network in 2020 and 2030, OD pairs which have MRT station in both of origin and destination zone are regarded as OD pair to be diverted to MRT. Total of person trip of extracted MRT OD Pairs and assumed daily passenger demand of MRT based on the capacity of Line(s), MRT passenger OD is estimated.

Person trip demand excluding MRT passenger OD should be converted to vehicular OD by modal share and average vehicle occupancy rate. Modal share in 2020 adopts current modal share in 2016, and modal share in 2030 is estimated by modal split model based on future road network.

In terms of BRT, 6 routes are planned in the Master Plan, and construction and investment plan for BRT Line 1 was prepared by HCMC in 2015 as a Green Transport Project. For the traffic demand in the survey, passenger demand of BRT Line 1 is included in MRT demand because BRT Line 1 is parallel to MRT M2 and M3a, and capacity of BRT is quite smaller than MRT.

When BRT is installed, lanes of existing road along BRT might be reduced, however, BRT Line 1 is under preparation of detail design and design of cross section is not indicated, therefore,

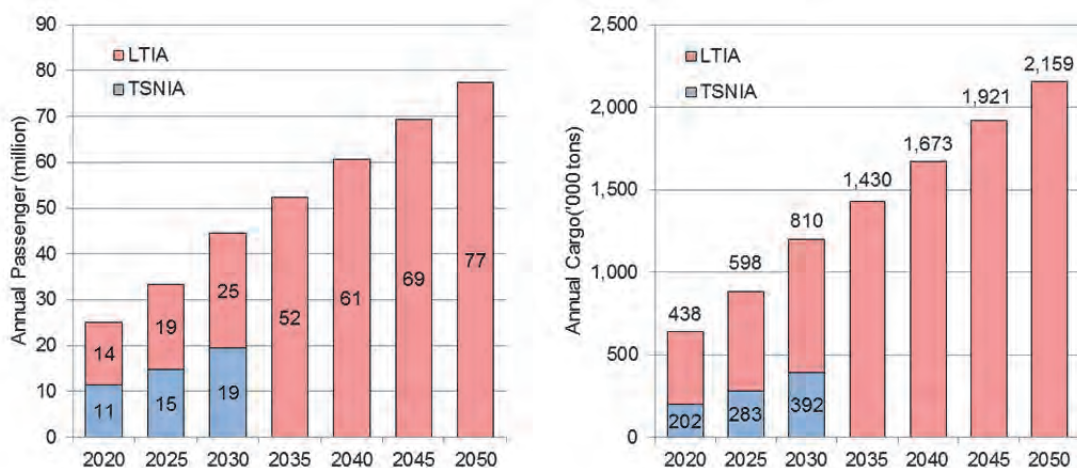
road capacity reduction by BRT is not considered in the road network for the traffic assignment in the survey.

3.4 Traffic Demand relevant to International Airport

In accordance with increase of demand at existing Tan Son Nhat International Airport (TSNIA), Vietnam Government plans new international airport, namely, Long Thanh International Airport (LTIA) in Long Thanh District of Dong Nai Province. JICA conducted master plan study for LTIA upon request of Vietnam Government in 2010 and master plan is approved by prime minister in 2011. In 2015, JICA conducted “Preparatory Survey on Long Thanh International Airport Development and Passenger Terminal Management Project” and LTIA project is in progress toward open in 2020.

In the traffic demand forecast for the survey, vehicle trip relevant to passenger and cargo generated at airports should be considered.

In the preparatory study, passenger and cargo demand forecast based on the review of master plan is summarized below.



Source: LTIA Master Plan (JICA, 2011)

Figure 3.4.1 Annual Passenger and Cargo Demand at International Airport

Based on the forecasted future passenger and cargo demand, future vehicular trip generation is estimated by current modal share and average occupancy relevant to existing TSNIA based on the results of traffic survey.

Table 3.4.1 Estimated Vehicle Trip Generation at International Airport

Airport	Mode	2020	2025	2030	2035	2040
TSNIA	Motorcycle	2,770	3,625	4,762	0	0
	Cars	6,544	8,566	11,252	0	0
	Mini Bus	292	382	502	0	0
	Large Bus	116	152	200	0	0
	2 Axles	149	210	290	0	0
LTIA	Motorcycle	3,361	4,538	6,111	12,791	14,832
	Cars	7,941	10,722	14,439	30,223	35,043
	Mini Bus	355	479	645	1,349	1,565
	Large Bus	141	191	257	538	623
	2 Axles	324	443	600	1,059	1,239

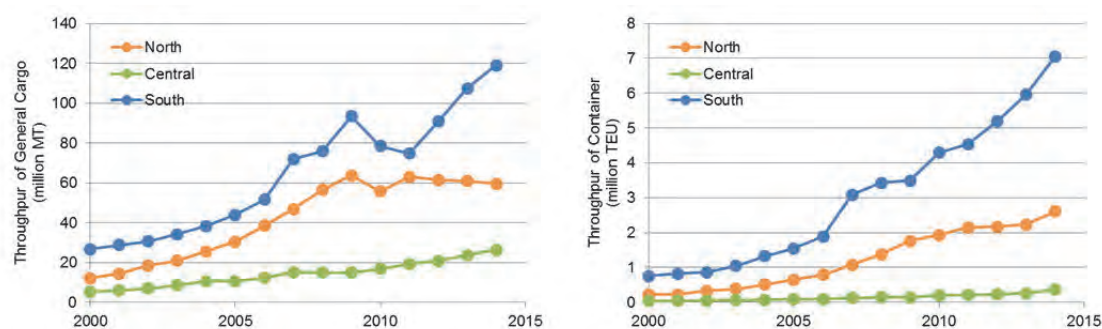
Source: JICA Survey team

Estimated vehicular trip generation is distributed to origin/destination zone in accordance with ODs based on current OD in 2016.

3.5 Truck Traffic Demand Forecast

(1) Truck Trip relevant to Port

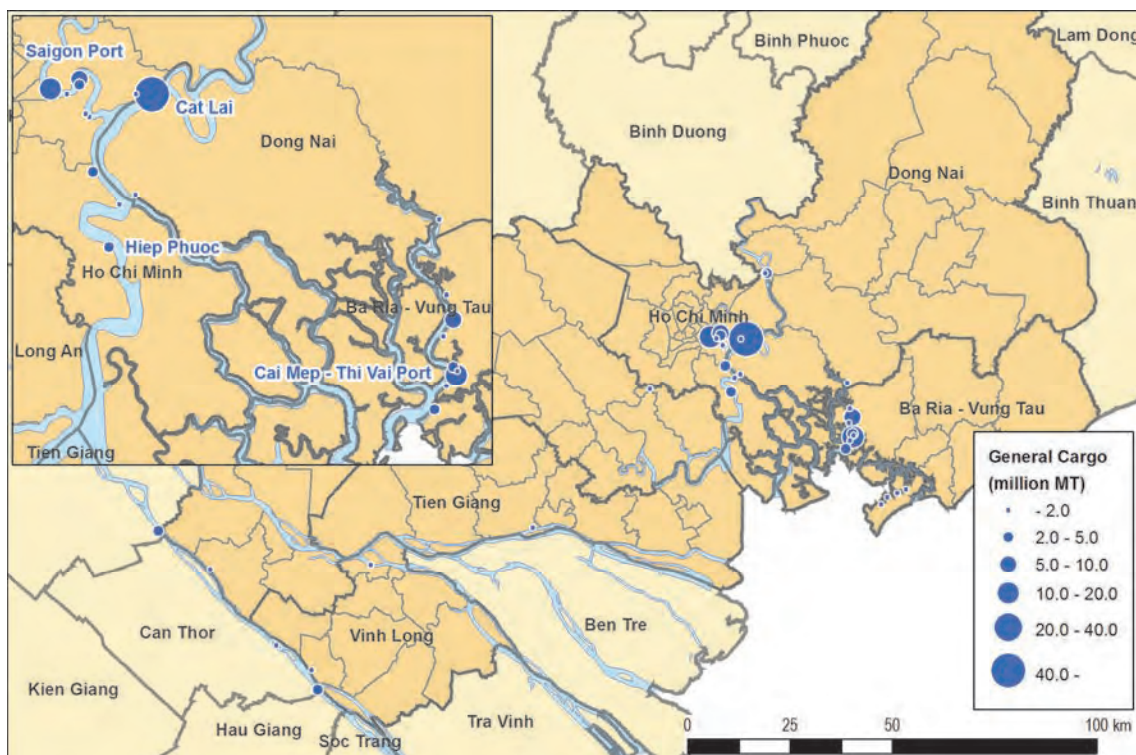
The following figure shows the growth of through put of seaports in Vietnam. Throughput of general cargo had affected by inflation and rising price in Vietnam during 2010-2011, however, container cargo have stable increase in accordance with international trade growth.



Source: Vietnam Seaport Association

Figure 3.5.1 General Cargo and Container throughput by Region

The following figures show the throughput of general cargo and container by seaport in 2014. Cat Lai is the most major seaport which dominates 39% of general cargo (46 million MT in 2014) and 54% of container (3.8 million TEUs) in Southern Vietnam.



Source: JICA Survey Team

Figure 3.5.2 General Cargo throughput in the Survey Area in 2014



Source: JICA Survey Team

Figure 3.5.3 Container throughput in the Survey Area in 2014

Future throughput of general cargo and container by seaports are estimated by following regression models respectively.

$$\log(GC) = -11.507 + 1.782 \cdot \log(GDP_{CONST}) \quad (R^2=0.951)$$

Where,

GC : Annual general cargo throughput (MT), and

GDP_{CONST} : GDP constant price in Vietnam.

$$\log(CC) = -20.458 + 2.759 \cdot \log(GDP_{CONST}) \quad (R^2=0.984)$$

Where,

CC : Annual container throughput (TEU), and

GDP_{CONST} : GDP constant price in Vietnam.

As the results, elasticity of general cargo and container to GDP growth rate are estimated 1.782 and 2.759.

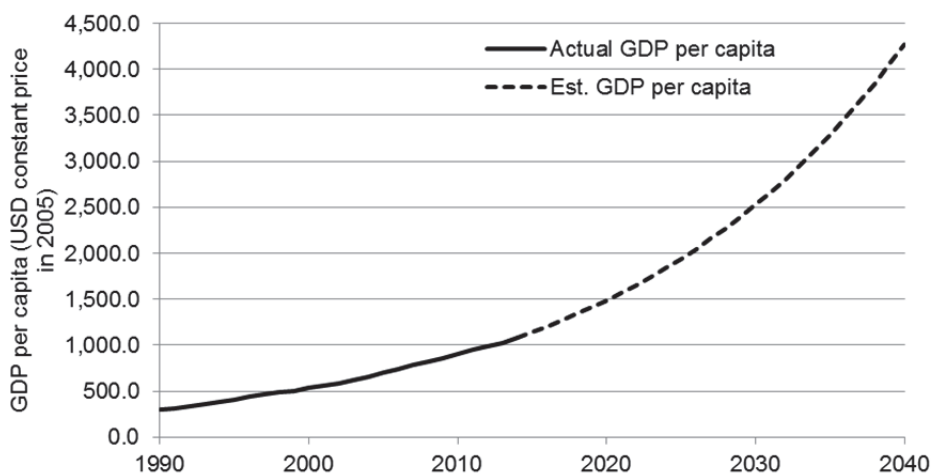
Future GDP growth is estimated by two steps, forecasting of GDP per capita of Vietnam and forecasting GDP growth rate in accordance with GDP per capita. GDP per capita of Vietnam is estimated by following regression model.

$$\log(GDPc) = 107 \times \log(Year) - 350.5 \quad (R^2=0.997)$$

Where,

GDPc : GDP per capita (USD constant price in 2005), and

Year : Year.



Source: JICA Survey Team

Figure 3.5.4 Forecasted GDP per capita of Vietnam

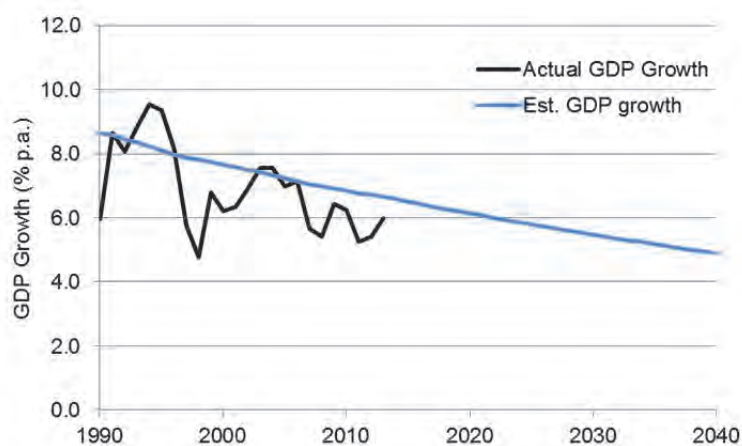
To estimate GDP growth rate, following regression model is estimated by GDP per capita and GDP growth in 1990 - 2013 prepared by World Bank in ASEAN countries except Singapore and Brunei.

$$\log(GDP\text{growth}) = -0.215 \times \log(GDPc) + 1.47 \quad (R^2=0.739)$$

Where,

GDPgrowth : Annual GDP growth, and

GDPc : GDP per capita (USD constant price in 2005).



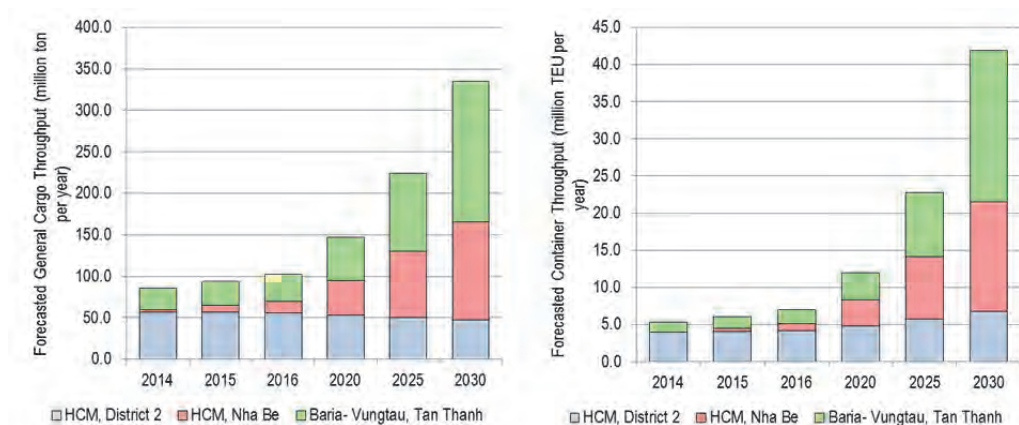
Note: Actual GDP growth rate is based on World Development Indicators by World Bank.
 Source: JICA Survey Team

Figure 3.5.5 Forecasted Annual GDP Growth Rate of Vietnam

Based on elasticity of cargo throughput at ports and GDP growth, future cargo throughput is computed. In terms of major ports, namely, Cat Lai port and planned Tan Cang-Phu Huu in HCM District 2, Tan Cang Hiep Phuoc and SPCT port in HCM Nha Be District, and Cai Mep – Thi Vai Port in Tau Tan Thanh District of Ba Ria- Vung Province are expected to share cargo demand in the survey area in future. Future throughput of three major ports is estimated by following assumption.

- Cat Lai port capacity is 4.6 million TEU per year and almost saturated, therefore, future throughput is limited to the capacity of Cat Lai port and Phu Huu port (planned).
- Future cargo throughput exceeding capacity of Cat Lai and Phu Huu port is distributed to ports in Nha Be District and Tan Thanh District in accordance with port area.

As the result, future cargo throughput of three major ports is estimated as shown in following figures.



Source: JICA Survey Team

Figure 3.5.6 Forecasted Annual throughput of Major Ports in Study Area

Based on observed truck trip generation and annual throughput at major ports, truck trip generation is estimated by following models.

$$TG_{2AX} = 68.762 \cdot C + 118.2 \quad (R^2=0.966)$$

Where,

TG_{2AX} : 2 Axles truck trip production or attraction (vehicle/day), and

C : Annual throughput of general cargo (million MT per year).

$$TG_{3AX} = 15.906 \cdot C + 125.62 \quad (R^2=0.864)$$

Where,

TG_{3AX} : 3 Axles and more truck trip production or attraction (vehicle/day), and

C : Annual throughput of general cargo (million MT per year).

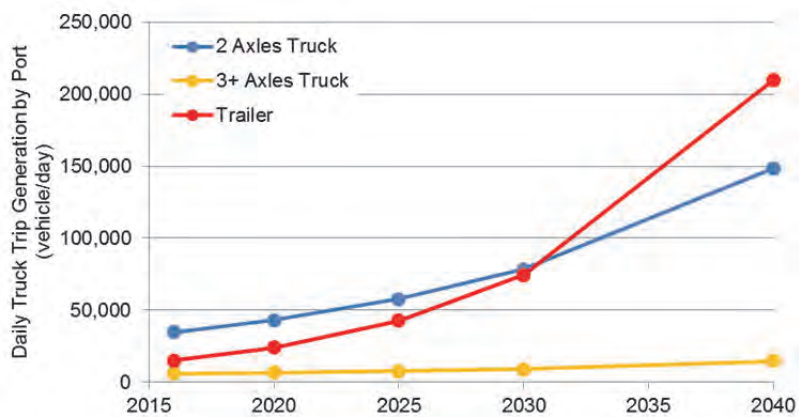
$$TG_{TRL} = 1,298.7 \cdot C - 203.32 \quad (R^2=0.988)$$

Where,

TG_{TRL} : Trailer trip production or attraction (vehicle/day), and

C : Annual throughput of container (million TEU per year).

Based on the forecasted future throughput of ports and truck trip generation models, future truck trip generation is forecasted as shown in following figure.

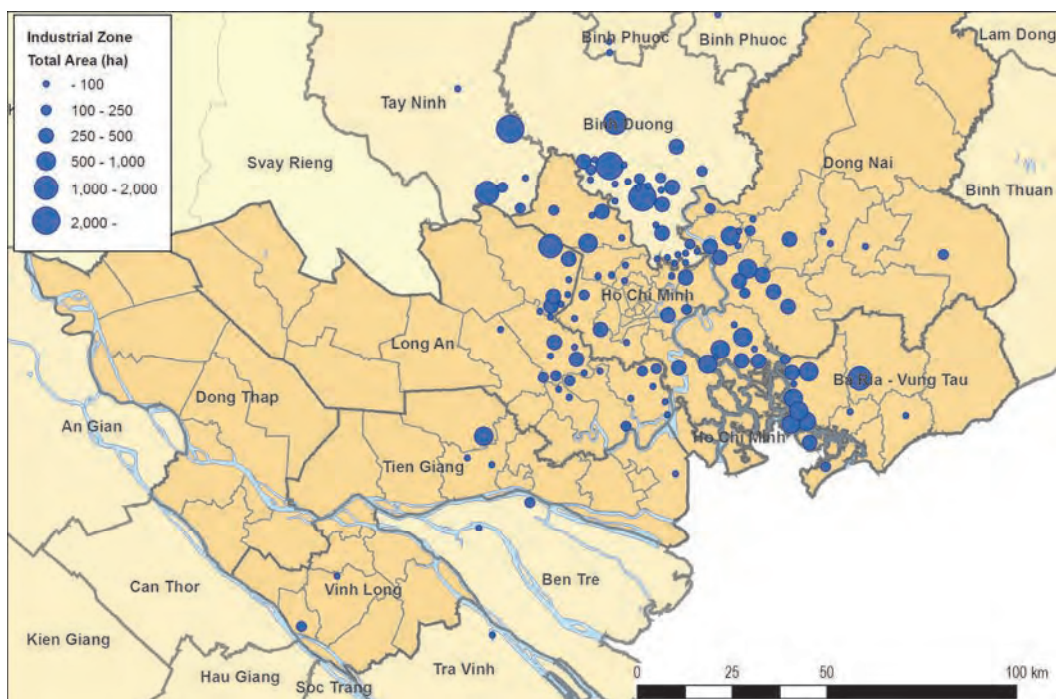


Source: JICA Survey Team

Figure 3.5.7 Forecasted Truck Trip Generation by Ports

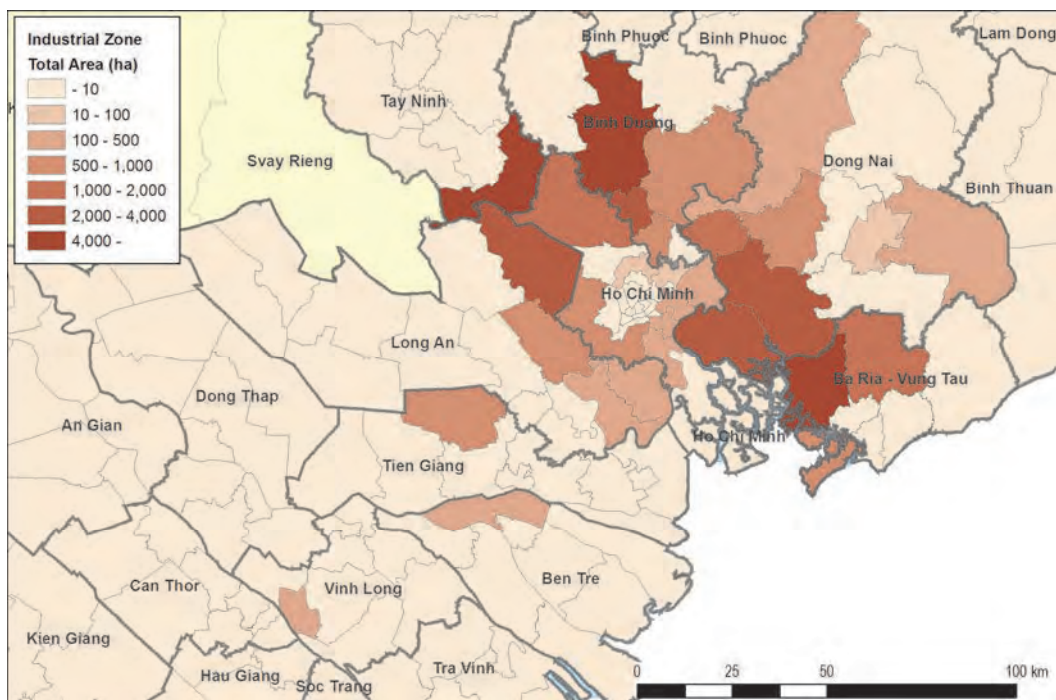
(2) Truck trip relevant to Industrial Zone

Industrial zones in the study area are distributed surrounding HCMC as shown in following figures. Total area of industrial zone is a total of occupied area by industry, vacancy area and land for other facilities such as road.



Source: JICA Survey Team

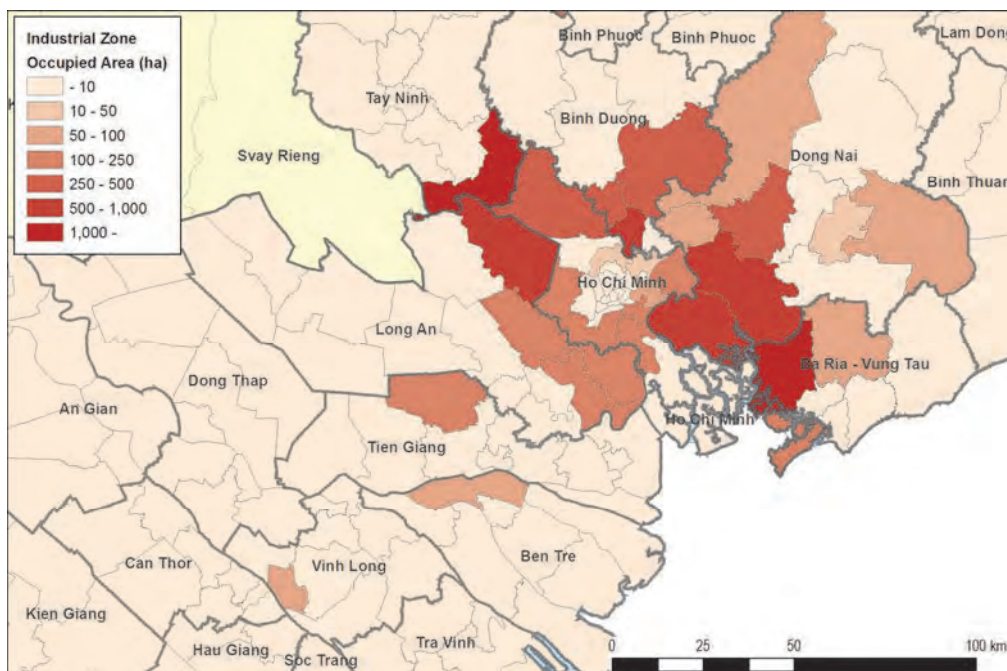
Figure 3.5.8 Existing Industrial Zones in the Survey Area and Vicinity



Source: JICA Survey Team

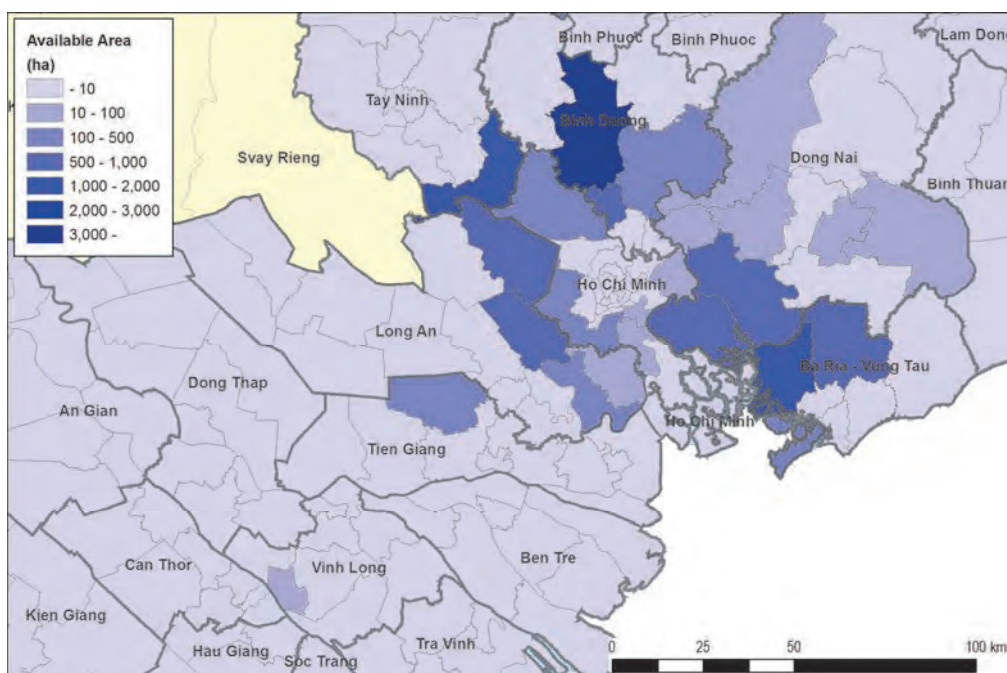
Figure 3.5.9 Current Total Area of Industrial Zone by Traffic Analysis Zone

Currently, as of 2015, occupied area by tenants and vacancy area for tenant are indicated as shown in following figures. The former is expected to have a correlation with current truck trip generation, and latter is expected to have a correlation with future truck trip generation growth.



Source: JICA Survey Team

Figure 3.5.10 Current Occupied Area of Industrial Zone by Traffic Analysis Zone



Source: JICA Survey Team

Figure 3.5.11 Available Area for Tenant in the Industrial Zone by Traffic Analysis Zone

Based on the estimated current truck OD and industrial zone area, truck trip generation is estimated by following models.

$$TG_{2AX} = 4.482 \cdot A_{occ} + 25.0 \quad (R^2=0.752)$$

Where,

TG_{2AX} : 2 Axles truck trip production or attraction (vehicle/day), and

A_{occ} : Occupied area in industrial zone (ha).

$$TG_{3AX} = 0.883 \cdot A_{occ} + 57.944 \quad (R^2=0.743)$$

Where,

TG_{3AX} : 3 Axles and more truck trip production or attraction (vehicle/day), and

A_{occ} : Occupied area in industrial zone (ha).

$$TG_{TRL} = EXP(1.226 \cdot \ln(A_{occ}) - 1.393) \quad (R^2=0.629)$$

Where,

TG_{TRL} : Trailer trip production or attraction (vehicle/day), and

A_{occ} : Occupied area in industrial zone (ha).

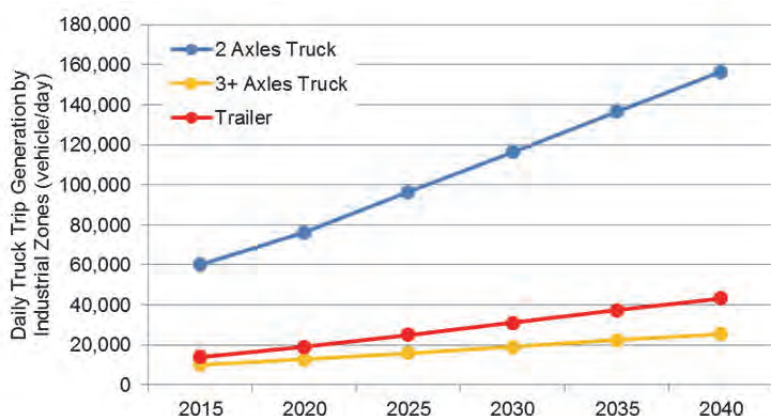
Future occupied area by tenant in industrial zone is assumed that (i) existing plan of new industrial zone and extension plan of existing industrial zone are realized in 2030, (ii) Occupancy rate in 2030 is 100%, and (iii) years between 2015 and 2030 are estimated by liner regression.

Table 3.5.1 Current and Future Industrial Zone Area

	2015				Est. 2030	
	Total Area (ha)	Area for Industrial	Occupied Area	Occupancy rate	Total Area (ha)	Area for Industrial
Survey Area	22,237	13,911	7,073	50.8%	31,572	16,685
Other Southern Region	21,089	12,654	6,038	47.7%	29,664	14,688
Total	43,327	26,565	13,111	49.4%	61,236	31,372

Source: JICA Survey Team

Assumed occupied area of industrial zones and truck trip generation model, future zonal truck trip generation by industrial zone is estimated as shown in the following figure.



Source: JICA Survey Team

Figure 3.5.12 Forecasted Truck Trip Generation by Industrial Zones

3.6 Forecasted Future Vehicle Demand

Forecasted vehicle demand is combined passenger vehicle OD and truck OD. Following table summarizes future vehicle demand relevant to survey area.

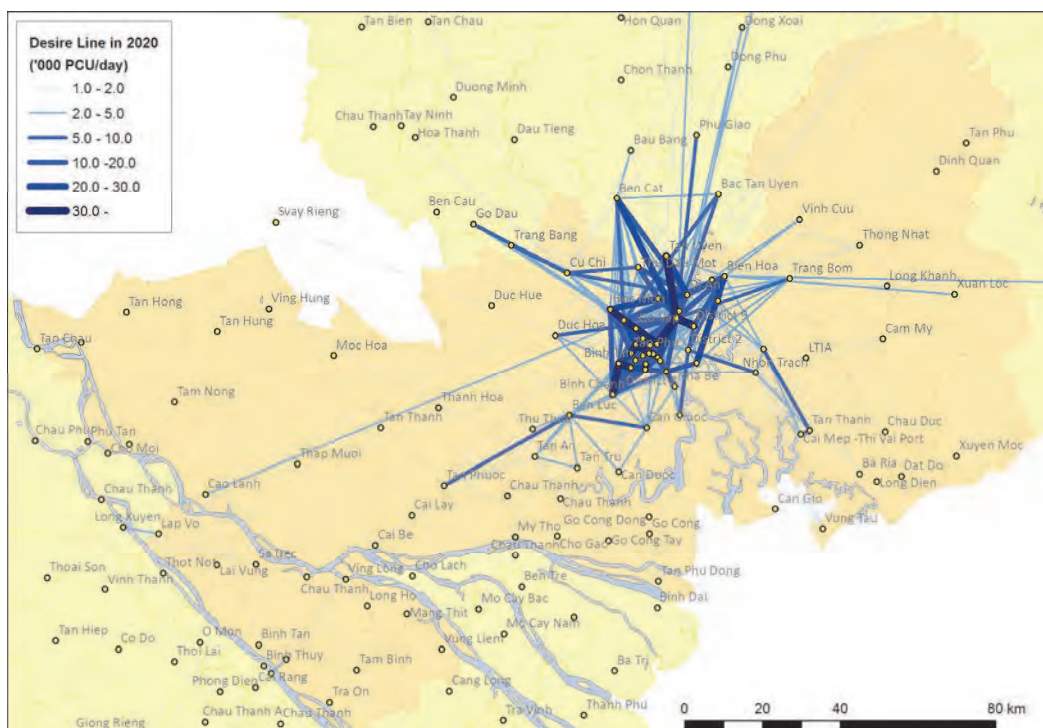
Table 3.6.1 Forecasted Vehicular Trip

Mode	Vehicle Trip ('000 trip per day)				Annual Growth Rate (% p.a.)		
	2016	Est. 2020	Est. 2030	Est. 2040	2016-2020	2020-2030	2030-2040
Motorcycle	16,894	17,769	16,059	17,782	1.3%	-1.0%	1.0%
Cars	413	437	1,210	1,346	1.5%	10.7%	1.1%
Mini Bus	29	31	85	95	1.2%	10.8%	1.1%
Large Bus	53	55	153	170	0.9%	10.9%	1.0%
2Axles Truck	316	416	769	1,352	7.1%	6.3%	5.8%
3+ Axles truck	40	53	97	170	7.1%	6.2%	5.7%
Trailer	41	65	163	372	11.9%	9.7%	8.6%

Note: Vehicular trip is based on vehicular OD matrices for the traffic assignment and only trips relevant to survey area.

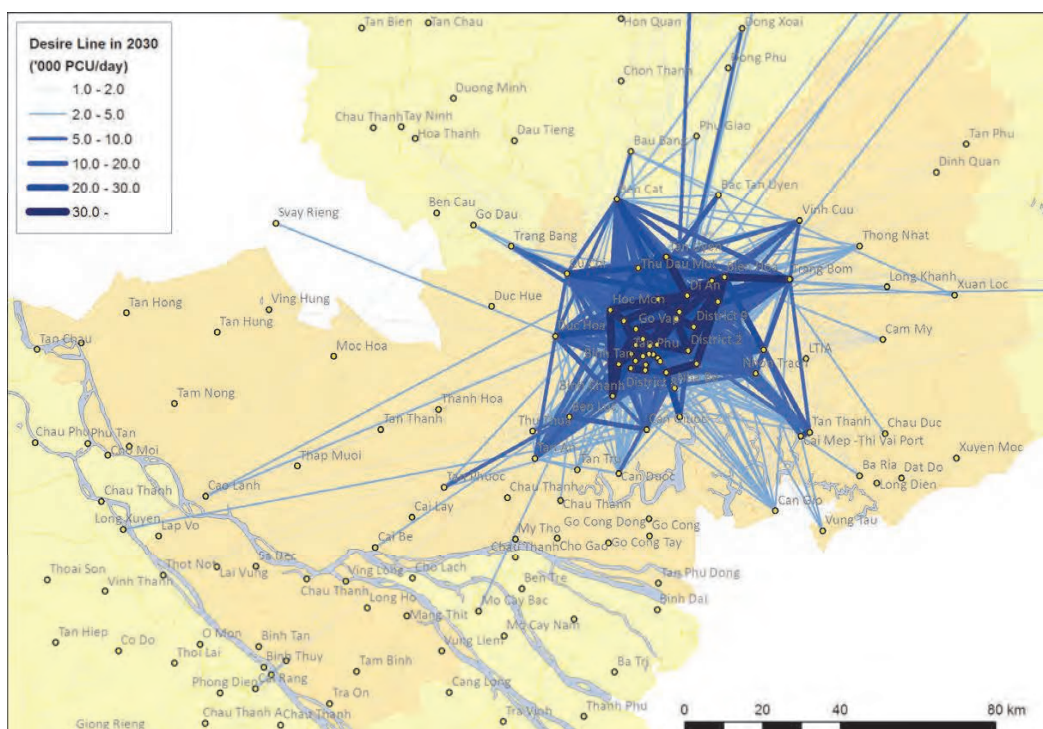
Source: JICA Survey Team

Future vehicular OD in 2020 is estimated by present pattern method with estimated vehicular OD in 2016 and forecasted vehicular trip generation in 2020. Vehicular OD in 2030 is estimated by trip generation in 2030, trip distribution model and modal split modes. The following figures show the desire line of forecasted vehicular OD in 2020 and 2030.



Source: JICA Survey team

Figure 3.6.1 Desire Line of Forecasted Vehicular Trip in 2020



Source: JICA Survey team

Figure 3.6.2 Desire Line of Forecasted Vehicular Trip in 2030

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MINUTES OF MEETING



**DATA COLLECTION SURVEY ON TRAFFIC CONDITIONS OF
SOUTHERN ROADS AND BRIDGES**
Oriental Consultants Global Co., Ltd.
International Development Center of Japan INC.



Minutes of Meeting with Dong Nai DoT

1. Place: Department of Transport (DoT) of Dong Nai

2. Date: 14:15 ~ 15:30 dated 10th March, 2016

3. Attendance:

DoT: Mr. Nguyen Thanh Dam (Director of Planning Department), Mr. Vu Xuan Du (Expert of Planning Department)

The JICA Survey Team: Mr. Gunji (Team Leader), Mr. Nakano, Mr. Hisada

4. Contents of Discussion:

(1) Introduction

Both parties introduced each other and exchanged contact information.

(2) Brief Presentation

Mr. Gunji gave a brief presentation (by using the PPT handout as attached hereto) on the Inception Report, including survey approach and methodology, organization and work plan, as well as requests to the DoT.

(3) Conclusion

- DoT highly appreciates JICA Survey Team and presents his financial demands for investment of significant projects in the province such as Tan Van – Nhon Trach, a part of HCM RR3, Nhon Trach inter-port highway, etc.
- DoT is willing to support the JICA Survey Team to collect necessary information and documents relating to Transport Development Plan of province.
- DoT explains the procedures for selection of investor for BT and BoT projects in the province, and explained that it follows Decree No.78/2007 and Decree No.15/2015. Dong Nai province has not implemented any road or bridge project by BT or BoT by provincial budget yet.

End.



**DATA COLLECTION SURVEY ON TRAFFIC CONDITIONS OF
SOUTHERN ROADS AND BRIDGES**
Oriental Consultants Global Co., Ltd.
International Development Center of Japan INC.



Minutes of Meeting with Ba Ria-Vung Tau DoT

1. Place: Department of Transport (DoT) of Ba Ria-Vung Tau

2. Date: 14:30 ~ 16:00 dated 11th March, 2016

3. Attendance:

DoT: Mr. Luong Anh Tuan (Deputy General Director of DoT), Mr. Nguyen Kim Hoan (Expert of Finance and Planning Department)

The JICA Survey Team: Mr. Gunji (Team Leader), Mr. Nakano

4. Contents of Discussion:

(1) Introduction

Both parties introduced each other and exchanged contact information.

(2) Brief Presentation

Mr. Gunji gave a brief presentation (by using the PPT handout as attached hereto) on the Inception Report, including survey approach and methodology, organization and work plan, as well as requests to the DoT.

DoT summarizes and explains about Transport Development Plan of Ba Ria-Vung Tau province until the year 2020 and vision to the years afterward. DoT is now updating this Plan. However, there is no much difference.

(3) Conclusion

- DoT highly appreciates JICA Survey Team and expresses his demands for financial support from JICA to realize the Transport Development Plan of the province, Above all, 2 following significant projects need the fund for implementation as soon as possible:
 - Phuoc An Bridge: It is planned as cable stayed bridge with required fund of app. USD300 mil. According to the DoT, the efficiency of Cai Mep-Thi Vai port complex shall be drastically increased once this bridge to be completed to connect to HCM expressway system.
 - Bien Hoa-Vung Tau expressway: congestion usually occurs at the weekend on the NH51 which connect Vung Tau with Dong Nai province and HCM city. In additional, it is unsafe for road users since there are high volume of cargo trucks running on this route.
- DoT explained the dangerous traffic condition on NH51 with mixed types of vehicles from motorbikes to 40feet container trailers. Nearly 50% of accidents in the province occur in NH51 and connecting road to Cai Mep-Thi Vai port. DoT desires above mentioned projects, especially Phuoc An Bridge, to be implemented promptly to improve the situation.
- DoT is willing to support the JICA Survey Team to collect necessary information and documents required by JICA Survey Team as much as he can.
- DoT explains that Ba Ria-Vung Tau province has not implemented any road or bridge project by BT or BoT by provincial budget yet.

End.



**DATA COLLECTION SURVEY ON TRAFFIC CONDITIONS OF
SOUTHERN ROADS AND BRIDGES**
Oriental Consultants Global Co., Ltd.
International Development Center of Japan INC.



Minutes of Meeting with Ho Chi Minh (HCM) DoT

1. Place: Department of Transport (DoT) of HCM

2. Date: 9:15 ~ 11:00 dated 11th March, 2016

3. Attendance:

DoT: Mr. Nguyen Van Tam (Deputy General Director of DoT), Mr. Bui Anh Tuan and Le Hong Son (Experts of Planning Department)

The JICA Survey Team: Mr. Gunji (Team Leader), Mr. Nakano, Mr. Arita, Mr. Hisada

4. Contents of Discussion:

(1) Introduction

Both parties introduced each other and exchanged contact information.

(2) Brief Presentation

Mr. Gunji gave a brief presentation (by using the PPT handout as attached hereto) on the Inception Report, including survey approach and methodology, organization and work plan, as well as requests to the DoT.

DoT summarizes and explains about Transport Development Plan of HCM city until the year 2020 and vision to the years afterward which was approved at Decision 368/QD-Ttg by Prime Minister in 2013.

(3) Conclusion

- DoT highly appreciates JICA Survey Team and presents his huge financial demand for investment of the significant projects as follows:
 - Remaining sections of HCM RR2: Section from Rach Chiec bridge to Go Dua intersection; Section from An Lap T-junction to Nguyen Van Linh road.
 - Remaining sections of HCM RR3
 - There are 5 elevated roads planned in the HCM city including Routes 1,2,3,4&5. Among these planned elevated roads, the route 5 with estimated cost of app. USD700 mil. is the first priority. Due to its required huge investment cost, it is very good if JICA could provide a TA for route 5 study.
 - Major interchanges at HCM gateway: An Phu and Nguyen Van Linh interchanges
 - MRT lines: HCM city needs the fund for implementation of MRT Lines 3A, 3B, 4 and Line 5-second phase
 - BRT: The BRT route 1 has been being implemented using WB fund. The fund for investment of other BRT lines has not determined yet.
 - Monorail: Although several monorail lines are planned by HCM city, it is not the time to invest them now.

- MOT and HCM city is sharing the role as Executing Agency for the above mentioned projects. HCM city has plan to discuss with MOT for clearer demarcation of each Party for project preparation and implementation.
- DoT is willing to support the JICA Survey Team to collect necessary information and documents required by JICA Survey Team as much as he can.
- DoT explains the procedures for selection of investor for BT and BoT projects in the province, and explained that selection of investors follows Decree No.30/2015. JICA study team confirmed that there is not any written criteria for selecting projects implemented by BT, BoT. They also provided JICA study team the information that HCMC has completed 4 BT and 6 BoT projects.

End.



**DATA COLLECTION SURVEY ON TRAFFIC CONDITIONS OF
SOUTHERN ROADS AND BRIDGES**
Oriental Consultants Global Co., Ltd.
International Development Center of Japan INC.



Minutes of Meeting with Dong Thap DoT

1. Place: Department of Transport (DoT) of Dong Thap

2. Date: 9:15 ~ 11:00 dated 14th March, 2016

3. Attendance:

DoT: Mr. Pham Van Tong (Deputy General Director of DoT), Mr. Nguyen Thanh Hoan (Director of Planning Department), Mr. Bui Van Vu (Dep. Director of Transport Management Department)

The JICA Survey Team: Mr. Gunji (Team Leader), Mr. Hisada

4. Contents of Discussion:

(1) Introduction

Both parties introduced each other and exchanged contact information.

(2) Brief Presentation

Mr. Gunji gave a brief presentation (by using the PPT handout as attached hereto) on the Inception Report, including survey approach and methodology, organization and work plan, as well as requests to the DoT.

DoT summarizes and explains about Transport Development Plan of Dong Thap province until the year 2020 and vision to the year 2030.

(3) Conclusion

- DoT highly appreciates JICA Survey Team and presents his financial demand for:
 - Replace of weak bridges on the road network in the province.
 - Improvement of Muong Khe – Doc Phu Hien canal which connect Tien river and Hau river as very important inland waterway route.
 - Construction of a large scale bridge on planned Ho Chi Minh highway crossing Tien river whose location is near the border between Vietnam and Cambodia.
- DoT is willing to support the JICA Survey Team to collect necessary information and documents required by JICA Survey Team as much as he can.
- DoT explains the procedures for selection of investor for BT and BoT projects in the province

End.



**DATA COLLECTION SURVEY ON TRAFFIC CONDITIONS OF
SOUTHERN ROADS AND BRIDGES**
Oriental Consultants Global Co., Ltd.
International Development Center of Japan INC.



Minutes of Meeting with Vinh Long DoT

1. Place: Department of Transport (DoT) of Vinh Long

2. Date: 14:15 ~ 16:00 dated 14th March, 2016

3. Attendance:

DoT: Mr. Nguyen Van Liet (General Director of DoT), Mr. Tran Van Na (Deputy General Director of DoT),
Mr. Ho Van Tri (Deputy Director of PMU)

The JICA Survey Team: Mr. Gunji (Team Leader), Mr. Hisada

4. Contents of Discussion:

(1) Introduction

Both parties introduced each other and exchanged contact information.

(2) Brief Presentation

Mr. Gunji gave a brief presentation (by using the PPT handout as attached hereto) on the Inception Report, including survey approach and methodology, organization and work plan, as well as requests to the DoT.

DoT summarizes and explains about Transport Development Plan of Vinh Long province until the year 2020 and vision to the years afterward which approved in 2011.

(3) Conclusion

- DoT highly appreciates JICA Survey Team and presents his financial demand for investment of following significant projects:
 - Vo Van Kiet urban arterial road with estimated investment cost of app. USD 80 mil.
 - Connecting road from NH53 to Hoa Phu industrial zone, which is the biggest industrial zone in the province, with estimated cost of about USD 30 mil.
 - Quoi An bridge on provincial road 902 crossing Mang river with investment cost of app. USD20 mil.
- DoT is willing to support the JICA Survey Team to collect necessary information and documents required by JICA Survey Team as much as he can.
- DoT explains the procedures for selection of investor for BT and BoT projects in the province

End.



**DATA COLLECTION SURVEY ON TRAFFIC CONDITIONS OF
SOUTHERN ROADS AND BRIDGES**
Oriental Consultants Global Co., Ltd.
International Development Center of Japan INC.



Minutes of Meeting with Long An DoT

1. Place: Department of Transport (DoT) of Long An

2. Date: 14:00 ~ 15:30 dated 15th March, 2016

3. Attendance:

DoT: Mr. Nguyen Van Chinh (Dep. General Director of DoT), Mr. Tran Thien Truc (Director of Planning Department), Mr. Pham Phuong Nam (Dep. Director of Infrastructure Management Dept.)

The JICA Survey Team: Mr. Gunji (Team Leader), Mr. Hisada

4. Contents of Discussion:

(1) Introduction

Both parties introduced each other and exchanged contact information.

(2) Brief Presentation

Mr. Gunji gave a brief presentation (by using the PPT handout as attached hereto) on the Inception Report, including survey approach and methodology, organization and work plan, as well as requests to the DoT.

DoT summarizes and explains about Transport Development Plan of Long An province until the year 2020 and vision to the year 2030.

(3) Conclusion

- DoT highly appreciates JICA Survey Team and presents his financial demand for investment of following significant projects:
 - Replacement of weak bridges on the road network
 - Construction of 4 new bridges crossing the Vam Co Dong and Vam Co Tay rivers and locating on the planned provincial roads which will connect Tan An city with Ho Chi Minh city.
- DoT is willing to support the JICA Survey Team to collect necessary information and documents required by JICA Survey Team as much as he can.

End.



**DATA COLLECTION SURVEY ON TRAFFIC CONDITIONS OF
SOUTHERN ROADS AND BRIDGES**
Oriental Consultants Global Co., Ltd.
International Development Center of Japan INC.



Minutes of Meeting with Tien Giang DoT

1. Place: Department of Transport (DoT) of Tien Giang

2. Date: 09:15 ~ 11:00 dated 15th March, 2016

3. Attendance:

DoT: Mr. Tran Van Bon (General Director of DoT), Mr. Ngo Tri Dung (Director of Planning Department), Mr. Son (Presentative of provincial Department of Planning)

The JICA Survey Team: Mr. Gunji (Team Leader), Mr. Hisada

4. Contents of Discussion:

(1) Introduction

Both parties introduced each other and exchanged contact information.

(2) Brief Presentation

Mr. Gunji gave a brief presentation (by using the PPT handout as attached hereto) on the Inception Report, including survey approach and methodology, organization and work plan, as well as requests to the DoT.

DoT summarizes and explains about Transport Development Plan of Tien Giang province until the year 2020 and vision to the year 2030.

(3) Conclusion

- DoT highly appreciates JICA Survey Team and presents his financial demand for investment of following significant projects:
 - Replacement of weak bridges on the road network
 - Construction of new bridges crossing the river to replace ferry stations.
 - The road connecting Dong Nam Tan Phuoc industrial zone with Go Cong industrial zone with total length of 40km and estimated cost of app. USD80 mil.
 - Construction of Rach Mieu 2 bridge on NH60 crossing Tien river.
- DoT is willing to support the JICA Survey Team to collect necessary information and documents required by JICA Survey Team as much as he can.
- DoT explains the procedures for selection of investor for BT and BoT projects in the province

End.



**DATA COLLECTION SURVEY ON TRAFFIC CONDITIONS OF
SOUTHERN ROADS AND BRIDGES**
Oriental Consultants Global Co., Ltd.
International Development Center of Japan INC.



Minutes of Meeting with Cuu Long CIPM

1. Place: Cuu Long CIPM office

2. Date: 09:00 ~ 10:30 dated 16th March, 2016

3. Attendance:

Cuu Long CIPM: Mr. Diep Bao Tuan (Director of Investment and Business Department), Ms. To Thanh Huyen (Expert of Investment and Business Department)

The JICA Survey Team: Mr. Gunji (Team Leader), Mr. Hisada

4. Contents of Discussion:

(1) Introduction

Both parties introduced each other and exchanged contact information.

(2) Brief Presentation

Mr. Gunji gave a brief presentation (by using the PPT handout as attached hereto) on the Inception Report, including survey approach and methodology, organization and work plan, as well as requests to the DoT.

Cuu Long CIPM summarizes and explains about Transport Development Plans of Ho Chi Minh city and Mekong Delta Region as well as his targeted projects.

(3) Conclusion

- Cuu Long highly appreciates JICA Survey Team and presents his financial demand for investment of following significant projects:
 - Remaining sections of HCM RR3: 2 sub-sections under Tan Van - Nhon Trach Section with the length of 11km and 5km&a big interchange with Ben Luc-Long Thanh expressway respectively; Section from Ben Luc to NH22 which FS shall be done by ADB fund.
 - HCM elevated road No.5
 - HCM RR4, Section from Ben Luc to Hiep Phuoc (intersection with NH1 to Can Giuoc).
- Cuu Long is willing to support the JICA Survey Team to collect necessary information and documents required by JICA Survey Team as much as he can.

End.



**DATA COLLECTION SURVEY ON TRAFFIC CONDITIONS OF
SOUTHERN ROADS AND BRIDGES**
Oriental Consultants Global Co., Ltd.
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Minutes of Meeting with Project Management Unit 7 (PMU7)

1. Place: HCMC DOT office

2. Date: 14:30 ~ 15:30 dated 19th April, 2016

3. Attendance:

HCMC DOT: Mr. Vu Xuan Nguyen (General Director), Mr. Dung, Mr. Hai, Mr. Hung

The JICA Survey Team: Mr. Nakano, Ms. Lan (Interpreter)

4. Contents of Discussion:

(1) Introduction

Both parties introduced each other and exchanged contact information.

(2) Brief Presentation

JICA survey team (Mr. Nakano) gave a brief presentation (by using the PPT handout as attached hereto) on the Inception Report, including survey approach and methodology, organization and work plan, as well as requests to the PMU7.

PMU7 (Mr. Nguyen Chung Khanh) briefly explained about the projects managed and implemented by PMU7.

(3) Conclusion

- PMU7 highly appreciates JICA Survey Team's visit
- HCMC DOT provides following project status:
 - PMU7 recognizes that 2nd My Thuan bridge project starts at the IC to NH 30 and ends at the IC to NH80. The project is approximately estimated 6km long. It is planned to be constructed before My Thuan – Can Tho expressway is opened (2019).
 - 2nd My Thuan bridge project needs EIA to be approved before the construction. The assessment is in under preparation by PMU7.
 - Trung Luong – My Thuan expressway is under construction by a joint stock company of 5 domestic companies. It is planned to be completed by Dec. 2018.
 - My Thuan – Can Tho expressway project has been approved by the central government and a joint stock company of 3 domestic companies has submitted a proposal of BOT project to PMU7. It is planned to be constructed in 2019.
- PMU7 strongly requests JICA to continue the project by Japanese ODA. (METI FS executed in 2015)
- PMU7 is willing to support the JICA Survey Team to collect necessary information and documents required by JICA Survey Team as much as they can.

End.



**DATA COLLECTION SURVEY ON TRAFFIC CONDITIONS OF
SOUTHERN ROADS AND BRIDGES**
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Minutes of Meeting with Traffic Safety Projects Management Unit (TSPMU)

1. Place: TSPMU office

2. Date: 010:30 ~ 11:15 dated 25th April, 2016

3. Attendance:

TSPMU: Mr. Le Gia Hung (Chief of Project Management Division No.2)

The JICA Survey Team: Mr. Nakano, Mr. Hisada

4. Contents of Discussion:

(1) Introduction

Both parties introduced each other and exchanged contact information.

(2) Brief Presentation

Mr. Nakano/Mr. Hisada gave a brief presentation (by using the PPT handout as attached hereto) on the Inception Report, including survey approach and methodology, organization and work plan, as well as requests to the TSPMU.

TSPMU summarizes and explains about Ho Chi Minh City – Moc Bai Expressway Project.

(3) Conclusion

- TSPMU highly appreciates JICA Survey Team and provide following project status:
 - KOICA is interested in the project. However, they have not replied to TSPMU's request of conference for Pre-FS yet.
 - TSPMU supposes that traffic survey, traffic demand forecast, proposal of fund whether ODA or not and so on will be carried out in the pre-FS by KOICA.
 - The project has already decided to implement by official meeting between Ministry of Transport (MOT) of Vietnam and Ministry of Public Works and Transport (MPWT) of Cambodia.
 - Vietnamese investor has already contacted MOT.
- TSPMU is willing to support the JICA Survey Team to collect necessary information and documents required by JICA Survey Team as much as he can.

End.



**DATA COLLECTION SURVEY ON TRAFFIC CONDITIONS OF
SOUTHERN ROADS AND BRIDGES**
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Minutes of Meeting with Planning & Investment Department (DPI)

1. Place: DPI office

2. Date: 14:00 ~ 14:30 dated 26th April, 2016

3. Attendance:

DPI: Mr. Nguyen Ngoc Hai (Senior Official of Project Management Division)

The JICA Survey Team: Mr. Nakano, Mr. Hisada

4. Contents of Discussion:

DPI and JICA survey team discussed candidate projects based on attached list which is as of April, 2016. Besides, JICA survey team explained that the candidate projects are listed without JICA opinion, thus, it is not avail.

- Ho Chi Minh City Ring Road No.3
 - Its west portion will be funded by ADB and JICA. At the moment, between ADB and JICA are under discussion.
 - Selection of consultant for FS is in progress.
- Phuoc An Bridge
 - Ba Ria-Vung Tau province has already applied to MPI for construction of Phuoc An bridge.
 - Phuoc An bridge is not under MOT but Ba Ria-Vung Tau province.
- Bien Hoa – Vung Tau Expressway
 - BH – VT expressway which was proposed in M/P will be constructed by BOT scheme.
- Ho Chi Minh City – Moc Bai Expressway
 - KOICA is due to conduct pre-FS at this moment.
- Second My Thuan Bridge
 - As related project, the construction of Trung Luong – My Thuan expressway is under construction. 5 packages of 33 packages have been undertaken and all packages are supposed to be done in 2018.
- Viaduct No.5
 - This is under HCMC people's committee. It is difficult to conduct land acquisition because the site along the route is narrow.
- Ho Chi Minh City Ring Road No.4
 - Section between Ben Luc and Hiep Phuoc will be constructed by BOT scheme.

- Ben Luc – Long Thanh Expressway
 - This is under construction.

- Others
 - If there is any important document which JICA survey team has already acquired, JICA survey team would like to obtain from DPI. (if any)

End.



**DATA COLLECTION SURVEY ON TRAFFIC CONDITIONS OF
SOUTHERN ROADS AND BRIDGES**
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Minutes of Meeting with Project Management Unit 85 (PMU85)

1. Place: Project Management Unit 85 (PMU85) Hanoi office

2. Date: 14:00 ~ 15:00 dated 27th April, 2016

3. Attendance:

PMU85: Mr. Minh (Deputy Director), Mr. Giang, Mr. Khanh
The JICA Survey Team: Mr. Nakano, Ms. Hang (Interpreter)

4. Contents of Discussion:

(1) Introduction

Both parties introduced each other and exchanged contact information.

(2) Brief Presentation

JICA survey team (Mr. Nakano) gave a brief presentation (by using the PPT handout as attached hereto) on the Inception Report, including survey approach and methodology, organization and work plan, as well as requests to the PMU7.

PMU85 (Mr. Minh) briefly explained about the Bien Hoa – Vung Tau Expressway Project (hereinafter BH-VT project).

(3) Conclusion

- PMU85 highly appreciates JICA Survey Team's visit
- PMU85 explained project status as follows:
 - PMU85 is aiming to implement the project by BOT scheme.
 - PMU85 prepared the pre-FS report and submitted to MOT. FS has been executing by TEDI. It planned to be finished by Sep. 2016.
 - After FS report is approved by MOT, PMU 85 will hold the bidding process to select a BOT investor for Phase 1 (Bien Hoa - Tan Thanh, including access to Cai Mep – Thi Vai port area with 4 lanes. It is planned to take 6 months to select the investor.
 - There will be no investment from government. The investor will collect toll from road users and recoup the investment. Toll rate and project period will be set by investor and proposed in proposal.
 - Local government will execute the land acquisition. The cost will be paid by the investor.
 - EIA for the project has been approved in 2010, it only needs some updating process.
 - There is not any specific plan including financial procurement for Phase 2.
- PMU85 is willing to support the JICA Survey Team to collect necessary information and documents required by JICA Survey Team as much as they can.

End.



**DATA COLLECTION SURVEY ON TRAFFIC CONDITIONS OF
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Minutes of Meeting with Asian Development Bank (ADB)

1. Place: ADB office

2. Date: 16:30 ~ 17:15 dated 28th April, 2016

3. Attendance:

ADB: Mr. Ahonen (Senior Transport Specialist)

JICA: Ms. Tanaka

The JICA Survey Team: Mr. Nakano, Mr. Hisada

4. Contents of Discussion:

ADB and JICA survey team discussed investment of Ring Road No.3 (RR3) and other projects.

- ADB is selecting the consultant for FS of RR3. Besides, FS will commence from June, 2016.
- ADB is always open and doesn't think that they will invest in RR3 by themselves. It depends on Vietnam Government and other donors including JICA. At this moment, they can't say in particular because FS isn't done. The scheme of co-financing must be requested by Vietnamese Government.
- Therefore, investment amount and ceiling price for RR3 are not yet determined.
- ADB is also interested in Mekong Delta Area and North-South Expressway.

End.



**DATA COLLECTION SURVEY ON TRAFFIC CONDITIONS OF
SOUTHERN ROADS AND BRIDGES**
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International Development Center of Japan INC.



Minutes of Meeting with Planning & Investment Department (DPI)

1. Place: DPI office

2. Date: 10:00 ~ 11:00 dated 1st July, 2016

3. Attendance:

DPI: Mr. Nguyen Ngoc Hai (Senior Official of Project Management Division)

The JICA Survey Team: Mr. Gunji (Team Leader), Mr. Nakano, Mr. Arita and Mr. Hisada

4. Contents of Discussion:

(1) Confirmation of Survey Progress

First of all, Mr. Hai explained that Ms. Thuy has accompanied Deputy Minister Mr. Dong to visit Lach Huyen Highway Project and Lach Huyen Port. Thus, she could not join the meeting.

Both sides confirmed the work progress which started with the data/information collection and the traffic survey conducted in cooperation with the Police in late February 2016. At last, the draft final report has been prepared and it is to be presented to DPI today a preliminary conclusion of the survey.

(2) Brief Presentation

The survey team leader, Mr. Gunji gave a brief presentation on the Draft Final Report. The report covers such contents as the objectives of the survey, traffic demand forecast, method of project prioritization, criteria for short-listed projects. He also showed a location map of the short-listed projects, and their preliminary results of economic and financial indicators used for priority considerations.

(3) Conclusions

DPI agreed with the method of selecting short-listed projects and Mr. Hai expressed his interest in details of traffic demand forecast. Among the selection criteria, Mr. Hai stressed the importance of intermodal transport, especially between road and inland waterway transports in the Mekong Delta Region.

There are 6 candidate projects in the short list proposed by the team. They are:

- HCMC Ring Road No.3 (Section 3 & Section 4),
- HCMC Ring Road No.4 (Ben Luc – Hiep Phuoc Port)
- Phuoc An Bridge
- Bien Hoa – Vung Tau Expressway (Phase1 & Phase2)
- HCMC – Moc Bai Expressway
- 2nd My Thuan Bridge

Mr. Hai informed the team that the MOT and KOICA signed ROD two weeks ago for carrying out prefeasibility studies on several projects, among which HCMC – Moc Bai Expressway was proposed in BOT form.

Last year, there was no new projects accepted by JICA but only the additional fund required for the on-going projects, such as Da Nang – Quang Ngai Expressway, Ben Luc – Long Thanh Expressway, Lach Huyen Project, etc. In the coming fiscal year, the MOT is looking for new projects enumerated in the said short-list.

End



**DATA COLLECTION SURVEY ON TRAFFIC CONDITIONS OF
SOUTHERN ROADS AND BRIDGES**
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Minutes of Presentation on Draft Final Report (DFR)

1. Place: Liberty Central Saigon Riverside Hotel

2. Date: 15:30 ~ 16:30 dated 5th July, 2016

3. Attendance: Refer to attachment

4. Agenda of the DFR presentation:

Mr. Gunji explained the result of study such as preliminary conclusion and short listed projects in addition to criteria in accordance with the following topics.

- 1) Objectives of the survey
- 2) Survey area
- 3) Preliminary result of traffic demand forecast
- 4) Methodology of project selection
- 5) Project long list
- 6) Criteria for selecting short listed projects
- 7) Project short list
- 8) Preliminary results of economic priority indicators
JICA survey team explained the preliminary results of economic priority as of July 5th, 2016.
- 9) Preliminary conclusion
JICA survey team explained the preliminary conclusion as of July 5th, 2016.

5. Presentation Material: Refer to attachment

End

“Seminar on PPP/BOT”
and
“DFR (Draft Final Report) Presentation on Data Collection Survey on
Traffic Conditions of Southern Roads and Bridges”

Venue: Apollo 2&3 – 2nd Floor, 17 Ton Duc Thang St, District 1st, HCM City, Liberty Central
 Saigon Riverside Hotel

Date: 5th July, 2016

Time: 1:30 p.m.

List of Participants

Name	Affiliation, Organization
Tran Thien Tnu	Long An Transport Department
Du Quang Vinh	//
Le Tucm Phong	//.
To Chieu Minh Tu	
Nguyen Van Choa	
Nguyen Tawng Giang	
Dang Thanh Tung	
Tran Van Bon	Tren Giang Transport D-
Nguyen Thanh Binh	nt
Tuong Thanh Hwang	
Nguyen Cong Ninh	
Doan Manh Luang	
Nguyen Ngoc Khuong	
Hai Hong Hai	
Izumi IWAKA	JICA
To Thanh Huyen	Cuu Long CRPM

Data Collection Survey on Traffic Conditions of Southern Roads and Bridges



From
the People of Japan



Presentation on Draft Final Report (DFR)



July 5th, 2016



ORIENTAL CONSULTANTS GLOBAL CO., LTD.
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- AGENDA -

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(I) DFR Presentation by JICA Survey Team

- 1.Introduction**
- 2.Traffic Demand Forecast**
- 3.Prioritization of Projects**
- 4.Economic Analysis**
- 5.Preliminary Conclusion**

(II) Discussion

1. Introduction

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1.1 Objectives of the Survey

Improvement of logistics efficiency for southern Vietnam by:

- **Incorporating into the plan review the increasing traffic demand for Ho Chi Minh City Metropolitan Area and the Mekong Delta Area,**
- **Ensuring of efficient freight transport movement,**
- **Elaborating needs to improve and develop existing road and bridge infrastructure**

1. Introduction

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1.2 Survey Area

Ho Chi Minh City Metropolitan Area

- Ho Chi Minh City
- Dong Nai Province
- Ba Ria Vung Tau Province

Mekong Delta Area

- Long An Province
- Dong Thap Province
- Tien Giang Province
- Vinh Long Province



2. Traffic Demand Forecast

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2.1 Social Economic Frame Work

- Reference is made to the study “Data Collection Survey on Railways in Major Cities in Vietnam (METROS), 2013-16” as the latest and most relevant study of similar nature.
- Population growth of HCMC remains slow but it will reach 9.5 million in 2030.
- Population in the HCMC center will gradually decrease but increase in outer area.
- Urban population in Dong Nai, Long An and Vinh Long will grow at a rate over 3%/yr.
- Rapid urbanization continues not only in the HCMC’s periphery but sets out in provincial urban centers.

Population Framework of City/Provinces of the Survey Area (‘000 persons)

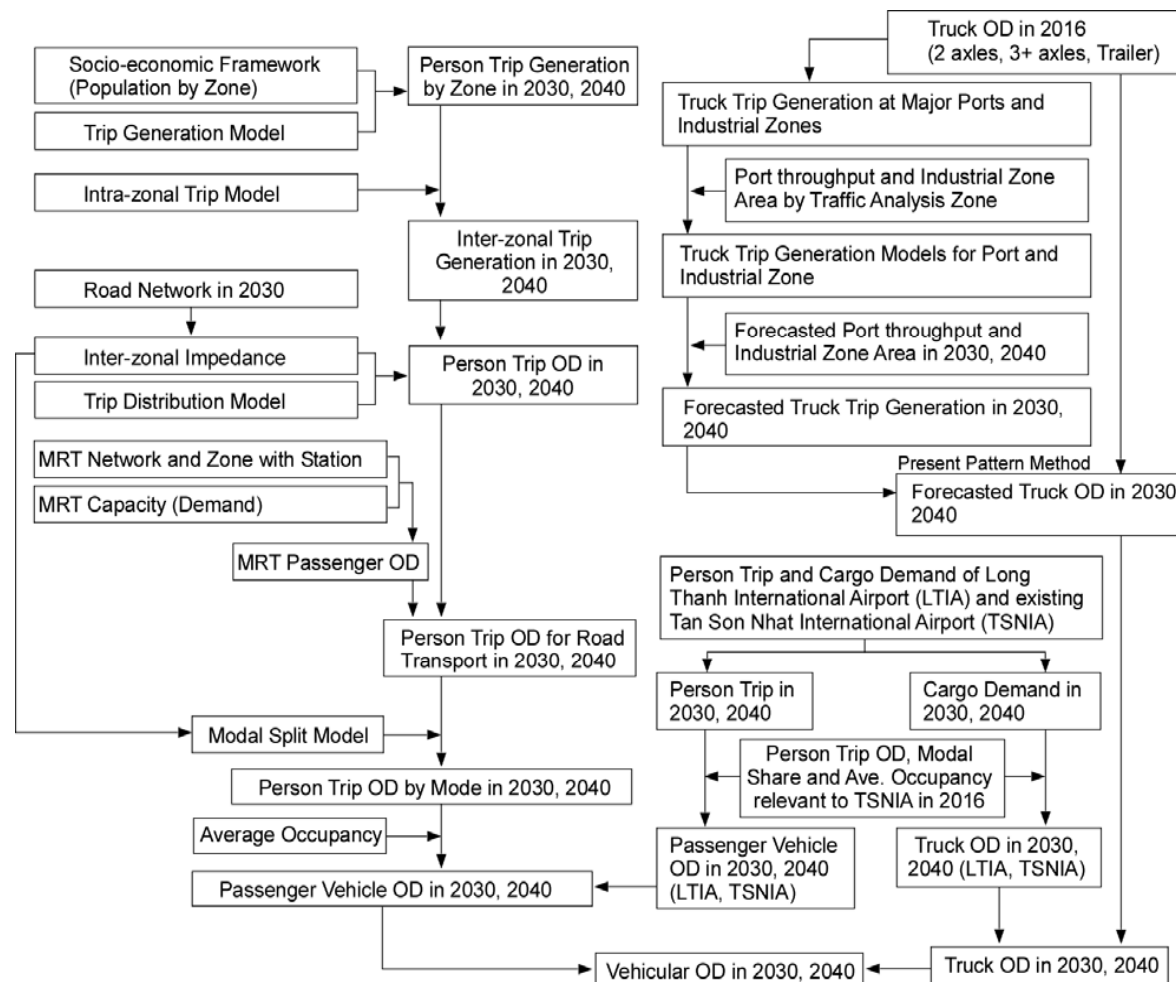
City/ Province	2016			2020			2030		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
HCMC	6,895	1,421	8,316	7,429	1,294	8,723	8,507	984	9,491
Dong Nai	1,016	1,829	2,845	1,241	1,890	3,131	1,911	1,929	3,840
BRVT	571	529	1,100	635	498	1,132	773	402	1,176
Long An	281	1,214	1,495	330	1,248	1,578	472	1,278	1,751
Dong Thap	319	1,389	1,708	350	1,374	1,724	424	1,308	1,732
Tien Giang	275	1,436	1,711	304	1,422	1,726	372	1,359	1,730
Vinh Long	183	861	1,045	211	866	1,077	285	839	1,125
Survey Area	9,540	8,679	18,220	10,499	8,592	19,091	12,744	8,100	20,843

2. Traffic Demand Forecast

ORIENTAL CONSULTANTS GLOBAL CO., LTD.
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2.2 Methodology of Traffic Demand Forecast in 2030&2040

Future passenger vehicle demand in 2030 (and 2040 for the economic analysis) is computed by demand forecast models estimated by METROS* PT survey results.

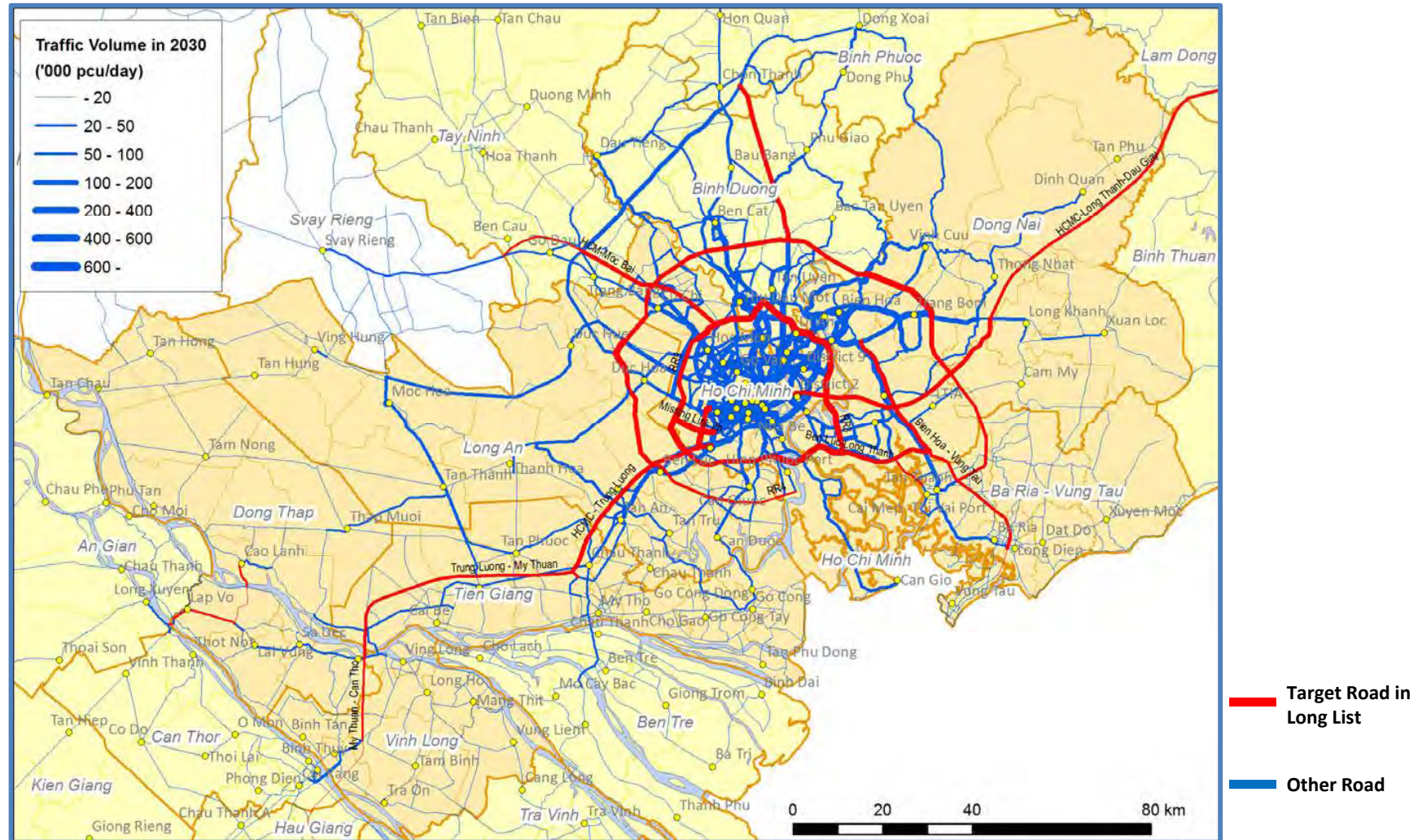


METROS:
Data Collection Survey
on Railway in Major
Cities in Vietnam
(METROS), 2015, JICA

2. Traffic Demand Forecast

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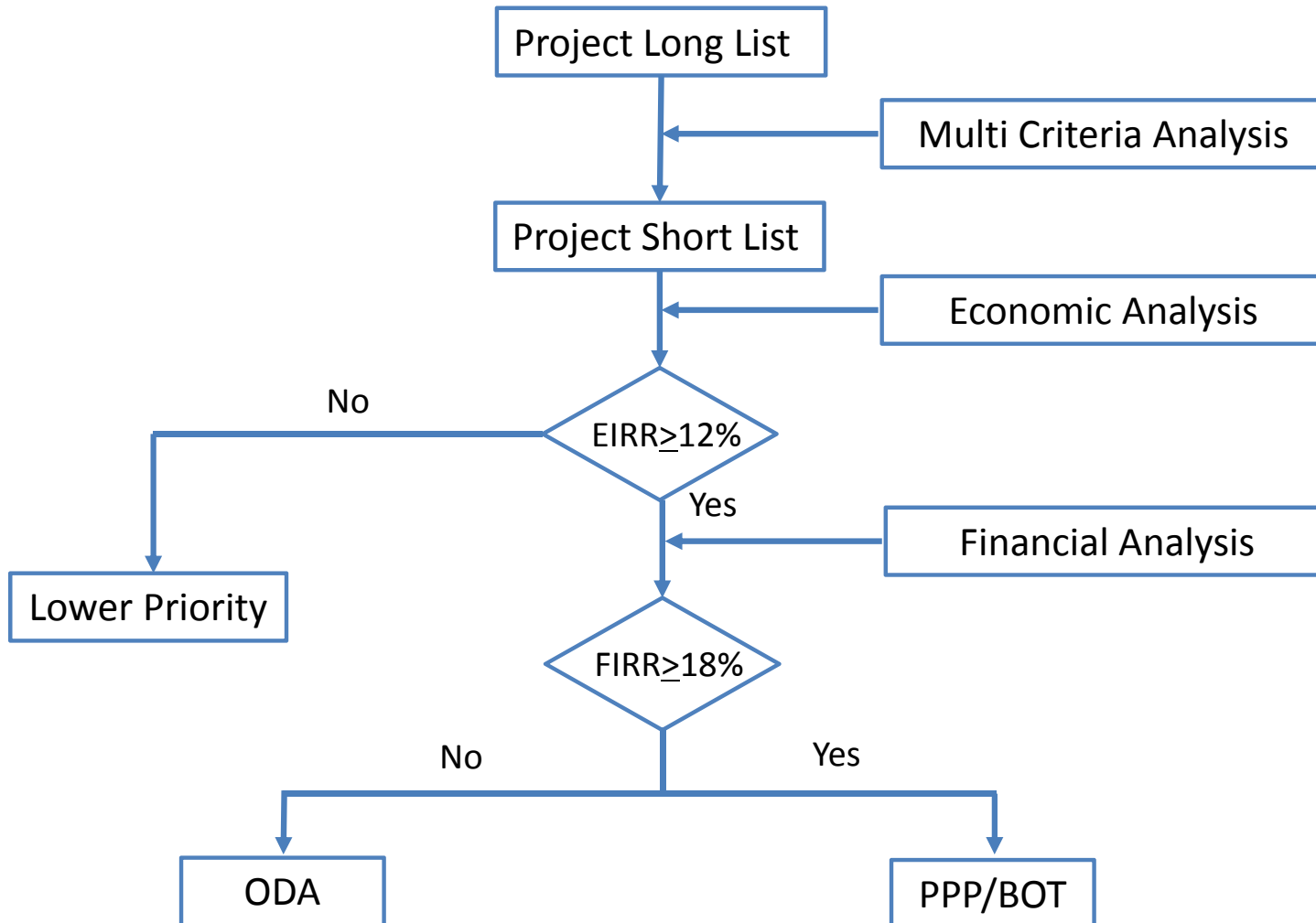
2.3 Preliminary Result of Traffic Demand Forecast



3. Prioritization of Projects

3.1 Methodology

To pursue rationale and efficient process, the selection of priority projects will be carried out in accordance with the following flow chart.



3. Prioritization of Projects

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3.2 Project Long List (1) - Ring Road

Road Category	Project Name	Pro. Type *1	Road Length (km)	No. of Lanes/width (m)	Const. Period *2(Year)	Planning/Implementation Progress	TDF*3, 2030 (pcu/day)	Fund Source (Expected)	Expected Opening Year		Data and Information Source (Date, etc.)	
									2020	2030		
Ring Road	2nd Ring Road:											
	Southwest Section		5km	4 lanes			30,000		N/A	Op.	Missing Link	
	Northeast Section		9km	6 lanes			142,000	PPP	N/A	Op.	Missing Link	
	Viaduct No.5		30.4km	4 lanes		Planned on the 2nd Ring Road	125,000		N/A	Op.		
	3rd Ring Road:											
				(97.7km)								
	Section 1: NhonTrach - Tan Van (including Extension to NH 1)		34.3km	4 lanes/19.5m		F/S financed completed. KEXIM	146,000	Const. Fund by EDCM for 1-2 but no fund yet for 1-1 & 1-3 sub-sections	N/A	Op.	TOR of ADB financed F/S for Sections 3 and 4, issued in 2015. TOR of ADB F/S Hearing from Cuu Long CIPM on 16/03/2016	
	Sub-section 1-1: North											
	Sub section 1-2: Central											
	Sub section 1-3: South											
	(Extension to NH 1)			4 lanes/20.5m				Korean BOT	N/A	Op.		
	Section2:Tan Van - Binh Chuan		16.7km	Varies		Operation Construction has been completed by BOT of a state owned enterprise in 2014.	183,000		Op.	Op.		
	Section 3: Binh Chuan – NH22		17.5km	8 lanes (4-Urban, 4-xpress)/74.5m		ADB-financed Pre-F/S completed	166,000	BOT	N/A	Op.		
	Section 4: NH 22 – Ben Luc		29.2km	Ditto		Fund for Const. by ADB or JICA expected for either one of the two sub-sections.	180,000	ADB + JICA	N/A	Op.		
Sub-section 4-1: North												
Sub-section 4-2: South												
4th Ring Road:												
Section1:Trang Bom-NH No.13		51.9km	4 lanes/27.0m (viaduct), 74.5m (Embankment)			64,000		N/A	Op.	Cuu Long CIPM http://cuulongcipm.com.vn/Home/investor/00269f.aspx		
Section2:Tan Uyen-Binh Duong		22.8km				73,000		N/A	Op.			
Section3:NH No.22-Ben Luc		41.6km	4 lanes/27.0m (viaduct), 74.5m (Embankment)			59,000		N/A	Op.			
Section4:Ben Luc-Hiep Phuoc		34.7km				38,000		N/A	Op.			
Section5:Trang Bom-Phu My		TBD				33,000		N/A	Op.			

*1: Project Type, *2: Construction Period, *3: Traffic Demand Forecast, *4: Operation

Note: The result of traffic demand forecast is shown excluding the motorcycle.

3. Prioritization of Projects

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3.2 Project Long List (2) - Expressway Network (HCM Region Regional Expressway)

Road Category	Project Name	Pro. Type *1	Road Length (km)	No. of Lanes/width (m)	Const. Period *2 (Year)	Planning/Implementation Progress	TDF*3, 2030 (pcu/day)	Fund Source (Expected)	Expected Opening Year		Data and Information Source (Date, etc.)	
									2020	2030		
HCM Region Regional Expressway	HCMC-Long Thanh-Dau Giay		55.0km	4 lanes (designed 6-8 lanes)	Feb., 2016	Completed	138,000 (71,000)	JICA/ADB	Op. *4	Op.		
	Bien Hoa – Vung Tau		(46.8km)	(6 lanes)	2016-‘17: Land Acq. 2017-‘18: Const.	PMU 85 proposed to MOT in Apr., 2016						
	Section 1: Bien Hoa – Phu My						135,000		N/A	Op.		
	1-1: Bien Hoa – Long Thanh Dau Giay				6 lanes/32.25~34.5m				N/A	Op.		
	1-2: Long Thanh Dau Giay ex – Ben Luc Long Thanh ex			38.0km	8 lanes/39.75~42m		Pre FS by PMU85 done		BOT	N/A	Op.	
	1-3: Bem Luc Long Thanh ex – Tan Thanh (JCT)				6 lanes/32.25~34.5m					N/A	Op.	
	Section 2: Phu My (JCT) – Cai Mep Thi Vai Port			8.8km	6 lanes/30.5~33m			76,000		N/A	Op.	
	Section 3: Tan Thanh (JCT) – Vung Tau	TBD		30.8km	4 lanes/24.75~27m			55,000	undecided	N/A	Op.	
	Ben Luc – Long Thanh						Under construction		JICA/ADB	Op.	Op.	
	Section 1: Package A1 – A3	ODA		18.7km	4 lanes/25~26.5	Till 2020		182,000	ADB	Op.	Op.	
	Section 2: Package A4, J1 – J3	ODA		13.7km	4 lanes/21.75	Till 2017	Almost all elevated	219,000	JICA	Op.	Op.	
	Section 3: Package A5 – A7	ODA		25.3km	4 lanes/25~26.5	Till 2020		149,000	ADB	Op.	Op.	
	HCMC – Moc Bai	TBD		55.0km	4 to 6 lanes	Till 2030	FS is committed by KOICA	99,000	undecided	N/A	Op.	
	HCMC – Thu Dau Mot – Chon Thanh			69.0km	6~8 lanes	Till 2030		116,000		N/A	Op.	
HCMC – Trung Luong			61.9km	4 lanes/24.5m	2008	Completed	146,000	VN Gov't	Op.	Op.	CIENCO5 http://www.cienco5.vn/tabid/82/CID/46/ItemID/237/default.aspx	

*1: Project Type, *2: Construction Period, *3: Traffic Demand Forecast, *4: Operation

Note: The result of traffic demand forecast is shown excluding the motorcycle.

3. Prioritization of Projects

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3.2 Project Long List (3) - Connecting Links in HCM Region

Road Category	Project Name	Pro. Type *1	Road Length (km)	No. of Lanes/width (m)	Const. Period *2(Year)	Planning/Implementation Progress	TDF*3, 2030 (pcu/day)	Fund Source (Expected)	Expected Opening Year		Data and Information Source (Date, etc.)
									2020	2030	
Connecting Links in HCM Region	Tan Tao Expressway		10.5km	4 lanes			82,000	BOT	Op. *4	Op.	Known as "Tan Tao – Cho Dem Road"
	Missing Link 1 (Access road between An Phu Intersection and crossing point between North-South Expressway and Ring Road No.2)		4.5km	6 lanes/16m			22,000		Op.	Op.	
	Missing Link 2 (Access road between Tan Tao Expressway and East-West Road.	BOT	3.0km	4lanes	Till 2030		26,000		N/A	Op.	
	East –West Road	ODA	22km	6 lanes	2000 – 2012		66,000	JICA	Op.	Op.	
	Phuoc An Bridge and Access including I/C	BOT	12km	6 lane/66m	Till 2030		21,000	BOT (Cong Ty Phuoc An Port)	N/A	Op.	DOT, BA RIA VUNG TAU Cong Ty Phuoc An Port is under Petro VN.

*1: Project Type, *2: Construction Period, *3: Traffic Demand Forecast, *4: Operation

Note: The result of traffic demand forecast is shown excluding the motorcycle.

3. Prioritization of Projects

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3.2 Project Long List (4) - Mekong Delta Region

Road Category	Project Name	Pro. Type *1	Road Length (km)	No. of Lanes/width (m)	Const. Period *2(Year)	Planning/Implementation Progress	TDF*3, 2030 (pcu/day)	Fund Source (Expected)	Expected Opening Year		Data and Information Source (Date, etc.)
									2020	2030	
Mekong Delta Region	Trung Luong – My Thuan		54.3km	4 lanes		Under construction	79,000	Public Construction Private O&M	N/A	Op. *4	JICA PPP Study
	My Thuan – Can Tho		32.3km	4 lanes			36,000	PPP I/A: PMU7	N/A	Op.	JICA PPP Study
	Can Tho – Ca Mau						N/A		N/A	N/A	
	2 nd My Thuan Bridge		North:1,980m South:1,040m	Br: 6 lanes/32m **1 st Stage 4 lanes/25.5m **2 nd Stage 6 lanes/33m	Sep., 2016	METI FS has been completed.	61,000	Undecided I/A:PMU7	N/A	Op.	METI FS
	2 nd Can Tho Bridge						N/A		N/A	N/A	
	Second Southern Highway Tuyen N2 sy Dung								Op.	Op.	Technical assistance consultant's report [ADB] N2: Ho Chi Minh Road(popular name)
	Second Southern Highway Cao Lanh Bridge		7.8km (including approach road L=5.7km)	4 lanes/24.5m		Technical assistance consultant's report has been completed by ADB.	9,000	ADB/AusAID	N/A	Op.	
	Second Southern Highway Cao Lanh – Vam Cong		15.7	4 lanes/33m			10,000	ADB/AusAID/K EXIM	N/A	Op.	
	Second Southern Highway Vam Cong Bridge		5.8km (including approach road L=2.9km)	4 lanes/24.5m			20,000	ADB/KEXIM	N/A	Op.	

*1: Project Type, *2: Construction Period, *3: Traffic Demand Forecast, *4: Operation

Note: The result of traffic demand forecast is shown excluding the motorcycle.

3. Prioritization of Projects

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3.3 Criteria for Selecting Short Listed Projects

Category	Criteria	Points
1. Contribution to Social and Economic Development	1.1 National/International Development Context	2 or 0
	1.2 Regional Development Context	
	1.3 City / Provincial Development Context	
2. Accessibility to Development Nodes / Missing Link	2.1 Access to Industrial Development Zone	2 or 0
	2.2 Access to Gateway (Sea port, Land Port, Airport)	
	2.3 Missing Link on the Route	
3. Contribution to Improvements of Urban Traffic and Logistics	3.1 Promotion of Intermodal Transport	2 or 0
	3.2 Urban Traffic in the HCMC Metropolitan Area	
	3.3 Logistics Improvements in the Survey Area	
4. Future Traffic Demand	4.1 $T \geq 50,000$ pcu/day	2
	4.2 $25,000 \leq T < 50,000$ pcu/day	1
	4.3 $T < 25,000$ pcu/day	0
5. Impacts on Land Use	5.1 Negligibly Small	2
	5.2 Not significant	1
	5.3 Significant	0

3. Prioritization of Projects

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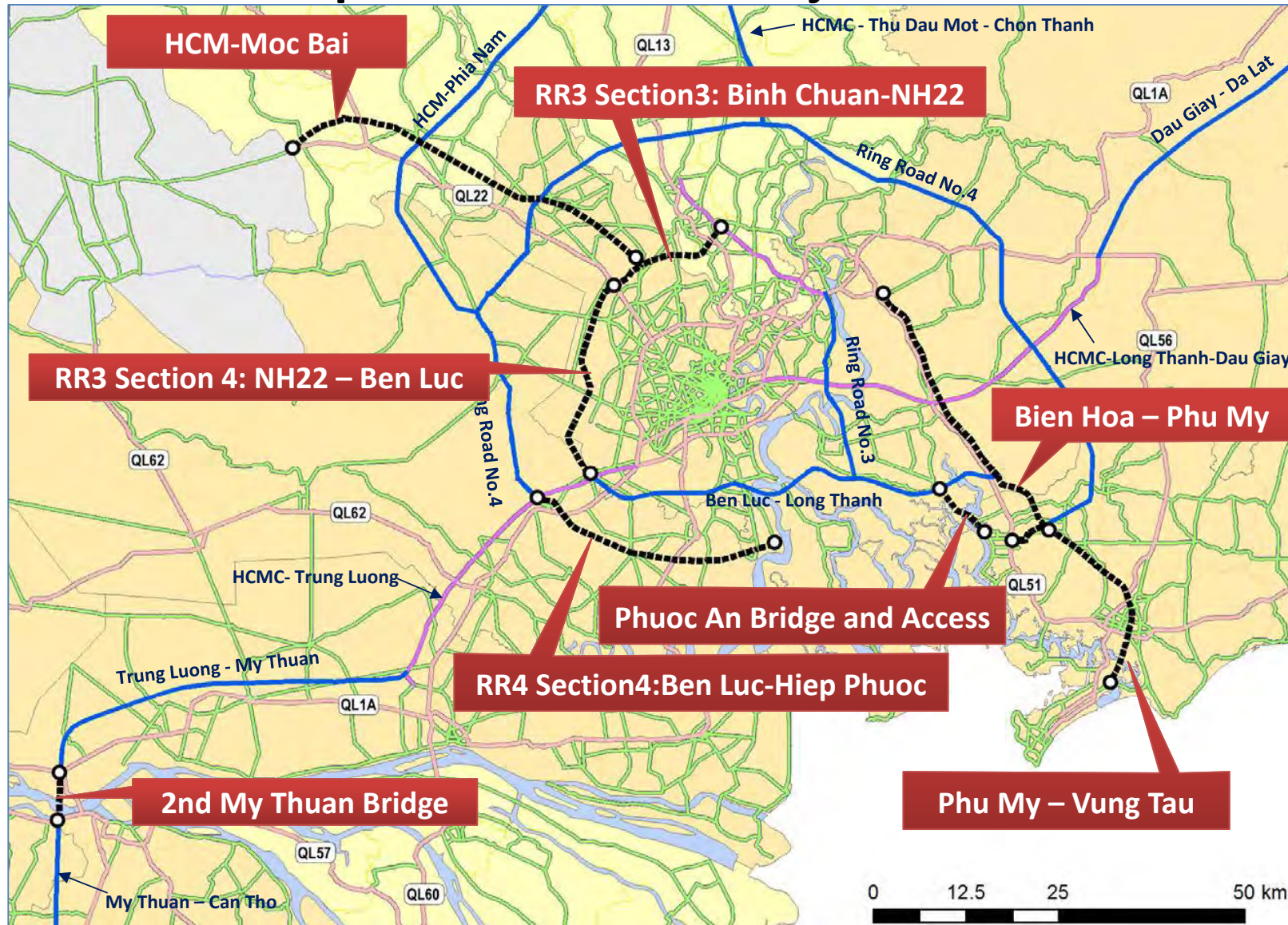
3.3 Short Listed Projects

Candidate Project Name	Section/ Candidate Location	Status	Project Details	Project Cost		
				Million USD	Source	
1 Ho Chi Minh City Ring Road No.3	Section3 Binh Chuan ~ NH22	Pre-FS has been completed by ADB in 2012.	*4-lane expressway and 4-lane urban road *Connecting NH13, HCMC - Moc Bai expressway,	1,148	Final Report (ADB/Dec., 2012)	
	Section4 NH22 ~ Ben Luc	FS will be conducted by ADB.	NH22 and HCMC - Trung Luong expressway *Expected Fund Source: ADB, JICA, BOT	1,399		
2 Ho Chi Minh City Ring Road No.4	Ben Luc ~ Hiep Phuoc Port	Pre-FS has been completed by ADB in 2012.	*4-lane urban road *Connection HCMC - Trung Luong Expressway and Hiep Phuoc port and Industrial Zone *Expected Fund Source: ADB, PPP, BOT	840		
3 Phuoc An Bridge	Thi Vai River	METI FS has been completed in 2011.	*4-lane bridge *connecting Cai Mep port and Phouc An port connecting road *Expected Fund Source: BOT	297		Final Report (METI /Mar., 2011)
4 Bien Hoa – Vung Tau Expressway	Phase1 Bien Hoa ~ Phu My	Proposal for BOT has been submitted by PMU85 to MOT.	*4-lane expressway *Connecting Bien Hoa and Phu My (Phase 1)	504		Final Report (JICA/April, 2013)
	Phase2 Phu My ~ Vung Tau		*Connecting Phu My and Vung Tau (Phase 2) *Expected Fund Source: BOT	443		
5 Ho Chi Minh City – Moc Bai Expressway	Ho Chi Minh City ~ Moc Bai	FS will be undertaken by KOICA. VN Gov't, however, is currently considering to procure other fund for early project implementation.	*4-lane expressway *Connecting RR3 of HCMC and Moc Bai (Cambodian border) *Expected Fund Source: PPP	470	General Report (VN Gov't/July, 2015)	
6 Second My Thuan Bridge	Tien River	METI FS has been completed in 2011.	*4-lane expressway *Connecting Trung Luong - My Thuan Expressway and My Thuan - Can Tho Expressway *Expected Fund Source: JICA	749	Final Report (METI /Mar., 2011)	

3. Prioritization of Projects

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3.3 Location Map of Short Listed Projects



4. Economic Analysis

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Preliminary Results of Economic Priority Indicators

The following EIRR/FIRR are not indicative of project feasibility but project priority for comparison.

Candidate Project Name	Section/Candidate Location	Project Cost Million USD	Economic Evaluation			FIRR	
			EIRR	B/C	NPV (Million USD)		
1	Ho Chi Minh City Ring Road No.3	Section3: Binh Chuan - NH22	1,148	19.8 %	2.63	1,195	6.3 %
		Section4: NH22 - Ben Luc	1,399	13.8 %	1.57	290	7.8 %
2	Ho Chi Minh City Ring Road No.4	Ben Luc - Hiep Phuoc Port	840	12.8 %	1.47	114	Negative
3	Phuoc An Bridge	Thi Vai River	297	18.4 %	4.42	772	1.8 %
4	Bien Hoa – Vung Tau Expressway	Sec.1&2: Bien Hoa ~ Phu My	504	15.4 %	2.17	315	18.5 %
		Sec.3: Phu My ~ Vung Tau	443	12.8 %	1.43	56	12.1 %
5	Ho Chi Minh City – Moc Bai Expressway	Ho Chi Minh City - Moc Bai	470	14.0 %	1.62	119	13.9 %
6	2 nd My Thuan Bridge	Tien River	749	14.0 %	1.78	322	Negative

Note: EIRR and FIRR is calculated by discount rate 12.0%. Revenue for FIRR is based on following fare table.

	Cars	Medium Bus	Large Bus	2 Axles Truck	3 +Axles Truck	Trailer
VND/km	2,000	3,000	4,000	4,000	6,000	11,000

5. Preliminary Conclusion

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1. Based on the criteria for selecting priority projects, 6 projects are short-listed as the priority projects among the 22 long-listed projects.
2. The economic analysis of the projects indicate totally their feasibility but the financial analysis could not indicate their feasibility except for Bien Hoa ~ Phu My section of Bien Hoa ~ Vung Tau Expressway.
3. Despite of low FIRR, Section 3 (Binh Chuan ~ NH22) of the 3rd HCMC Ring Road and Phuoc An Bridge need more detailed financial study. Because their EIRR, B/C and NPV are high enough for the road/bridge users to shoulder the tariff higher than the assumption made in this survey.
4. Consequently, it is concluded that all the short-listed projects could be economically feasible.
5. A potential candidate of financially feasible project could be Bien Hoa ~ Phu My expressway section.
6. Both Section 3 of the 3rd HCMC Ring Road and Phuoc An bridge could be worth consideration to pursue the study on financial verification of the project.

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