

CHAPTER 5

TRAFFIC SURVEY AND ANALYSIS

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5.1 METHODOLOGY

To study the present traffic pattern and existing problems, and to estimate the future traffic demand required for the formulation of the future urban transport plan, the following traffic surveys were conducted in Vientiane (Table 5.1-1).

Table 5.1-1 Contents of Traffic Survey

Survey Item	Purpose	Survey Method	Major Outputs
Person trip survey	To acquire information on the travel behavior of residents in the Study Area	<ul style="list-style-type: none"> • Interview to sampled household members • Sampling rate of about 4,000 households 	<ul style="list-style-type: none"> • Travel characteristics of residents • Trip generation and attraction • Modal choice • OD matrices
Cordon line survey	To get data on the trips crossing the boundary of the Study Area for the purpose of adjusting the results of the person trip survey	<ul style="list-style-type: none"> • 12 hours roadside interview survey at 7 locations on the boundary of the Study Area • 16 hours traffic count survey at the same locations as above 	<ul style="list-style-type: none"> • OD matrices between internal and external zones • Vehicle occupancy • Commodity type and volume
Screen line survey	To obtain information for calibrating the OD matrices prepared from the person trip survey	<ul style="list-style-type: none"> • 16 hours traffic count survey at 11 locations 	<ul style="list-style-type: none"> • Traffic volume by vehicle type • Vehicle occupancy
Traffic count survey	To obtain information for calibrating the assigned traffic volume based on the person trip survey	<ul style="list-style-type: none"> • 16 hours traffic count survey at 20 road sections and 10 intersections 	<ul style="list-style-type: none"> • Traffic volume by vehicle type • Turning movement at intersections
Public transport users survey	To obtain attributes of the public transport passengers	<ul style="list-style-type: none"> • Interview to about 500 public transport passengers 	<ul style="list-style-type: none"> • Attributes of public transport passengers • Situation and problems in public transport transfer
Travel speed survey	To obtain information of travel speed and the bottlenecks of roads	<ul style="list-style-type: none"> • Floating car method • 11 routes of main roads • Morning and evening peak hours and noon 	<ul style="list-style-type: none"> • Travel time and speed • Bottleneck points
Parking condition survey	To acquire information of parking condition	<ul style="list-style-type: none"> • Parking inventory survey • Interview to about 200 users of parking areas 	<ul style="list-style-type: none"> • Parking situation and problems • Characteristics of users of parking areas
Commodity movement survey	To acquire information of commodity movement in the Study Area	<ul style="list-style-type: none"> • Interview to about 30 major trucking companies 	<ul style="list-style-type: none"> • Commodity movement • Characteristics of trucking companies
Stated preference survey	To obtain perception of various transport users when transport policy is changed e.g. vehicle reduction scheme	<ul style="list-style-type: none"> • Interview to car users, bike users and public transport users (about 2,000 samples in total) 	<ul style="list-style-type: none"> • Perception of users against change in transport policy

The main objectives of the survey are to collect necessary data and information in order to comprehend the existing traffic condition and to identify related issues and planning parameters. Traffic survey locations are shown in Figure 5.1-1. All the traffic surveys were conducted in May 2007, before school holiday season starts.

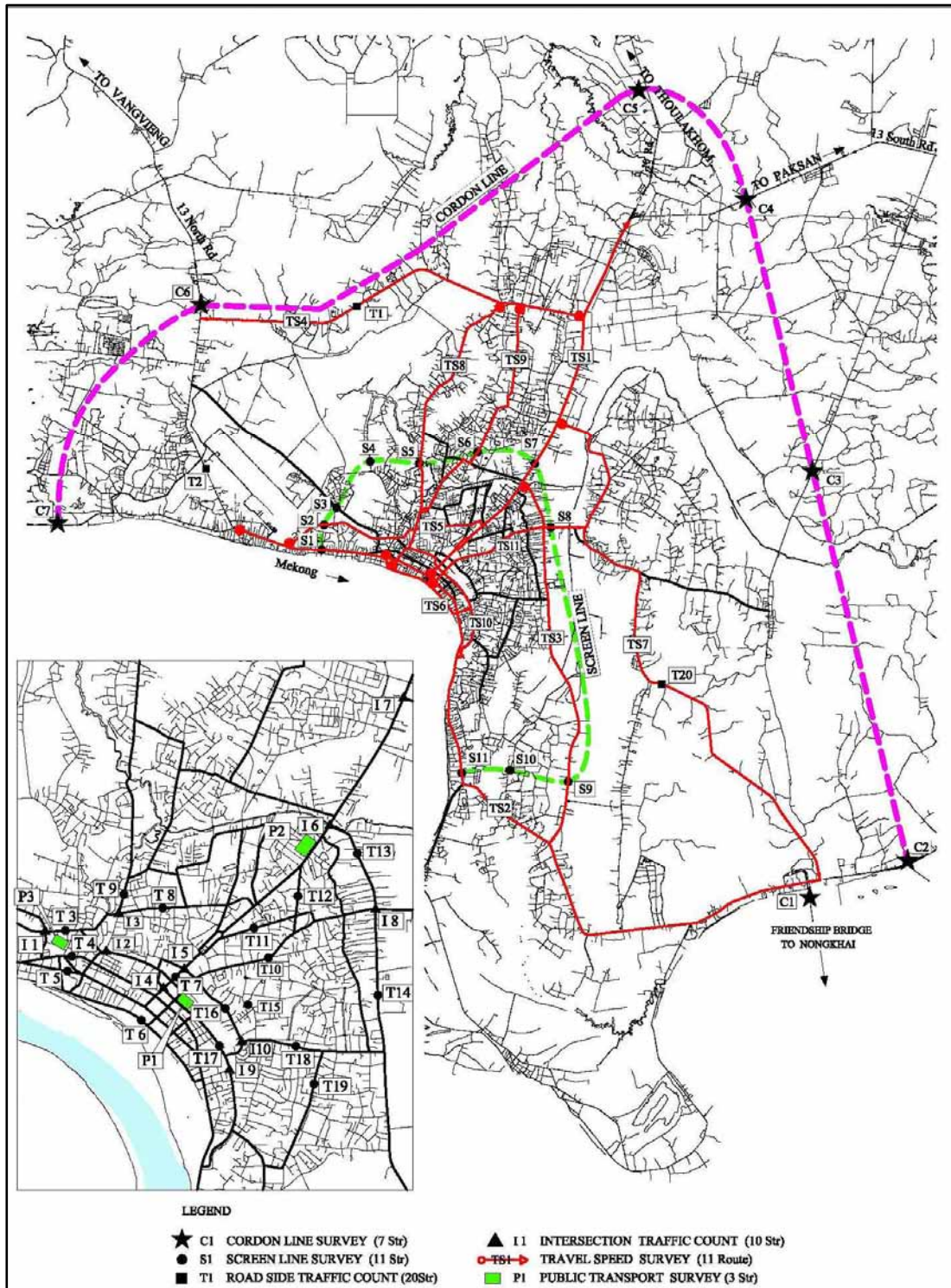


Figure 5.1-1 Traffic Survey Locations

5.1.1 Zoning

The zoning system is shown in Figure 5.1-2, Table 5.1-2 and Table 5.1-3.

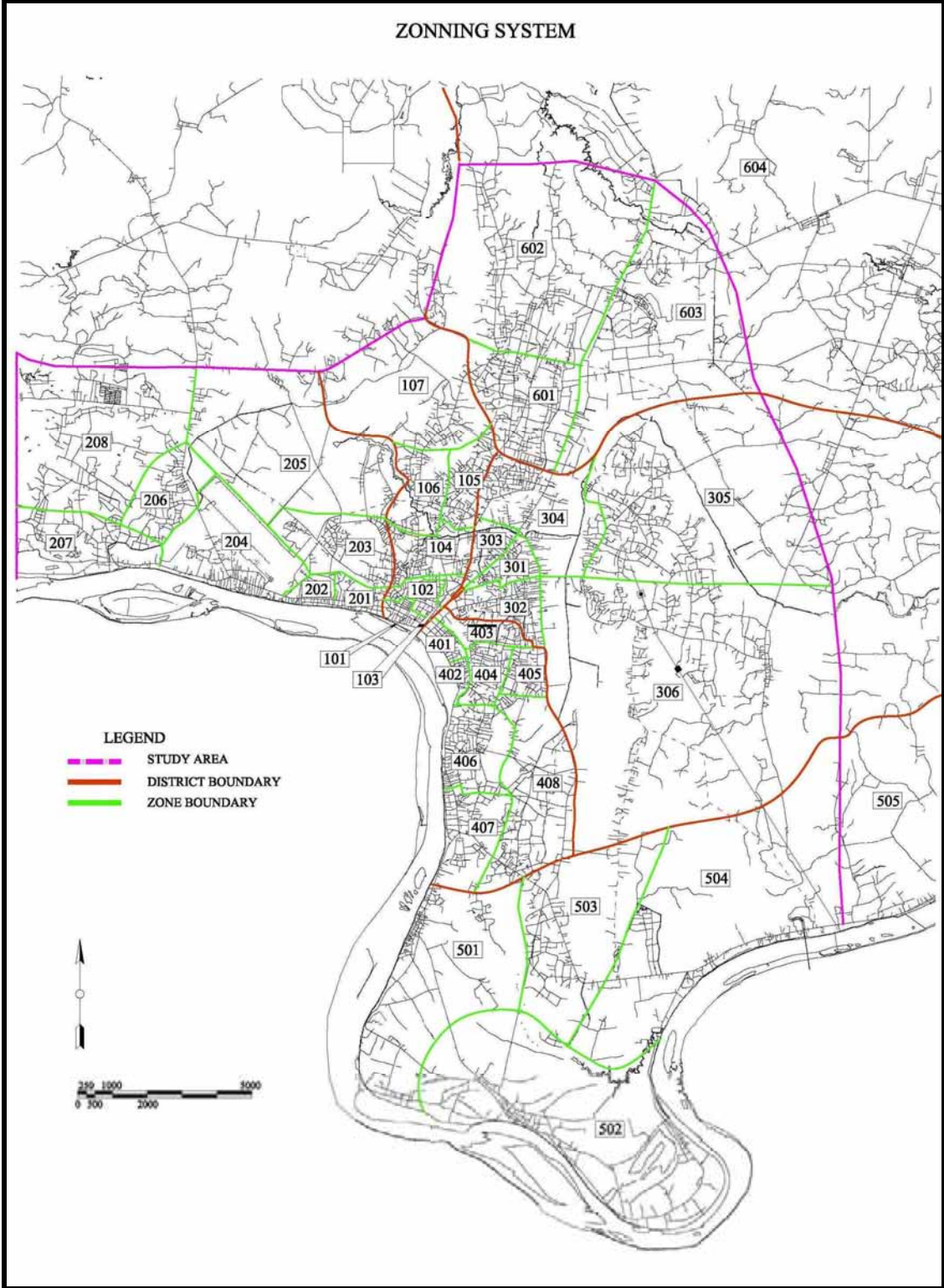


Figure 5.1-2 Zoning System of the Study Area

Table 5.1-2 Zoning System of Study Area

Small Zoning System				Medium Zoning System		Large Zone	
No.	Zone Code	Name	Village Name	Zone Code	Name	Zone Code	Name
1	101	Chanthabouli 1	Mea say, Hy sauk, Ar nou, si hom, Xieng nhuen, Varth chan	M1	Chanthabouli (Urban)	L1	Chanthabouli
2	102	Chanthabouli 2	Si sa kate, Say lom, Thong khan kham tay, Sisavardkang, Khoua luang nuea, Thong toum, Khoua luang tay, Thong khan				
3	103	Chanthabouli 3	Harthb sa dee tay, Si sa vard nuea, Harth sa deen nuea, Si sa vard tay, Sea dam duan, Sea bounhueang				
4	104	Chanthabouli 4	Hong seng, Hong kay koe, Hong ka tay, hong ka nuea, Sa yang, Dong mieng, Thong sang nang	M2	Chanthabouli (Suburban)		
5	105	Chanthabouli 5	Dong par lap, Phoun sa vang, Phoun tong sa varth				
6	106	Chanthabouli 6	No ng the tay, Don deng, Phoun tong chom ma nea				
7	107	Chanthabouli 7	Bor na ngoua, Nong ping, Nongtha nuea, Houai hong	M3	Sikhotabong (Urban)	L2	Sikhotabong
8	201	Sikhotabong 1	Khoontathong, Sithannuea, Khountatha, Nongdouang, Nongdouangthong, Nakh am, Nongdouangneua				
9	202	Sikhotabong 2	Meuangvatha, Vattaythong, Vattayhaythong, Vattaynoytha, Nongphanay, Vattayroythong, Meuangvathong, Oobmoung, A Kath				
10	203	Sikhotabong 3	No ngsanak ham, Dongnasokneua, Phakthang, Dongnasoktay	M4	Sikhotabong (Suburban 1)		
11	204	Sikhotabong 4	Sis omsuen, Phosi, Sikhaythongtay, Sibounheuangthong, Sibounheuangtha, Sikhaytha, Nhapha, Sikaythongnuea, Viengsavanh, Nahare				
12	205	Sikhotabong 5	Dongkalao, Luckhin, Dongnathong, Nongbeuktay, Nongbeukneua, Sumket				
13	206	Sikhotabong 6	No nsavang, Nalao, Nongmieng, Thongphong	M5	Sikhotabong (Suburban 2)		
14	207	Sikhotabong 7	No ngda, Kaoli ew, Thathong, Dankham, Nonkilaek, Nonkeo				
15	208	Sikhotabong 8	Champha, Phirhsavathay, Phonsavadnuea, Nongtangtay, Phonhsomboun, Phonhkhamb, Nongbouthongtai, Nongtanneua, Viengkam, Nonchouathongnuea, Chansavang				
16	301	Sayssetha 1	Fay, Phonsaat, Thatlouangneua, Thatlouangkang, Phonxay, Nongbone, Viengchalern, Thatlouangtai	M6	Sayssetha (Urban)	L3	Sayssetha
17	302	Sayssetha 2	Sisangvone, Phonthantai, Phorethannuea, Naxay, Saphangmor, Hongkare				
18	303	Sayssetha 3	No ngsangthor, Phonkheng				
19	304	Sayssetha 4	Chommanytai, Chommanykang, Chommanynuea, Phonphanao	M7	Sayssetha (Suburban 1)		
20	305	Sayssetha 5	Nabian, Nonsavanh, Phonthong, Xamkhae, Xoknoy, Vangxab, Nonsagnar, Nongnieng, Xoknoy, Hongsuphab, Amone, Senesavang				
21	306	Sayssetha 6	Dungnai, Dungkang, Kha ngoy, Somsangar, Meuangnoy, Nongvay, Houakhoua, Xiengda, Nonkhorneua, Nonsavang, Khamsavath, Xokkham				
22	401	Sisatthanak 1	Phiavath, Kaognod, Phaxai, Thatkhao, Phapho, Simeuang	M9	Sisatthanak (Urban)	L4	Sisatthanak
23	402	Sisatthanak 2	Beungkhagnongneua, Beungkhagnongtai				
24	403	Sisatthanak 3	No ngchane, Dongpalantha, Dongpalanthong, Phonsi nouan				
25	404	Sisatthanak 4	Phonsavantai, Saphanthongkang, Phonsavanneua, Sokpalouang, Saphanthongneua, Saphanthongtai	M10	Sisatthanak (Suburban)		
26	405	Sisatthanak 5	Phonpapaotha, Thongphanthong, Phonpapaothong				
27	406	Sisatthanak 6	Vatso b, Phoxay, Phanmanh, Donepamai, Thongkang, Vatnak, Thapalanxav				
28	407	Sisatthanak 7	Ko knine, Phonsavang, Xaysathanh, Chomcheng, So uanmone, Sangveui, Haysok, Chompethneua, Chompethtai	M11	Hathsayfong	L5	Hathsayfong
29	408	Sisatthanak 8	Donokkhum, Donekoy, Dongsavad				
30	501	Hathsayfong 1	Donkhasai, Natham, Somhong, Hadoneko, Bor o, Kangphanhang, Kang, Phao, Kangnhang, Houaha, Hadkans a,				
31	502	Hathsayfong 2	Donkerd, Phaphang, Savang, Phosi, Saiphongtay, Saiphongneua, Thakhaek, Chiemphang, Chormthong, Phongern, Hormtay, Kokxai, Tinpeer, Sitantay	M12	Hathsayfong		
32	503	Hathsayfong 3	Somvangtay, Salakhamneua, Somvangneua, Nongvang, Hadsaikhao, Nahav, Dongkhamasang, Somsanook, Nonghav				
33	504	Hathsayfong 4	Nahav, Dongphosi, Nongheo				
34	601	Xaythny 1	Sangkhou, Tan mee say, Sivilay, Pharkhao, Khamhong	M13	Xaythny	L6	Xaythny
35	602	Xaythny 2	Houai dan muang, Nonngviengkham, Say, Nantaum, Don teaw, Saphangmeuk, Dam sang, Don noun, Dong dauk				
36	603	Xaythny 3	Nakha, Dongsanghin, Say savang				

Table 5.1-3 Zoning System of out of Study Area

Zoning System in Vientiane (Study Area; No.1-36, Out of Study Area; No.37-45)

Small Zoning System				Medium Zoning System		Large Zone	
No.	Zone Code	Name	Village Name	Zone Code	Name	Zone Code	Name
37	209	Sikhothabong9		M15	Sikhothabong	L7	Sikhothabong
38	307	Saysettha7		M16	Saysettha	L8	Saysettha
39	505	Hathsayfong5		M17	Hathsayfong	L9	Hathsayfong
40	506	hathsayfong6	Friendship Bridge				
41	604	Xaythny4		M18	Xaythny	L10	Xaythny
42	605	Xaythny5					
43	701	Sangthong		M19	Sangthong	L11	Sangthong
44	801	Naxaythong		M20	Naxaythong	L12	Naxaythong
45	901	Mayparkngum		M21	Mayparkngum	L13	Mayparkngum

Zoning System in Vientiane (No.46-52)

Small Zoning System				Medium Zoning System		Large Zone	
No.	Zone Code	Name	Village Name	Zone Code	Name	Zone Code	Name
46	1001	South of Laos	Khammouan, Sayannakhet, Sarayan, Xekong, Attapu, Champasar	M22		L14	Laos
47	1002	Center of Laos	Vientiane	M23			
48	1003	North of Laos	Louang pharabang, Phongsali, Louang namtha, Bokeo, Oudonmxai, Xaignaboui	M24			
49	1004	East of Laos	Houaphan, Xiangkhoang	M25			
50	2001			M26		L15	Thailand
51	3001			M27		L16	Vietnam
52	4001			M28		L17	Other Countries

5.2 PERSON TRIP SURVEY

5.2.1 Methodology

The survey was designed to interview a total of 4,000 households in the Study Area, which represents a rate of about 6%, as the number of dwelling units in the Study Area was about 76,000 units in 2005.

The survey was implemented through household visit and direct questioning of adult members with sufficient competence to accurately answer the questions posed. Visits and date covered in questionnaire was on weekdays, i.e. Monday through Friday, excluding holidays. All household members aged 6 years old and above were covered by the interview. Questionnaire form is shown in Appendix 5-1.

5.2.2 Survey Results

The sampling rate is about 6.99% which is higher than the target of 6% and is considered high enough to produce a reasonable accuracy level. The total number of collected samples is presented in Table 5.2-1. Expansion factors are estimated based on trips per population (aged 6 years old and above) by the zoning in order to produce present OD table for people movement per purpose and per transport mode.

Table 5.2-1 Number of Households Interviewed

No.	District	POP6 & above in 2007	HH in 2007	Accomplishment			HH Size
				Sample of HH	Sample Rate	Sample of POP	
1	Chanthabuly	60,633	12,880	1,024	7.95%	4,879	4.76
2	Hatxayfong	88,482	20,627	1,232	5.97%	6,351	5.16
6	Sikhottabong	80,850	17,049	1,180	6.92%	5,840	4.95
4	Sisattanak	60,609	11,790	901	7.64%	4,232	4.70
5	Xaysettha	47,886	10,229	796	7.78%	3,429	4.31
6	Xaythany	41,522	8,895	565	6.36%	2,887	5.11
Total		379,982	81,470	5,698	6.99%	27,618	4.85

Note: POP: Population, HH: Household, estimation data by Study Team

5.2.3 Characteristics of Person Trip

(1) Total Number of Trips

The total number of person trips per day is 957,633 trips and the number of internal trips within the Study Area is 936,119 trips. The internal to external zone trips is 9,575 trips and the external to internal zone trips is 10,310 trips.

Table 5.2-2 Total Number of Person Trips

(unit: person trips per day)

		To		
		Study Area	Outside of Study Area	Total
From	Study Area	936,119	9,575	945,694
	Outside of Study Area	10,310	1,629	11,939
	Total	946,429	11,204	957,633



(unit: thousand person trips per day)

Figure 5.2-1 Total Number of Person Trips

(2) Trip Purpose

Trip composition by purpose is presented in Figure 5.2-2, in which the “to Home” (HOME) trips have a share of 49%, to Work (WORK) trips with share of 18%, to School (SCHOOL) trips with a share of 18%.

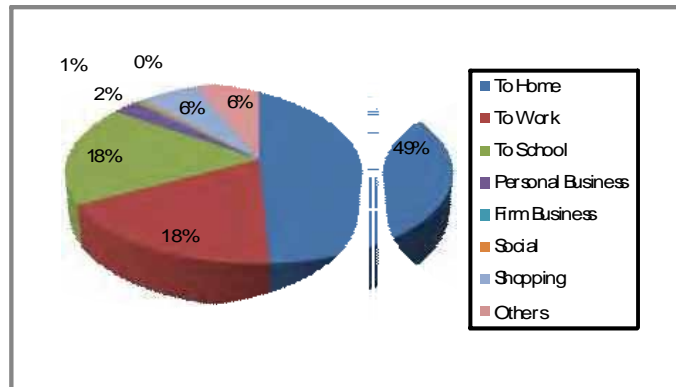


Figure 5.2-2 Total Number of Person Trips

(3) Modal Share

Trip composition by travel mode is presented in Figure 5.2-3. Trips by motorcycle has the highest share of 60%, while walking trips are 19%, trips by private vehicles (Sedan, Pick up and Taxi) are 10%. Tuk-tuk and Bus, which may represent the public transport share, handle about 2% and 1% of all trips, respectively.

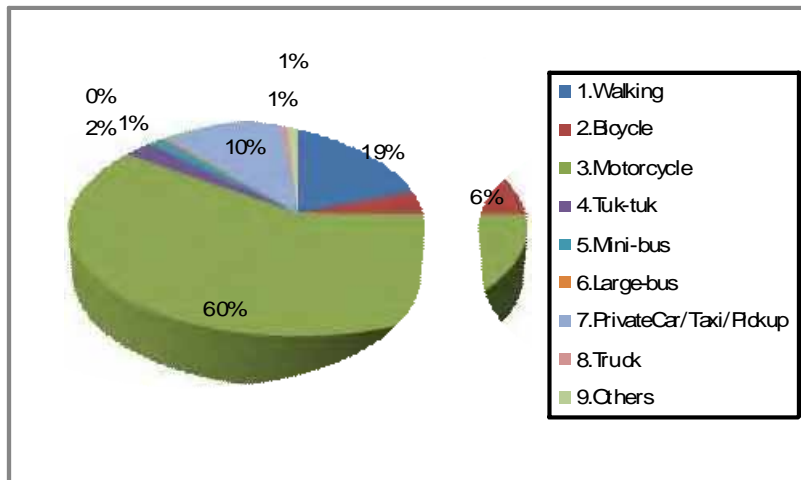


Figure 5.2-3 Modal Share

(4) Trip Distribution

Figure 5.2-4 shows the total trip distribution pattern by desired line. It is noted that the trip flows do not concentrate into the central area.



Figure 5.2-4 Trip Distribution of All Trips

5.3 CORDON LINE SURVEY

5.3.1 Methodology

The objective of this survey is to collect data on the inbound and outbound traffic volumes as well as to establish OD matrices for trips of people and vehicular movements between the Study Area and other zones. The survey was conducted for classified vehicular counting and roadside OD interview at seven stations located on main roads used as entrances and exits at the Study Area borders. The survey was carried out on a typical working day during May 2007. It has two main tasks as follows:

Classified vehicular counting was conducted on both traffic directions for 16 hours from 06:00 to 22:00 on a weekday. The number of each vehicle type was manually counted and recorded for every 15 minute interval. Vehicular classification is as follows;

- Bicycle
- Motor Cycle
- Tuk-tuk
- Car/Taxi
- Pickup
- Bus
- Light Truck (2-Axle Truck)
- Heavy Truck (>2-Axle Truck)
- Trailer
- Others

Roadside OD interview was conducted for 12 hours from 07:00 to 19:00 while the above-mentioned survey is conducted at the same time. Not less than 10 % from the traffic was stopped at random, and then drivers and bus passengers were interviewed. The following information was collected in this survey:

Roadside OD Drivers Interview

- Trip Purpose
- Origin and Destination
- Number of Passengers
- Loading Capacity
- Loading Items, Weight and /or Volume

Roadside OD Bus Passenger Interview

- Trip Purpose
- Origin and Destination

5.3.2 Survey Results

Figure 5.3-1 summarizes the collected data for each direction on an illustrated sketch-map. The highest traffic volume was recorded in the north about 12,600 vehicles on both directions. Hourly traffic volumes of each cordon stations are shown in Appendix 5-2.

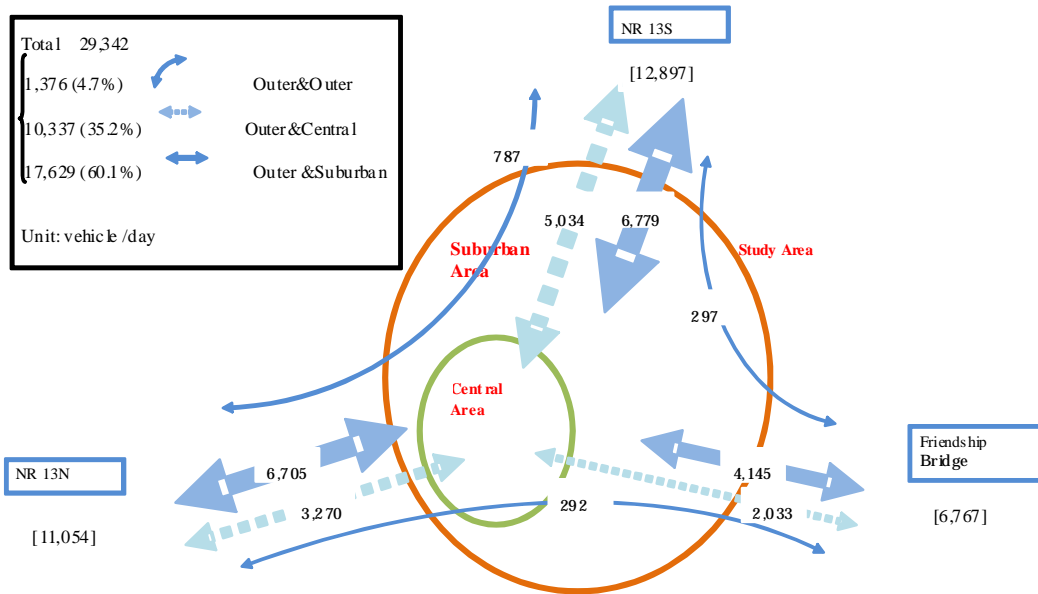


Figure 5.3-1 Characteristics of Traffic to/from Study Area

Table 5.3-1 shows the average occupancy by vehicle type.

Table 5.3-1 Average Occupancy

VEHICLE TYPE	OCCUPANCY (persons/vehicle)
MOTORCYCLE	1.3
TUK-TUK, SONTEO	4.0
MINI BUS	8.1
LARGE BUS	28.3
PICK UP	2.7
TAXI	2.4
SEDAN CAR	2.1
LIGHT TRUCK	2.5
HEAVY TRUCK	1.6
TRAILER	1.7

5.4 SCREEN LINE SURVEY

5.4.1 Methodology

To grasp the traffic volume from/to urbanized area, the screen line survey was conducted at 11 stations. Classified vehicular counting was conducted on both traffic directions for 16 hours from 06:00 to 22:00 on a weekday. Also the type of each vehicle crossing the screen line was manually and separately counted, then recorded for every 15-minute interval on both directions. Vehicular classification is the same as the cordon line survey.

5.4.2 Survey Results

Figure 5.4-1 shows the accumulated values of all the stations. The figure shows that there is very high peak in the morning in the direction from out of suburban area to city center, while on the opposite direction to the suburban area there are two peaks in the morning and evening peaks. Hourly traffic volumes of each screen line survey stations are shown in Appendix 5-3.

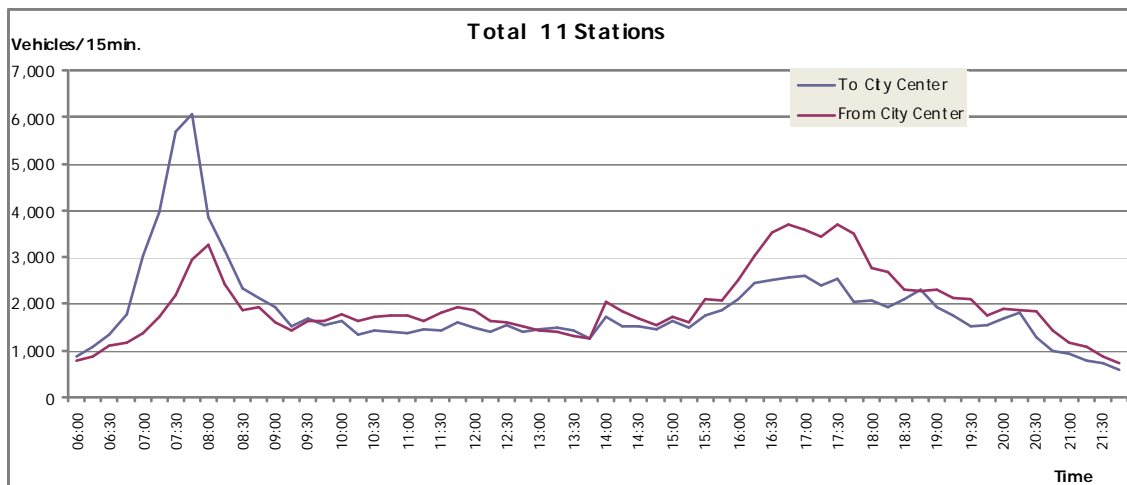


Figure 5.4-1 15min. Traffic Volume (accumulated values of all screen-line stations).

Figure 5.4-2 shows the vehicle type composition of screen-line all stations.

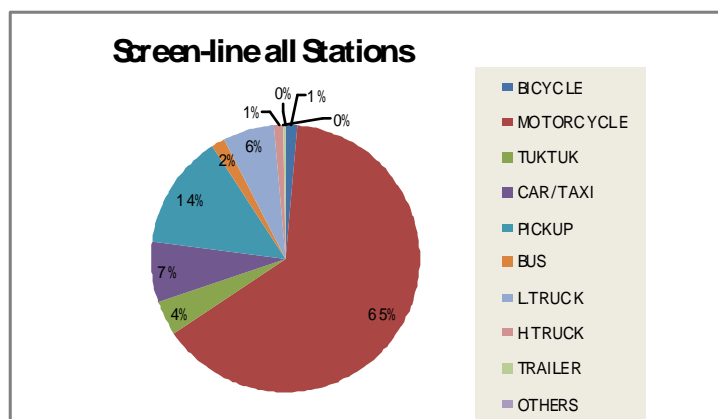


Figure 5.4-2 Vehicle Type Composition (Screen Line All Stations)

5.5 TRAFFIC COUNT SURVEY

5.5.1 Methodology

Traffic count survey on 20 road sections in the Study Area was conducted in order to obtain information to calibrate assigned traffic volume obtained from the person trip survey. Traffic count survey on 10 intersections or roundabouts was also conducted in order to identify the present traffic conditions. Traffic volume by turning directions and each type of vehicles was manually and separately counted, then recorded for every 15 minute interval for 16 hours from 06:00 to 22:00 on a weekday.

5.5.2 Survey Result

Major roads in the urbanized area show high traffic volume in comparison to other major road in the suburban area.

The highest traffic volume is counted in front of Pohphano Temple along Kaysone Road with 58,470 vehicles/ day for both directions including motorcycle.

Other major roads with high volume are as listed bellows:

Road	Daily Volume (vehicle/day)	
	(including motorcycle)	(excluding motorcycle)
Kaysone Road	58,470	26,835
Nangbone Road	43,243	9,487
Dongpina Road	41,555	16,435
Khariang Road	40,950	13,137
Asian Road	39,159	16,992
Kamphergmeuang Road	38,106	13,751
Kamphergmeuang Road	37,191	12,392
FaNgum Road	35,858	12,523
Sisangrone Road	34,058	12,432
Coo-Thai Road	33,945	8,688
Asian Road	33,373	13,673
Dongpalan Road	32,836	12,271

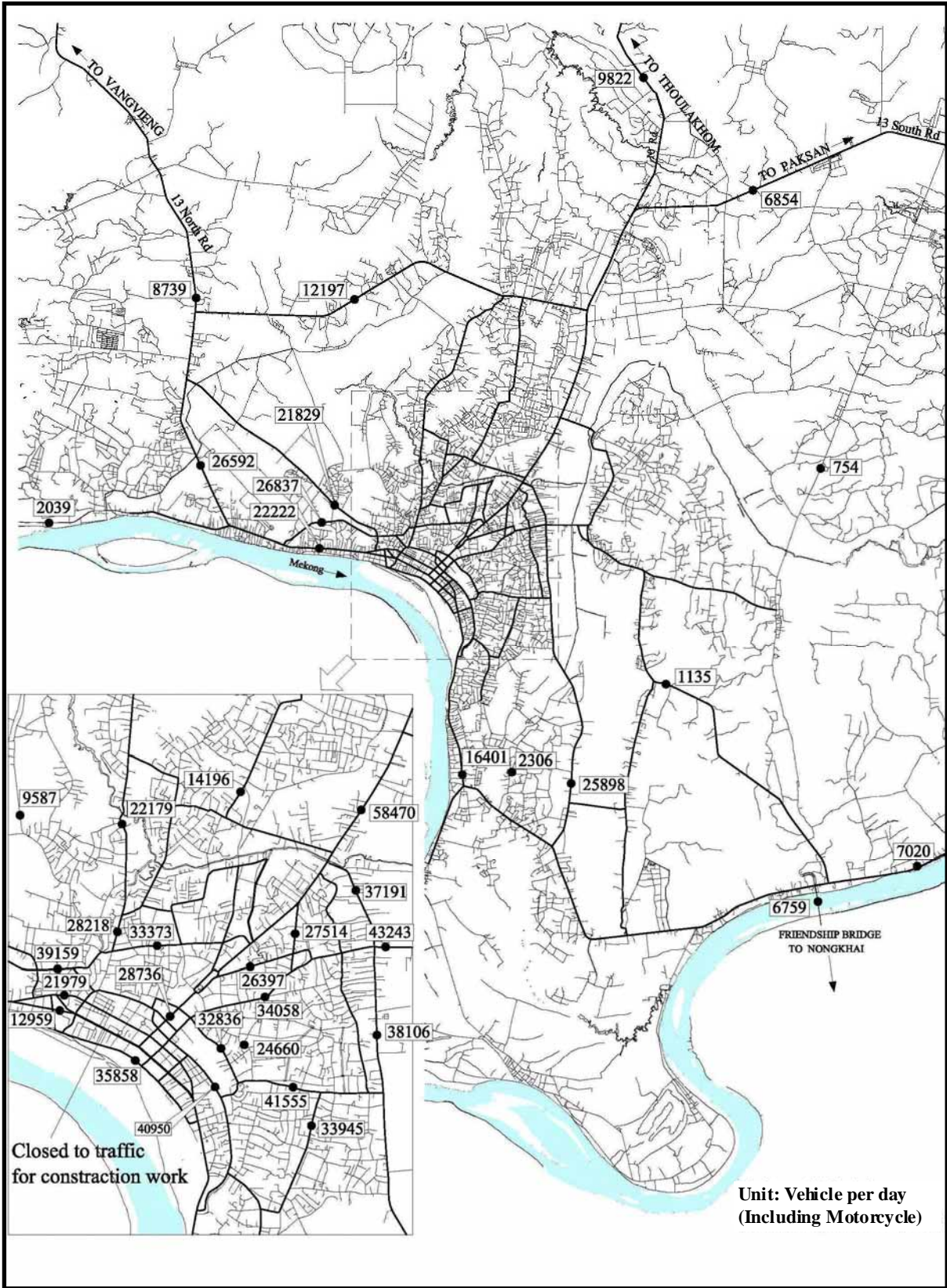


Figure 5.5-1 Daily Traffic Volume including Motorcycle

5.6 PUBLIC TRANSPORT USER INTERVIEW SURVEY

5.6.1 Methodology

The public transport passenger interview survey was carried out in order to collect characteristics and opinions of bus user as follows:

- Trip purpose
- Trip origin and destination
- Opinion on Bus service
- Opinion on traffic safety

The survey was conducted at three bus terminals (Morning Market Bus Terminal, Northern Bus Terminal, and Southern Bus Terminal). About 500 passengers were interviewed while they were either waiting for or after alighting from bus.

5.6.2 Survey Results

(1) Characteristics of Public Transport Users

Table 5.6-1 shows the distribution of the respondents. The total number is 559 samples.

Table 5.6-1 Respondents

Survey Location	Respondents
1.Morning Market	226
2.Southern Bus Terminal	168
3.Northern Bus Terminal	165
Total	559

(2) Opinion on Bus Service

Figure 5.6-1 shows the assessment of present bus service. All respondents highly evaluated present bus service except for air quality. They hate the dust air and vehicle exhaust coming from open window.

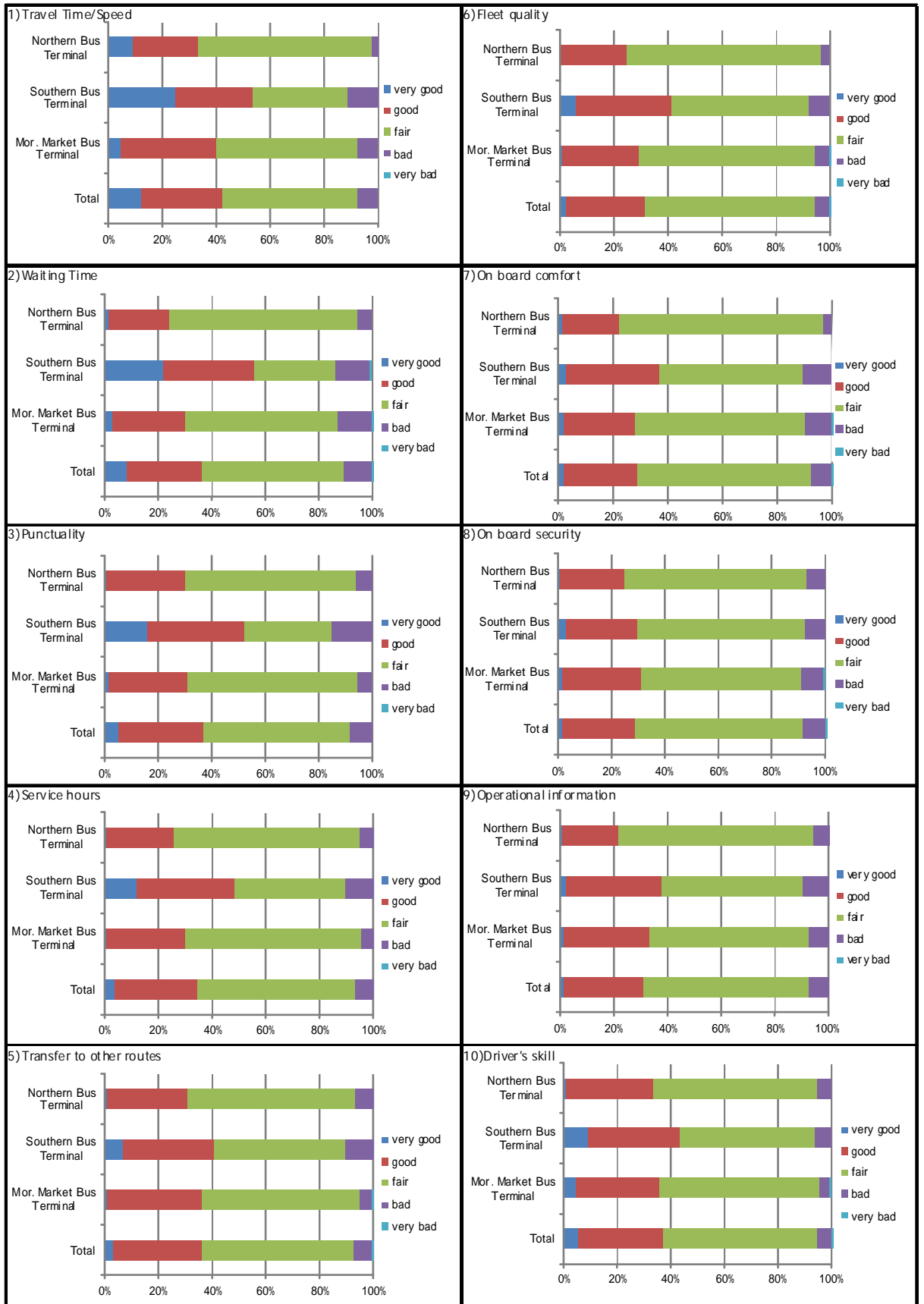


Figure 5.6-1 (1) Assessment of Present Bus Service



Figure 5.6-1 (2) Assessment of Present Bus Service

5.7 TRAVEL SPEED SURVEY

5.7.1 Methodology

The survey was carried out at major eleven (11) routes using the floating car method. Under this method, check points (mainly intersections and roundabouts) with some hundred meters intervals within the route are established beforehand. The survey is conducted by a survey vehicle traveling at the average speed of the traffic flow. The survey consists of three runs for each traffic direction. Before conducting the survey, several checkpoints were selected along the routes and confirmed at the site and on location map. A pair of enumerators involved in each survey to read passage time of checkpoints and stopping time, and also to assess causes of stopping and record all information on the survey form.

5.7.2 Survey Results

Average travel speed on each routes are shown in Table 5.7-1. Further details are shown in Appendix 5-5.

Average travel speed in the evening peak is lower than that in the morning peak.

Especially, the routes of lower average speed are as follow.

- Route 5 Asian Road (T2 Road)
- Route 10 Khouboulom Road and Khouvieng Road
- Route 11 Mahosot Road and Nongbone Road

Table 5.7-1 Average Travel Speed

No.	Road Name	Section (Start-End)	Date	Average Speed (km/h)		
				Morning	Noon	Evening
1	Lan-xang Avenue and Kaisone Road	Hokham - Donenoune	2007/5/9	37.7	37.1	33.4
		Donenoune - Hokham		24.7	36.1	29.0
2	Road No.1	Skhay Junction - Thanaleng	2007/5/10	27.9	30.6	27.6
		Thanaleng - Skhay Junction		30.7	31.5	31.0
3	T4 N Road	Hongxeng Bridge - Km10 Intersection	2007/5/15	43.6	42.1	33.5
		Km10 Intersection - Hongxeng Bridge		38.6	26.5	32.3
4	Dongdok Sikeuth Road	Dongdok Junction - Sikeuth Junction	2007/5/16	44.7	41.6	43.2
		Sikeuth Junction - Dongdok Junction		41.1	46.4	39.3
5	Asiane Road (T2Rd)	B. AKAd Junction - B. Phonsa-ad Junction	2007/5/17	21.5	22.4	17.7
		B. Phonsa-ad Junction - B.AKAd Junction		22.9	24.3	18.7
6	Fangum Road	Sihom Junction - Khouvieng Roundabout	2007/5/22	26.2	21.8	17.3
		Khouvieng Roundabout - Sihom Junction		27.1	21.8	20.2
7	Nongnieng Dongphosi Road	Nongnieng Intersection - Dongphosi Junction	2007/5/23	35.2	38.6	37.8
		Dongphosi Junction - Nongnieng Intersection		31.8	38.4	37.2
8	Savang Dongdok Road	Savang Junction - Dongdok University	2007/5/24	24.6	29.1	28.5
		Dongdok University - Savang Junction		32.5	31.1	28.9
9	Tanmixay Anou Road	Tanmixay Intersection - Anou Intersection	2007/5/29	30.2	35.0	31.3
		Anou Intersection - Tanmixay Intersection		29.3	31.6	28.6
10	Khouboulom Rd and Khouvieng Rd	Pakpasak Junction - Km3 Junction (Rd No.1)	2007/5/30	24.9	17.6	18.7
		Km3 Junction (Rd No.1) - Pakpasak Junction		25.8	16.4	15.1
11	Mahosot Rd and Nongbone Rd	Mahosot Hospital - Nonesavang Junction	2007/5/31	27.1	17.3	19.0
		Nonesavang Junction - Mahosot Hospital		23.5	19.5	18.4
Average Speed				29.8	28.5	26.0

5.8 PARKING CONDITION SURVEY

5.8.1 Methodology

This survey included an inventory survey, observational survey and interview survey in the Study Area.

(1) Inventory Survey

A map to indicate the condition of on-street parking spaces was prepared based on the existing road maps.

Measurement of streets width and inspection of signs and markings was conducted to estimate available capacities.

(2) Observational Parking Survey

a) General parking condition observational survey

To grasp on-street parking conditions in all major roads of urbanized area, parking vehicles between intersections were counted for each side of the street. This survey was conducted by recording video from car at morning time and afternoon time on a weekday.

b) Detailed observation parking survey

To grasp a detail parking condition, the observers patrolled and recorded the plate number of parking cars, vehicle type at some sections or parking area as follows.

- i. Nnongbon Road(Khu Vieng Rd. – Saylom Rd.)
- ii. Samsenthai Road(Pangkham Rd.- Thongkhanakham Rd.)
- iii. Parking area on Hatsady Road (behind Morning Market)
- iv. Parking area in front of Lanxang Hotel

(3) Interview Survey

Data on trip purpose, walking time, arrival time, expecting parking period and fare was collected through an interview survey for drivers who were parking their car at the same location as detailed observational parking survey. About 200 persons were interviewed.

Parking survey items and survey areas are summarized the following table.

	Urbanized Area (on-road parking)	Section or Parking lot (on-road/off-road parking)
Inventory Survey	○	○
Observational Parking Survey		
a) Rough Observational Parking	○	-
b) Detailed Observational Parking	-	○
Interview Survey	-	○

5.8.2 Survey Results

(1) On-road parking condition

Based on survey result, Figure 5.8-1 and Figure 5.8-2 show the occupied rate of the on-road parking space on major road in the urbanized areas.

- High occupancy of on-road parking was seen around the Morning Market area.
- Occupancy of on-road parking car condition in the morning time (9:00-11:00) is higher than that in afternoon time (14:00-16:00).
- The occupancy on the following roads is high.
 - Langxang Avenue
 - Ma ho sot- nong bone Road
 - Asian Road (T2 Road)

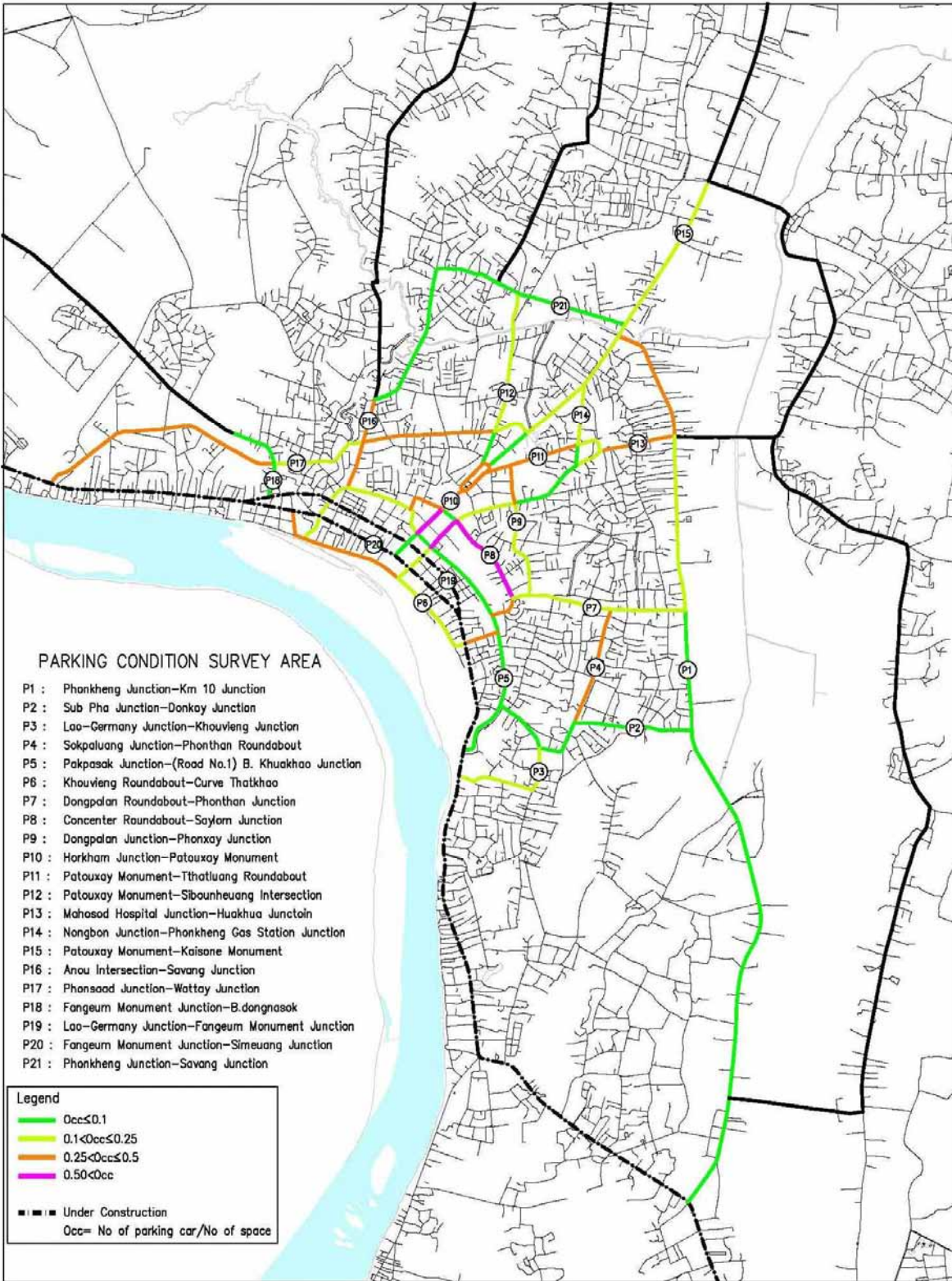


Figure 5.8-1 On-road Parking Condition in the Morning Time

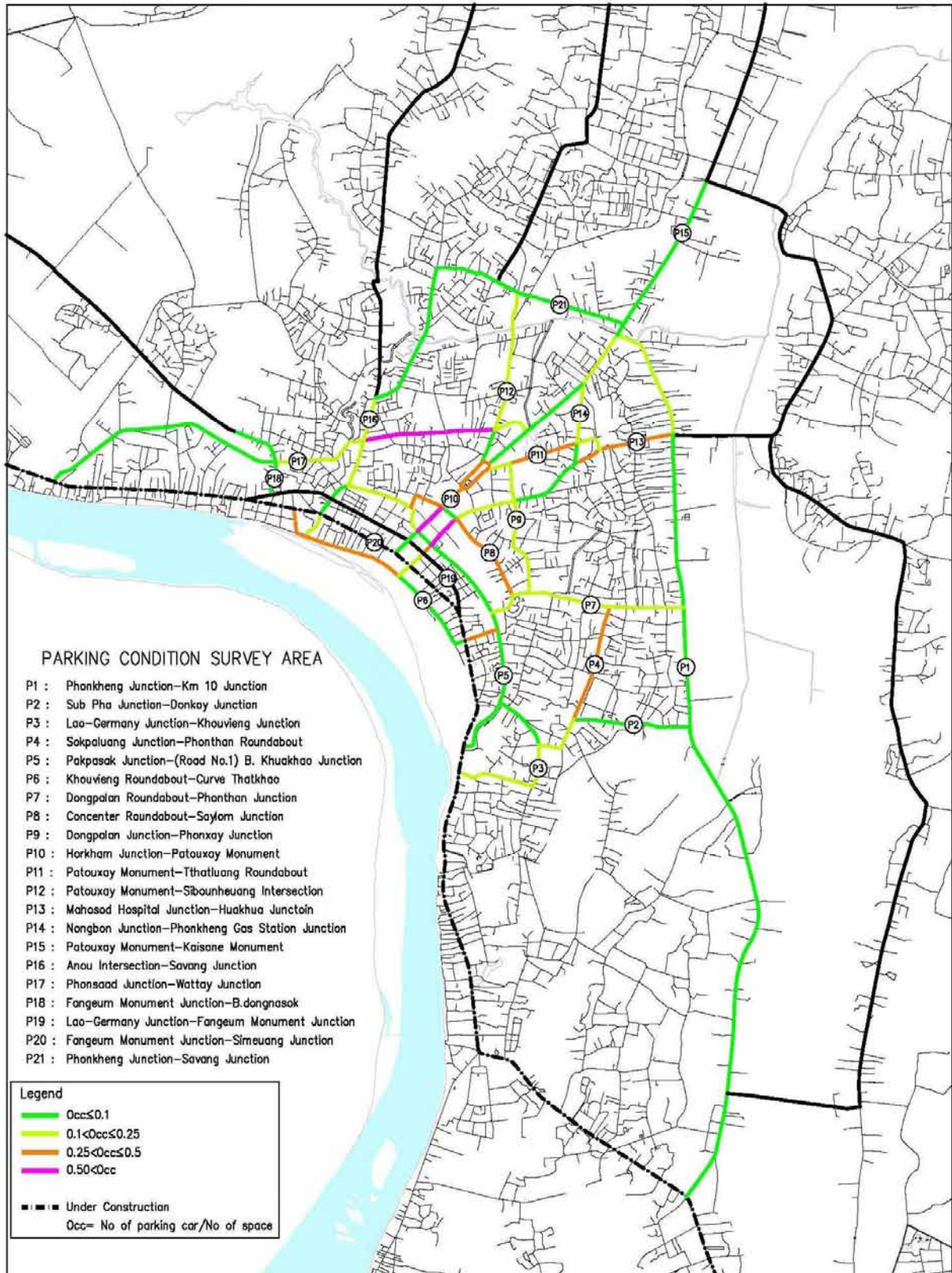


Figure 5.8-2 On-road Parking Condition in the Afternoon Time

(2) Parking Condition in the City Center

In 2004, parking inventory and parking car counting survey were conducted in the city center in Vientiane Urban Transport Master Plan, funded by Agence Française de Développement, (AFD). The area of this survey is illustrated in Figure 5.8-3. The summary of this survey result is shown in Table 5.8-1 and Table 5.8-2. This survey result shows that 53% of capacity is still available.

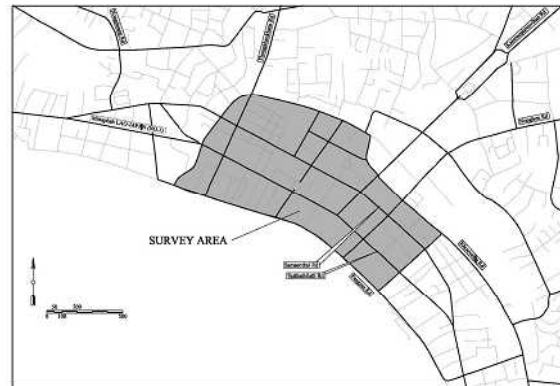


Figure 5.8-3 Parking Survey Area in Vientiane Urban Transport Master Plan

Table 5.8-1 Parking Space in the City Center

Parking on-road	Parking are off-street	Total
4,434	1,297	5,731
77.4%	22.6%	100%

Source: Vientiane Urban Transport Master Plan, BCEOM

Table 5.8-2 Parking Capacity in the City Center during Peak Hour

Capacity (spaces)	Peak hour demand	Capacity	
		Space	In %
5,731	2,665	3,066	53%

Source: Vientiane Urban Transport Master Plan, BCEOM

This study proposed to decrease the parking capacity in 2010 by removing of parking spaces on Samsenthai and Setthatirat along the curbside and prohibition of parking along Khouboukom and Khouvieng Road (see Table 5.8-3). It is said that parking areas in the city center is enough now based on this survey result.

Table 5.8-3 Proposed Parking Space in 2010

Parking on-road	Parking are off-street	Total
3,049	1,297	4,346
70.2%	29.8%	100%

Source: Vientiane Urban Transport Master Plan, BCEOM

5.9 COMMODITY MOVEMENT SURVEY

5.9.1 Methodology

The commodity movement survey was carried out to collect the necessary data and information for estimating the present freight demand linked to the road sector in the Study Area. Thirty (30) major transports related companies / organizations were selected.

The survey was conducted by mailing questionnaire with a letter of request in advance, and interviewing to the company head. The questionnaires sent to these companies were collected at the time of interview. The items asked in the questionnaire included following;

Company Attributes (category, number of employee, number of truck fleet)

Trip Information (loading items and volume, origin and destination)

5.9.2 Survey Results

(1) Company Categories

Figure 5.9-1 shows the distribution of company categories based the surveyed result. Main categories are miscellaneous industry, gas & petrol and construction materials.

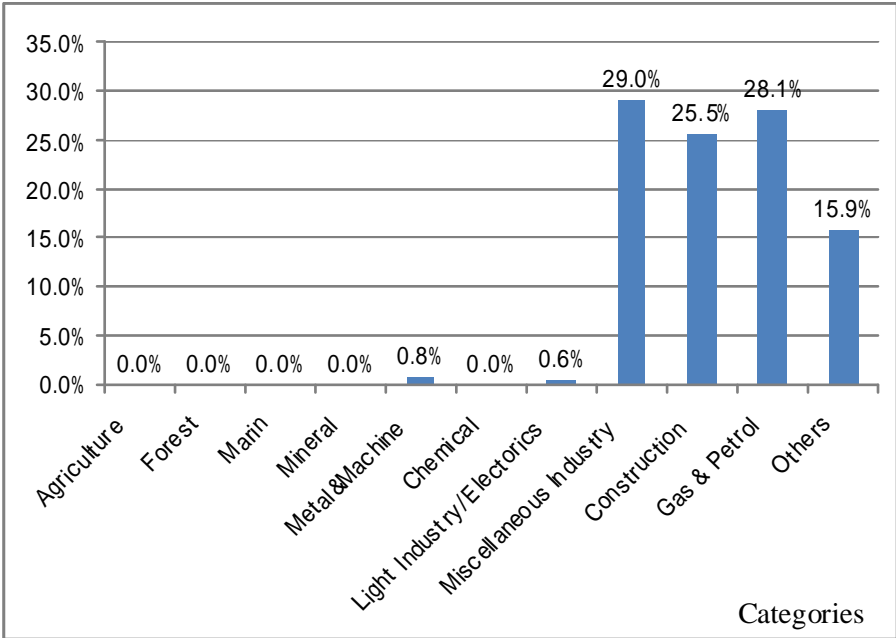


Figure 5.9-1 Distribution of Company Categories

(2) Trip Time

Distribution of trip time is shown in Figure 5.9-2. Average trip time was around 5.77 hour. 57.4% of all trips are less than 2 hour.

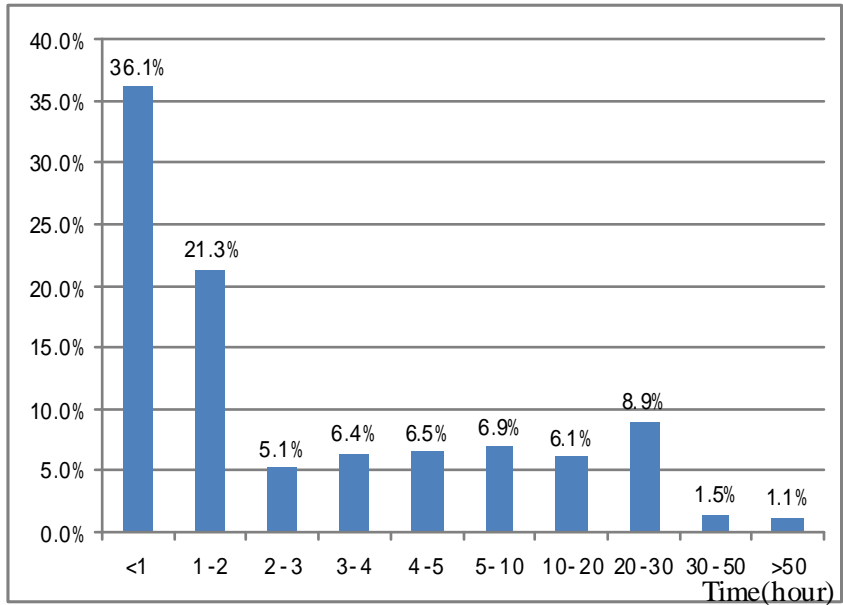


Figure 5.9-2 Distribution of Trip Time

5.10 STATED PREFERENCE SURVEY (SPS)

5.10.1 Methodology

The SPS is a survey to clarify people's choice activity response when some condition will change in the future. Therefore, the SPS is generally utilized to analyze individual choice activity changes, in case the conditions changes drastically in the future.

For example, if a new transport mode is to be introduced, it is generally difficult to analyze how many riderships would be shifted or attracted to the new transport mode. In this case, an opinion survey is conducted to obtain people's tendency to use the new mode, by showing its level of service and fare level. Based on this kind of survey (SPS), modeling work can cope with the issue. This method is also utilized to estimate people's choice changes when a drastic change happens to, for example, transport cost, travel speed, and so on.

Based on the above discussion, the Study Team conducted the SPS by interviewing a sample of the residents of Vientiane. The objectives of the survey were identified as follows:

- To obtain people's intention to use public transport modes if the service is improved drastically.
- To obtain people's intention to shift to the public transport from private cars in response to various public transport oriented improvement measures, and,
- To obtain people's opinion on present transportation

2,000 persons on Person Trip Survey were interviewed the same with Person Trip Survey.

5.10.2 Survey Results

(1) Potential Modal Shift of Car Users

Figure 5.10-1 illustrates the response of car users to question that “if New Public Transport System is introduced in Vientiane, do you change traffic mode?” Many respondents answered that they would change the public mode with reasonable waiting time and fare.

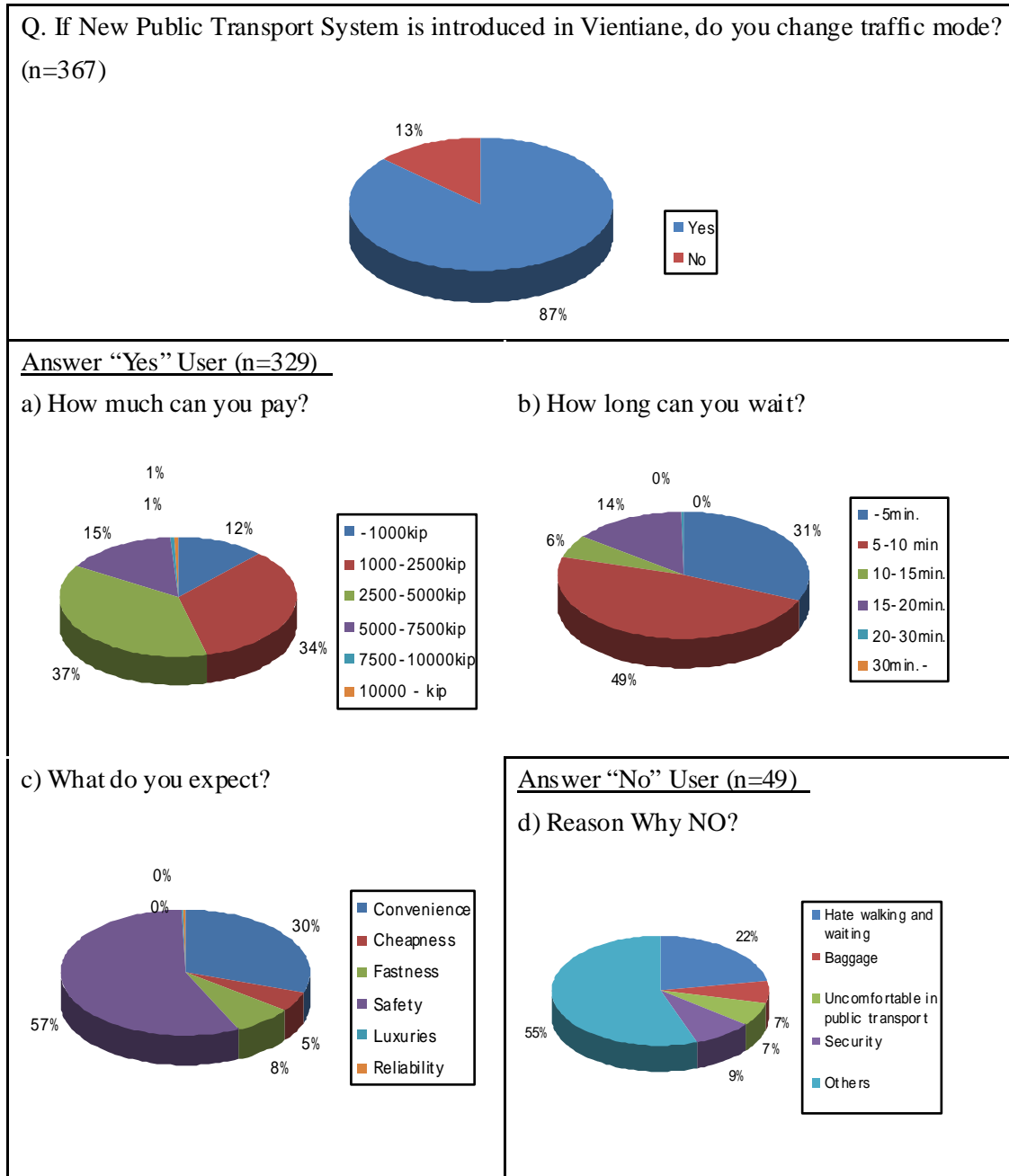


Figure 5.10-1 result of SPS (car user respondent)

(2) Potential Modal Shift of Motorcycle Users

Figure 5.10-2 illustrates the response of motorcycle users to question that “if New Public Transport System is introduced in Vientiane, do you change traffic mode?” Result is the nearly same as car user’s one.

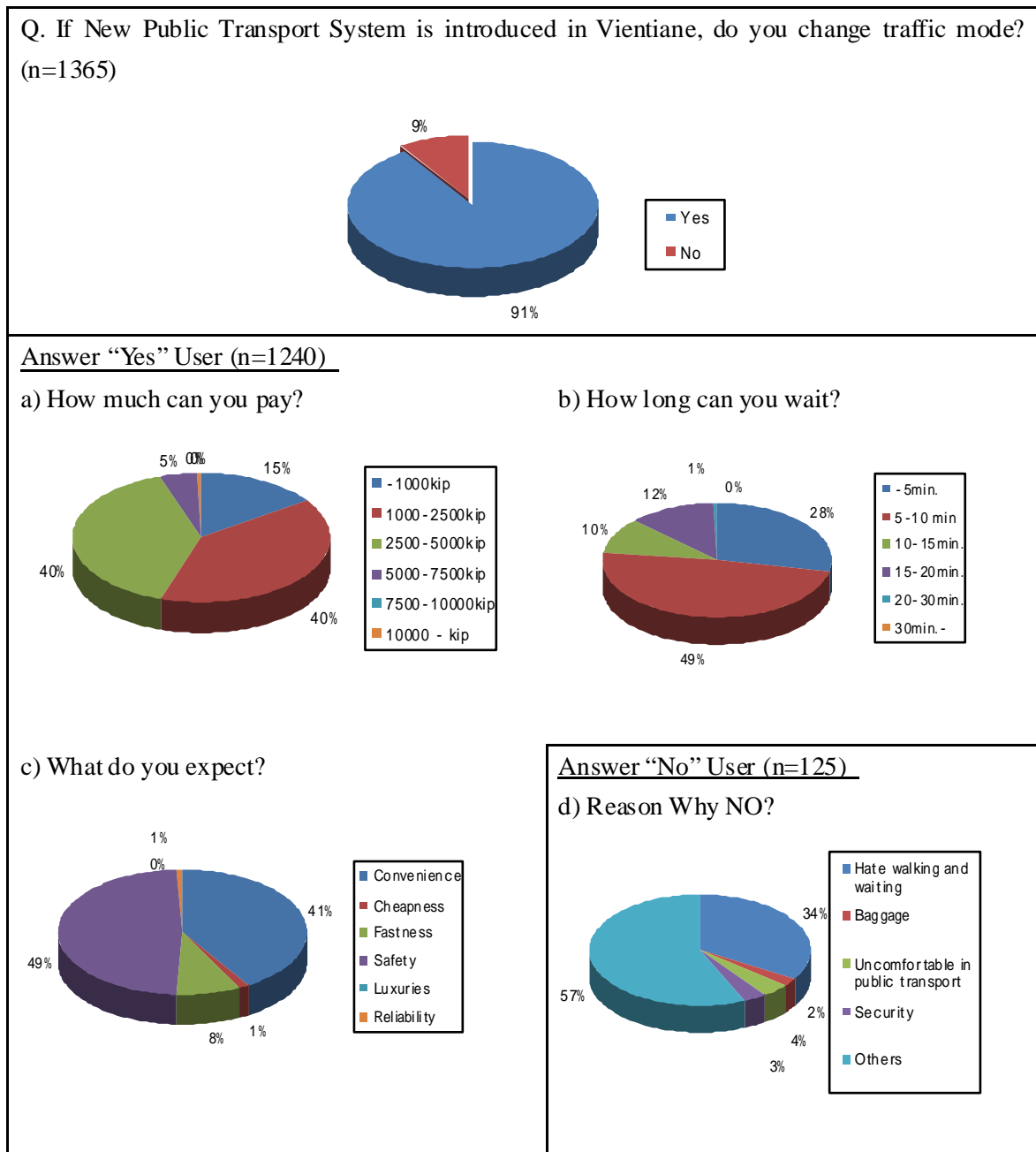


Figure 5.10-2 result of SPS (motorcycle user respondent)

5.11 NUMBER OF REGISTERED VEHICLES

Trend of number of registered vehicles are illustrated in Figure 5.11-1. The number of registered motorcycles has drastically increased since 2001 due to the introduction of low-priced motorcycles from China. The number of registered car increased since 2002 about 15- 34% per year. In the year 2006, the number of registered vehicles exceeds 200,000.

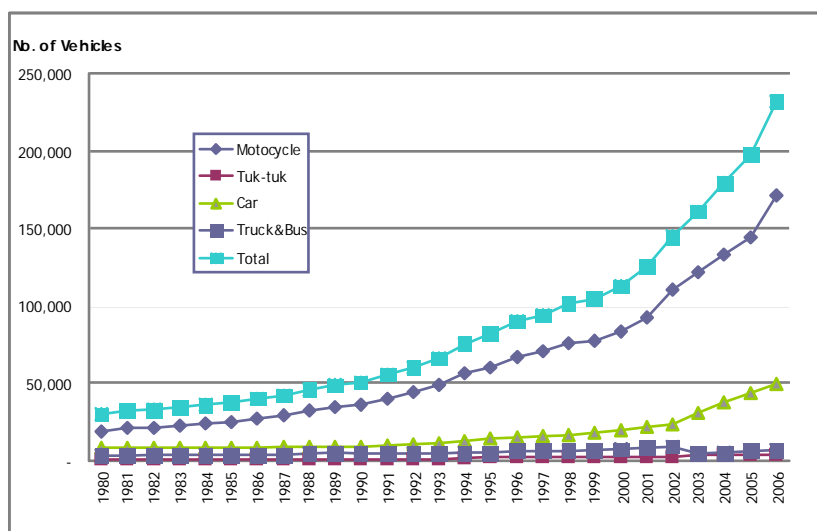


Figure 5.11-1 Trend of vehicle registration in Vientiane Capital

Table 5.11-1 Vehicle Registrations 1980-2006, Vientiane Capital

Year	Category of Vehicles								Total
	Motor Vehicles		Light Vehicles				Transport Vehicles		
	Motor Cycle	Tuk-tuk	Sedan	Pick-Up	Mini Bus	Jeep	Truck & Trailers	Buses	
1980	18,789	497	4,067	3,107	230	484	2,240	850	30,264
1981	20,709	499	4,089	3,122	232	488	2,419	856	32,414
1982	21,385	502	4,117	3,140	235	495	2,531	863	33,268
1983	22,815	506	4,147	3,159	238	501	2,647	871	34,884
1984	23,819	510	4,240	3,223	245	516	2,712	880	36,145
1985	25,149	516	4,296	3,266	249	525	2,827	890	37,718
1986	26,889	522	4,361	3,314	256	536	2,956	902	39,736
1987	29,141	529	4,456	3,378	263	549	3,143	916	42,375
1988	32,169	536	4,493	3,406	267	556	3,372	931	45,730
1989	34,345	545	4,576	3,462	274	569	4,403	947	49,121
1990	35,764	556	4,778	3,604	280	599	3,680	965	50,226
1991	39,976	584	5,114	3,893	295	643	3,729	966	55,200
1992	44,326	616	5,303	4,194	328	705	3,807	968	60,247
1993	48,543	1,110	5,528	4,642	429	821	3,841	973	65,887
1994	55,966	1,666	5,852	5,089	522	983	4,029	980	75,087
1995	59,888	2,196	6,316	5,965	625	1,230	4,546	999	81,765
1996	67,125	2,331	6,437	6,350	701	1,369	4,791	987	90,091
1997	70,369	2,365	6,610	6,628	767	1,387	4,967	1,059	94,152
1998	76,000	2,377	6,800	7,255	885	1,638	5,209	1,067	101,231
1999	77,338	2,377	7,072	7,821	1,068	1,966	5,586	1,100	104,328
2000	83,468	2,445	7,385	8,687	1,400	2,102	6,210	1,130	112,827
2001	92,475	2,480	7,744	10,204	1,661	2,327	6,966	1,168	125,025
2002	110,111	2,480	7,907	11,088	1,711	2,460	7,699	1,234	144,690
2003	121,576	3,543	7,185	16,802	2,229	4,749	4,018	515	160,617
2004	133,042	3,660	8,459	20,846	2,752	5,360	4,762	580	179,461
2005	144,507	3,695	9,437	24,353	3,507	5,923	5,405	665	197,492
2006	171,501	3,675	10,284	28,482	4,308	6,506	6,419	691	231,866

Source: MCTPC, Department of Transport, 1980-2006

5.12 DATABASE ON URBAN TRAFFIC

(1) General

A reliable database is an essential input to urban transportation planning, especially in urban area where traffic movements are complex and interactions among different modes. Without adequate database and analytical tools, which can handle large amounts of different data, planning cannot be done scientifically.

The Study intends to make a suitable database with its own management system.

In order for the database to be effectively utilized by Lao side as well as be properly managed over the years, the following were duly considered:

Items and coverage of data should meet the needs of relevant agencies or actual planning.

Access and use of the database should be easy, with a simple and clear structure, easy data search and retrieval, direct access through computer.

This database is under preparation using traffic survey data.

(2) Data category by correspondent figure

Most of the data can be plotted on a map in a form of an area, a line or a point. As such the data are classified according to the shape of their figure. From this point of view, the data are classified according to the following five categories:

- a) Zone information data
- b) Line information data
- c) Point information data
- d) OD information data
- e) Other non-graphical data

(3) Software of Database system

Each data file is compiled either in the numeric database (referred to simply as database) or in the “graphic data”.

In order to process the data into the requested format or output, it may be recommendable to apply ready made rather than developing a new package for data processing. Two well-known software, which could be used are the “dBase series” as a database application and the “Arc-view” as a graphic application. For the transport planning application, the adoption of the “JICA-STRADA” software is intended. All data files will be designed to be accessible with their applications.

CHAPTER 6

PUBLIC TRANSPORT

CHAPTER 6 PUBLIC TRANSPORT

6.1 PRESENT PUBLIC TRANSPORT SYSTEM

6.1.1 Public Transport in the Country

The public transport system in Lao PDR consists of road-based modes including bus and coach and paratransit modes, domestic air, and boat and ferry. The bus and coach play a major role in the public transport both in the rural and urban areas. Domestic airline is limited to use for the public because of expensive fares. No railway exists in Lao PDR, but an extension plan of Thai railway from Nongkhai through the Friendship Bridge is ongoing. (See Chapter 3: Relevant Project). The boat and ferry are used generally in the Upper Mekong areas to communicate Lao PDR, China, Myanmar and Thailand. In the Study Area, no boat service is provided because of low water in dry season in the Mekong, except the ferry which is operated for Nongkhai in Thailand. Table 6.1-1 describes trip type and public transport modes in Lao PDR.

Table 6.1-1 Trip Type and Public Transport Mode in Lao PDR

Trip Type			Public Transport Mode				
Trip Type		Destination	Air	Rail	Bus	Para-transit	Boat
Region	International	Thailand/China/Vietnam	O	Const. (Thai)	Private/State	-	Ferry (Thailand)
	Inter-Province	North/South	O	-	Private/State	-	-
	Inter-city	Central	-	-	Private/State	Sonteo	-
Urban	Suburbs	Urban Districts	-	-	State (big)	Sonteo	-
	Intra-city	City Center Area	-	-	State (mini)	Tuk-tuk	-
	Local	Villages	-	-	-	Tuk-tuk	-
Rural	Inter-City	District	-	-	-	Sonteo	-
	Local	Village	-	-	-	Tuk-tuk	-

Note: O: Operation: International railway is under construction 3.5km from Thailand.

6.1.2 Public Transport in Vientiane

The public transport in Vientiane is composed of air, rail, bus, paratransit and ferry. For air transport, there is an international airport within city area. A new railway line is under extension through the Friendship Bridge from Thailand to Vientiane. The first scope of construction is a 3.5km-single rail line and a station at Thanaleng. GOL intends to further extend the railway north to Vietnam and south to Southern Lao. The former will make half-circular surrounding the Vientiane, at 15 km-diameters.

For urban public transport in Vientiane at present, bus mass transit and paratransit vehicles are used. There are several types of bus mass transit, which are categorized by intracity, intercity and international transport. For the intracity urban public transport, the Vientiane State Bus Company (VSBC) plays a major role but recently the private bus company starts its operation

for selected route. Detailed bus operation will be explained in Section 6.2.

Meanwhile the paratransit complements the bus service for feeder public transport, which is composed of Tuk-tuk and Sonteo. The Tuk-tuk is allowed to operate intracity; the Sonteo is used for rural transport of agricultural products and passengers between the city center and suburban villages. In the town, a small number of taxis and vans are used mainly by businessmen, foreigner and tourists for short-distance transport among hotels, the Vientiane airport, the bus stations and the Friendship Bridge. All paratransit and taxi owners are organized in its associations. Details of paratransit association will be discussed in Section 6.

In Vientiane rural areas, bike-taxis provide transport services for passenger and cargos between the bus routes and the villages; a small passenger-ferry port is operated at 5km south from the Friendship Bridge for Nongkhai in Thailand. Immigration and custom offices are also attached to.

6.1.3 Public Transport Vehicle in Vientiane

Public transport vehicles which are currently operated in Vientiane are shown in Table 6.1-2. There are two types of vehicle for public transport; public mass transit and paratransit. Figure 6.1-1 shows land public transport and Appendix 6-1 shows its details.

Mass transit		Para transit	
			
Long Distance Bus	Intra-city Bus	Sonteo	Tuk-tuk

Figure 6.1-1 Public Transport in Vientiane

The bus mass transit is operated by the state and big private companies, which will be discussed in Section 6.2. Meanwhile the paratransit is defined as “public transport operated in an informal and largely disorganized manner, typically using small vehicles, owned by individuals.”¹. There are three types of paratransit in Vientiane; Sonteo, Tuk-tuk and Jambo. (See Appendix 6-1) They are operated by individuals and families, which contributes to creation of important employment opportunity. Besides taxies and vans (a wagon-typed hired taxi having maximum 15 seats) provide transport services from its stations to the destinations upon request of the passenger. Taxi’s share is very small and not major in public transport. The Tuk-tuk and Sonteo are traditionally familiar to Vientiane inhabitants for its convenience and

¹ Illes, R, [2005] “Public Transport in Developing Counties”, Elsevier, UK

reasonable fares for the passenger choice.

Table 6.1-2 Public Transport Vehicle in Vientiane

Vehicle Type	Trip	Passenger Nos.	Operation	Min. Fare (Kips)	Description
MASS TRANSIT VEHICLE					
A	Big Bus	Long Trip	By type	State/ Private	By distance Types of luxurious bus & common bus
B	Medium Bus	Medium /Urban Trip	45 Seats	State/ Private	2,000 Grand Aid by Japan (JICA)
C	Mini Bus	Short Trip/ Commuter	25 Seats	State	2,000 -ditto-
PARATRANSIT VEHICLE					
D	Sonteo	Urban Trip	12 Passengers	Private	By distance Converted pick-up truck (2-ton)
E	Three-Wheel (Tuk-tuk)	Urban Trip (Local)	8 Passengers	Private	5,000 Mostly Thai-made
F	Three-Wheel (Jambo)	Urban Trip (Local)	4-5 Passengers	Private	5,000 Converted motor bike
G	Taxi (Van)	Urban/Short Trip	4-5 Passengers (max 15)	Private	27,000 (unfixed) "Van" stations at Friendship Bridge
H	Motor Bike	Rural	1-2 Passengers	Private	NA Pilot operation
I	Small Ferry	Thailand (Nong kay)	20 Passengers	Private	NA At ----- Village

6.1.4 Number of Public Transport Vehicle in Vientiane

Figure 6.1-2 shows the number of registration vehicles from 2000 to 2006.

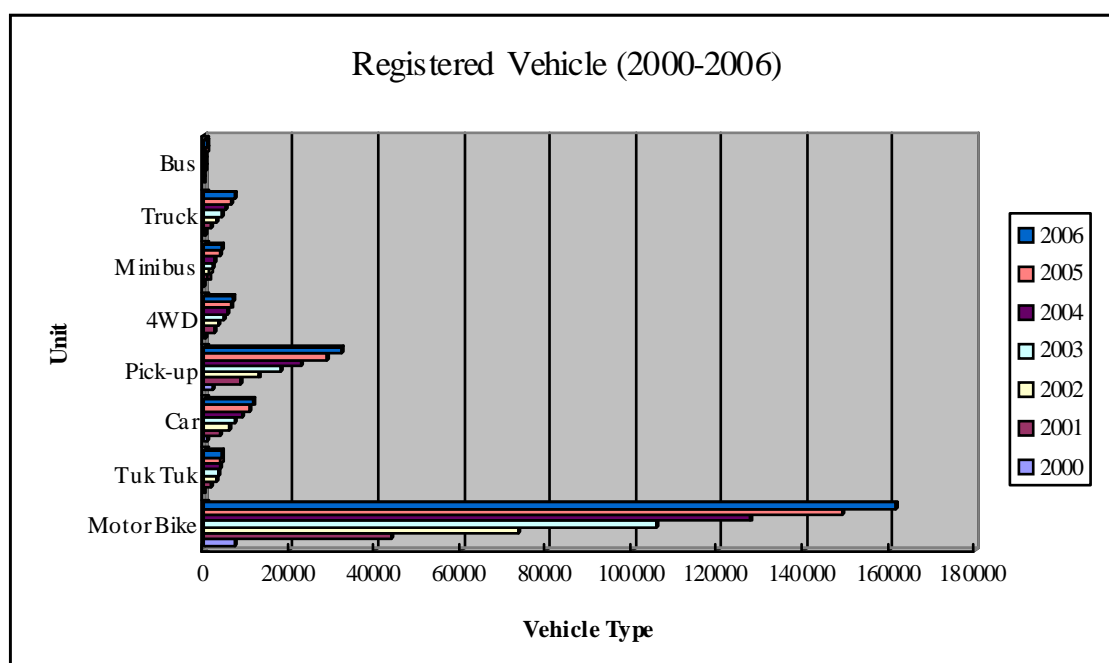


Figure 6.1-2 Vehicle Registration Number 2000-2006

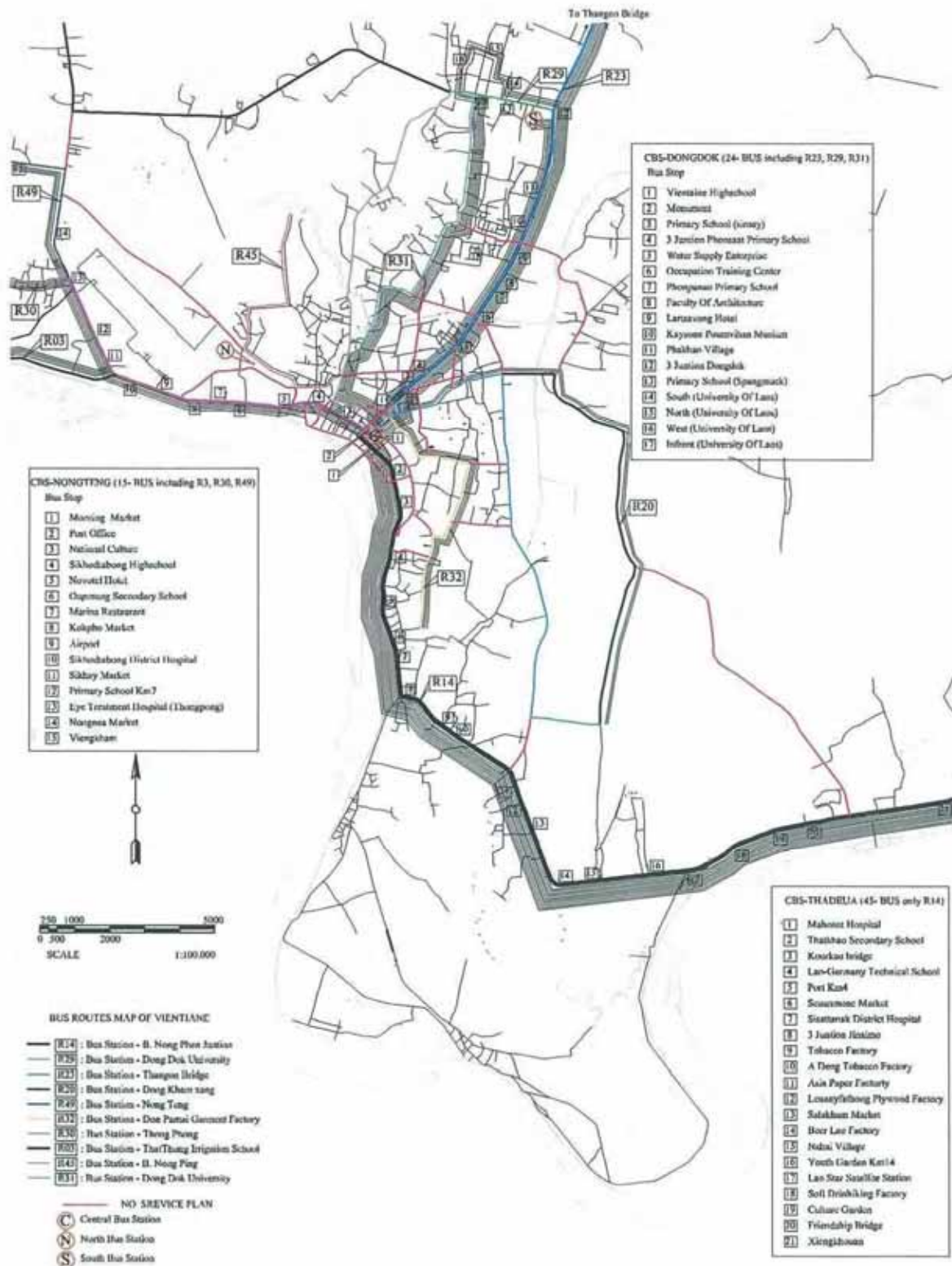
Total number of vehicles increased from 11,292 to 228,847 units, around 20 times. For the

public transport vehicle, the number of buses and minibuses increased from 74 to 741 (10 times) and from 95 to 4,349 (46 times), respectively; and Tuk-tuk from 186 to 4,273 (23 times).

6.15 Administration of Public Transport in Vientiane

Administration of public transport in Vientiane is under the Department of Communication, Transport, Post and Construction of Vientiane (DCPTC) who controls all public transport operators, state and private bus companies and all paratransit operators through each association in terms of increasing number of vehicles, decision of travel fare, allocation of services routes, review of transport policy such as private sector involvement and so on. Since Ministry of Communication, Transport, Post and Construction (MCTPC) has prohibited importing Tuk-tuk from Thailand due to its many traffic accidents, noisy engines and local vehicle design against promotion of urban beautification, the number of Tuk-tuks in operation has been decreased. Organization and issues of DCPTC will be discussed in different chapter.

6.2 URBAN BUS SERVICE IN VIENTIANE



URBAN BUS ROUTE AND MAJOR BUS STOP IN VIENTIANE

(Central Bus Station)

Figure 6.2-1 Urban Bus Route and Major Bus Stop in Vientiane

6.2.1 The Present Urban Bus Operation

In Vientiane the bus is the major player for urban transport service. The bus operation is carried out by a system composing of bus operator, routes and bus stops, bus stations and administration. There are two kinds of operators: public and private; Vientiane State Bus Company (VSBC) and Thong Li Pa Si Bus Company. The private operator has newly started urban bus service since October 2007.

6.2.2 Bus Service Routes in Vientiane

The bus route structure with bus frequency of VSBC is shown in Figure 6.2-1. There are three major bus routes in Vientiane; Central Bus Station (CBS) to University of Lao (North) on National Road No.13 South, CBS to Friendship Bridges (East) and CBS to International Airport (West). The timetable is shown in Table 6.2-1. The preliminary service survey conducted on these routes is shown in Section 6.4. The timetable for all bus routes at CBS is presented in Appendix 6-2.

Table 6.2-1 Urban Bus Routes and Timetable at Central Bus Station (VSBC)

Destination	No of Buses	Time for Bus Routes								Fare (Kip)	Bus Type
		01	02	03	04	05	06	07	08		
Route 29 Dongdok (University of Lao)	1	6:30	8:00	9:30	11:00	12:30	14:00	15:30	17:00	2,000	45 Seats
	2	7:00	8:30*	10:00	11:30	13:00	14:30	16:00	17:30		
	3	7:30	9:00	10:30	12:00	13:30	15:00	16:30	18:00		
Route 49 Nongtaeng	1	6:15	8:15	10:15	12:30	15:30	-			3,000	28 Seats
	2	6:50	8:50	10:50	13:30*	16:30					
	3	7:25	9:30	11:30	14:30	17:30					
Route 14 Thadeua (Through Friendship Bridge)	1	5:35	8:05	10:35	13:05	16:05				4,000	25 Seats
	2	5:50	8:20	10:50	13:20	16:25					
	3	6:05	8:35*	11:05	13:35	16:45					
	4	6:20	8:50	11:20	13:50	17:05					
	5	6:35	9:05	11:35	14:05	17:30					
	6	6:50	9:20	11:50	14:25						
	7	7:05	9:35	12:05	14:45						
	8	7:20	9:50	12:20	15:05						
	9	7:35	10:05	12:35	15:25						
	10	7:50	10:20	12:50	14:45						

Source: Vientiane State Bus Company.

Note: * The marked buses are preliminary survey conducted for its operation.

There are three bus stations (terminals) in Vientiane; the Central Bus Station (CBS), the Northern Bus Station (NBS) and the South & International Bus Station (SBS). CBS, the sole bus station for urban bus service among these stations, belongs to VSBC. It is also the gateway to international bus service for Thailand. NBS and SBS are constructed and operated by private companies and not used for urban transport. They provide only the intercity and international bus services. Urban bus service is also administrated by DCTPC as explained in Section 6.1.5.

Bus stops are fixed and located on main route; a few bus stops are equipped with shelter and bench, but mostly only with bus stop sign. The bus drivers operate additionally loading and unloading by on-demand base.

6.2.3 Vientiane State Bus Company

(1) Historical Company Status²

The State Bus Company (VSBC) of Vientiane is a 100% state-owned enterprise, of which roles and responsibilities are to provide social service in the field of urban transport in Vientiane and in some provinces. VSBC is independent enterprise but supervised by Department of Communication, Transport, Post and Construction of Vientiane (DCTPC) and the Mayor of Vientiane.

In 1991 the Passenger Transport Company was legally started as a state-owned enterprise under the Department of Economic and Planning (former name) of Vientiane and DCTPC in accordance with the Prime Minister's Office (PMO) Decree No. 91/PMO dated 5 December 1991. On 7 August 2002, VSBC Board of Management was established in accordance with the Vientiane Governor's Decree No. 1457/VTE. On 29 August 2002 the board meeting was held and the Company was renamed from the "Vientiane Passenger Transport Company" to the "Vientiane State Bus Company (VSBC)". VSBC pays government for the renting cost of fixed assets and retain the operating cost for future expansion.

(2) Number of Buses

In 1989/90 VSBC received the first batch of donation from the Government of Japan (GOJ) under the Project for the Improvement of Urban Transport in Vientiane, total value of JY 1,070,000,000 (US\$ 10 million equivalent) consisting of 50 buses (32 large buses and 18 medium buses) and the constructions of the Central Bus Station and a workshop.

In 1999/2000, VSBC also received the second batch of donation from GOJ for 56 buses and spare parts by Non-Project Grant Aid, total value is JY269,749,478 (US\$ 2.5 million equivalent) for 26 units of large-size buses (45 sheet-type: Hino) and 30 units of medium buses (25 sheet-type: Nissan) taking importance of public transport and renewal of the vehicle into

² Brief Report to the Business Improvement Committee, Prime Minister's Office, 19 Jul 2006

consideration. In addition, VSBC spent 2,606,800,902 Kip from its savings to purchase additional 28 buses. Generally the big buses run in the suburbs and min buses run in town. Table 6.2-2 shows the number of current buses available for VSBC.

Table 6.2-2 Number of Current Buses Available in Vientiane State Bus Company

No.	Brand	Seat	Number	Year	Finance	Remark
1	HINO	55	23	1988	Grant-Aid	GOJ
2	MITSUBISHI	28	18	1988	Grant-Aid	GOJ
3	HYUNDAI	45	26	2000	Grant-Aid	GOJ
4	NISSAN	25	30	2000	Grant-Aid	GOJ
5	HYUNDAI	45	5	1995-2005	Purchased	VSBC
6	MITSUBISHI	28	11	1995-2005	Purchased	VSBC
7	MITSUBISHI	45	1	1995-2005	Purchased	VSBC
8	MITSUBISHI	12	2	1995-2005	Purchased	VSBC
9	TOYOTA	30	2	1995-2005	Purchased	VSBC
	TOTAL:		118			

Source: Vientiane State Bus Company

(3) Organization of the VSBC

VSBC has totally 304 employees, 16 females (as of June 2006), 20 contracted employees. The management is administrated by three Directors and four (4) sections: accounting, admin-personnel, planning and transport, technical and maintenance.

(4) Fare and Frequency of Operation

Fares and frequencies of bus services of VSBC are listed in Table 6.2-3.

Table 6.2-3 Urban Bus Services by Vientiane State Bus Company at Central Bus Station

Route	Destination	Bus Numbers	Frequency	Fare (kip)	Bus Type
49	Nontaeng	3	14	3,000	28 seats
14	Thadeua	10	45	4,000	25 seats
29	Dongdok	3	24	2,000	45 seats
33	Nongtha	3	18	2,000	No operation
31	Phontong	6	38	2,000	28 seats
40	Nonghai	1	6	3,000	No operation
23	Thangon	6	30	4,000	25 seats
20	Dongkhamsang	2	12	3,000	28 seats
49	Nongtang	3	15	3,000	28 seats
48	Sikherd	2	12	3,000	No operation
32	Donpamay	3	28	2,000	28 seats
30	Thongpong	4	23	3,000	28 seats
03	Tadthong	4	23	3,000	28 seats
45	Nongping	1	8	2,000	28 seats

Source: CBS Planning Office of VSBC

Note: Approximately service capacity is estimated at 36,210 passengers. (Bus no. x frequency x seat)

(5) Number of Passenger

Figure 6.2-2 shows the annual total numbers of passengers from 1990 to 2005.

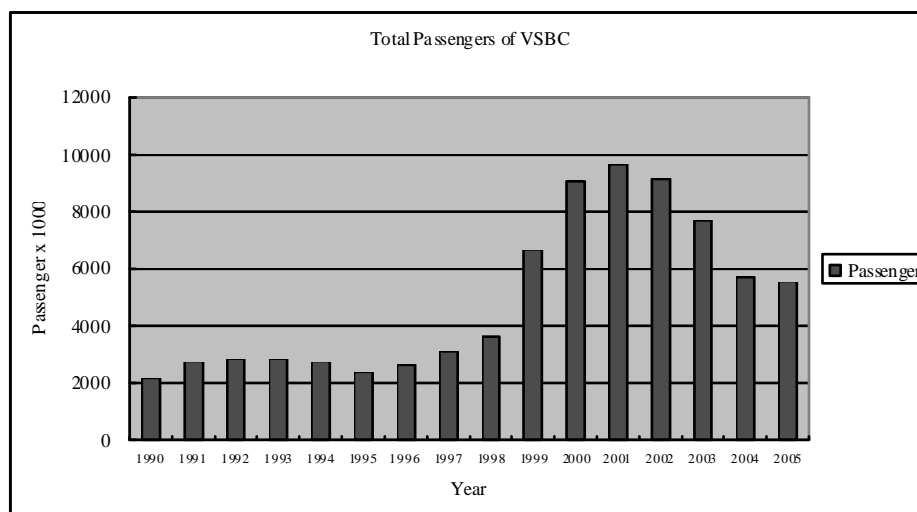


Figure 6.2-2 Passengers of Vientiane State Bus Company

(6) Financial Status

Table 6.2-4 shows number of passengers and financial statement of VSBC from 1990 to 2005. As clearly shown in Figure 6.2-3, VSBC had been able to provide services and to make profit until 2001, however, in 2002, VSBC started to lose 114,423,593 Kip. In 2002, VSBC moved all the intercity buses to the Northern Bus Station according to the Vientiane Mayor's Decree No. 2173/VTE dated 24 December 2002 and the Notice of Director of DCTPC No. 2624/DCTPC.VTE dated 27 December 2002.

Table 6.2-4 Number of Passengers and Financial Statement

Year	Passengers	Total income (Kip)	Total profit (Kip)	Tax (Kip)
1990	2,182,640	440,498,685	7,178,065	132,816,708
1991	2,745,751	784,478,785	138,328,641	268,389,343
1992	2,836,855	900,541,403	94,235,203	272,923,769
1993	2,853,741	915,204,343	35,522,325	161,912,719
1994	2,745,457	1,004,909,546	20,676,790	133,746,925
1995	2,402,459	1,191,669,006	30,958,601	164,395,717
1996	2,658,269	1,409,121,041	42,412,046	189,218,551
1997	3,103,175	1,659,931,240	5,520,947	183,693,847
1998	3,611,895	2,869,439,475	40,016,131	222,834,569
1999	6,676,783	8,082,727,558	348,738,658	2,039,706,248
2000	9,073,961	13,303,455,877	332,358,971	3,427,564,043
2001	9,647,054	17,589,986,263	716,744,254	3,398,714,222
2002	9,146,850	17,668,806,279	- 114,213,593	2,311,535,505
2003	7,716,152	21,469,777,231	188,760,640	2,244,719,030
2004	5,706,703	25,166,615,279	- 120,595,515	2,756,294,006
2005	5,560,903	28,893,079,240	- 1,319,473,024	1,915,996,169
Total	78,668,648	143,350,241,251	2,001,451,272	19,824,460,916

This resulted in decrease of number of passengers at CBS. To solve the adverse business environment, VSBC increased the bus fares. However, the profit is still lost due to the inflation and depreciation of exchange rate against hard currencies³.

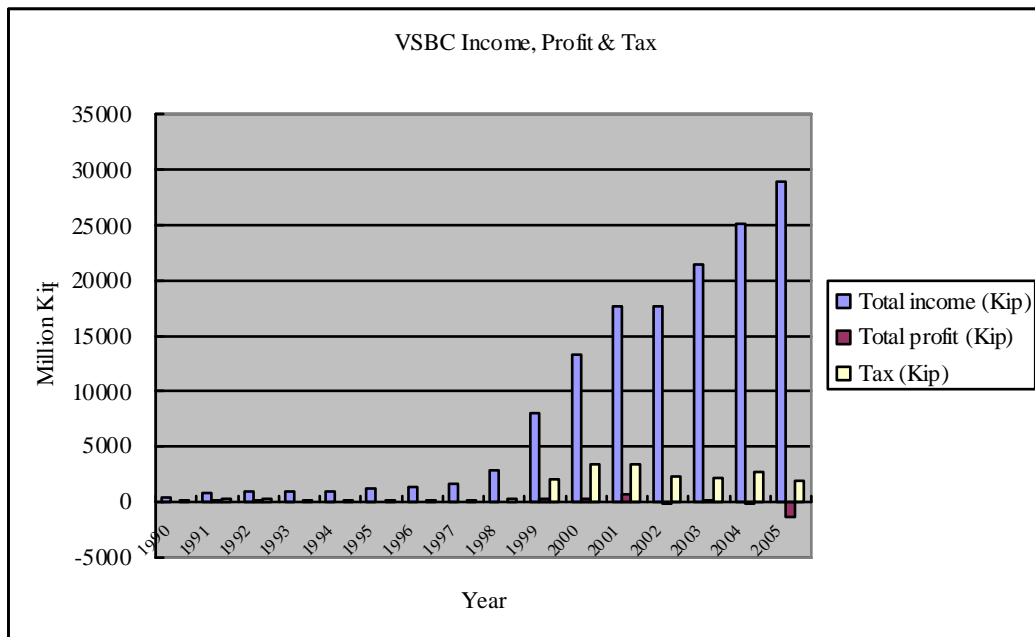


Figure 6.2-3 Total Income and Profit of Vientiane State Bus Company

6.2.4 Central Bus Station

(1) Location, Layout and Facilities

The Central Bus Station (CBS) is sole urban bus service station in Vientiane and located in the city center and adjacent to the Morning Market, the biggest and busiest market in Vientiane. CBS is also called “Morning Market Bus Station” or “Talat Sao Bus Station”. Figure 6.2-4 shows a view of CBS and Figure 6.2-5 for a view from entrance.



Figure 6.2-4 Central Bus Station

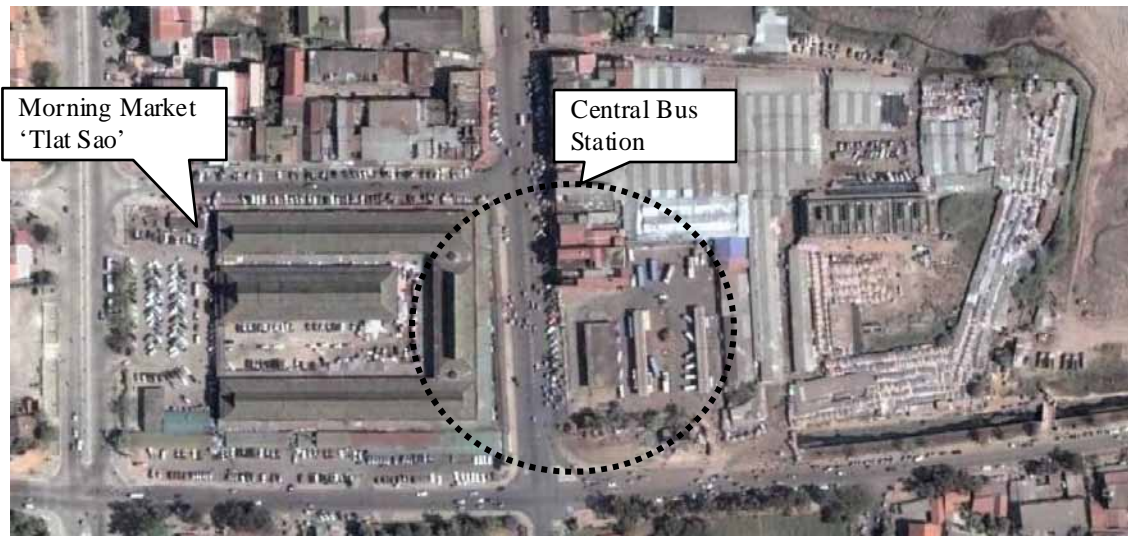
As mentioned in Section 6.2-3 above, CBS was built by Japan’s Grant-aid in 1989. At the present CBS is used at full capacity both for passengers and bus numbers. All facilities are also required for renovation.



Figure 6.2-5 View from Entrance

³ The exchange rate varied from 218.15 Kip/THB and 9,555 Kip/USD at the beginning of 2002 to 241.75 Kip/THB and 10,720 Kip/USD at the end of 2002

Figure 6.2-6 shows its location and Figure 6.2-7 for its layout having the area of approximately 10,000m², which is divided by an office space, a shop and restaurant area, a parking area and a bus parking area. There are three bus bays for loading and unloading. See Figure 6.2-8 and 9.



Note: Satellite picture was taken before a new department built

Figure 6.2-6 Central Bus Station Location

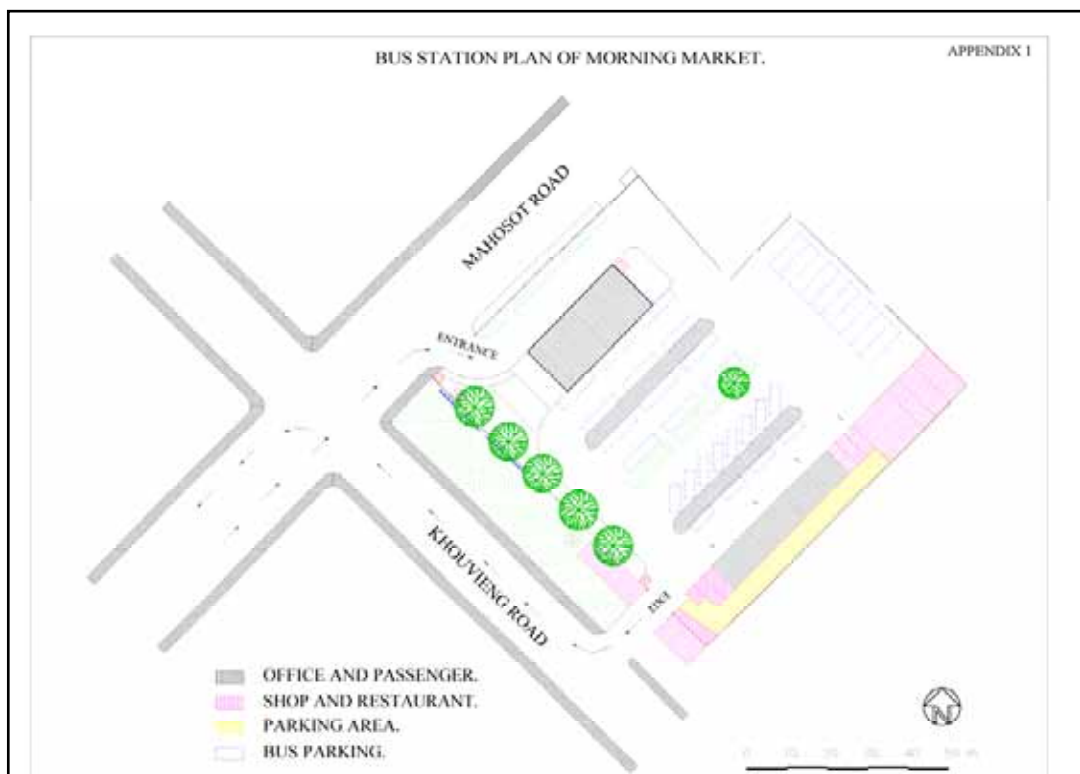


Figure 6.2-7 Layout of Central Bus Station



Figure 6.2-8 Bus Platform



Figure 6.2-9 Kiosk in CBS

(2) Bus Operation at CBS

The CBS provides three bus services; intracity (urban), intercity and international. The intracity operation is the major bus services which covers major road network in the Vientiane urban area. The long distance transport services are limited from CBS to cities on the National Road 13 South in the Vientiane Province, while international services are between Thailand through the Lao PDR-Thai Friendship Bridge, of which bus services are operated by VSBC and the private companies including Thai bus operators. Figure 6.2-10 shows bus operation at CBS. The detailed operations at CBS (Morning Bus Station) are attached in Appendix 6-2-4.

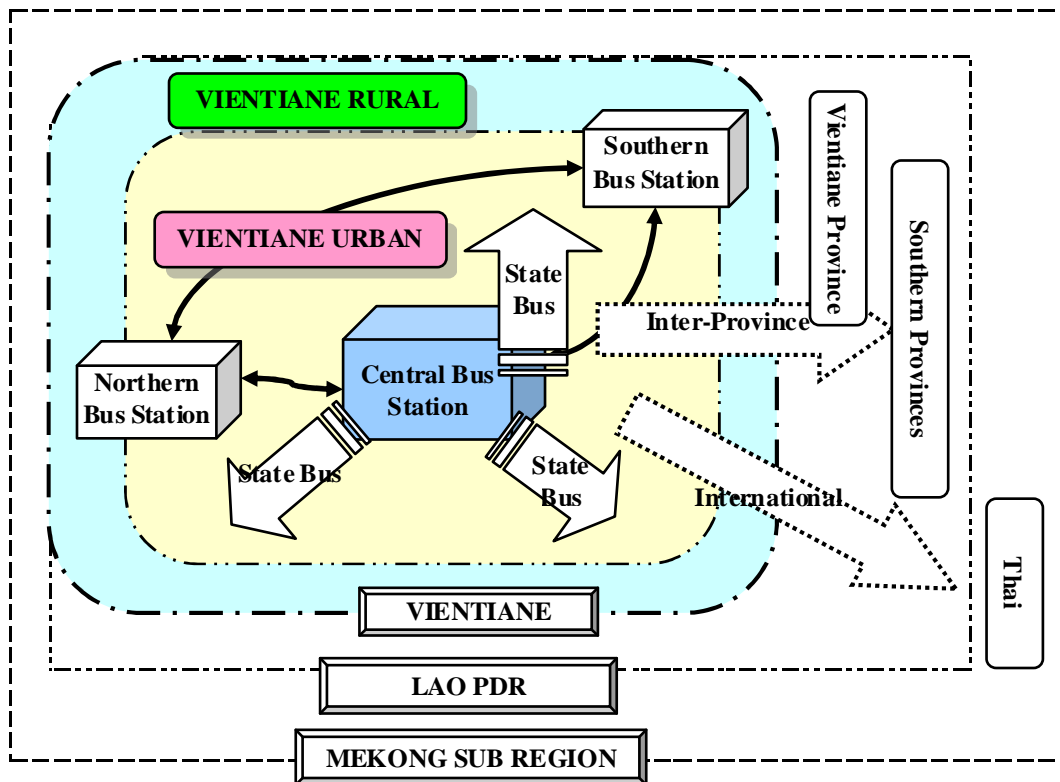


Figure 6.2-10 Operation of Central Bus Station

(4) Ownership and Administration of CBS

The Central Bus Station is owned and operated by the Vientiane State Bus Company through Operation Office at CBS as shown in Figure 6.2-11. The office manages and administrates daily bus operation. The office provides the bus service routes map with time table at the ticket counter and the time board at bus bay as shown in Figure 6.2-12 and 13, respectively. Additional or renewal bus route maps are required for bus user's convenience.



Figure 6.2-11 Operation Office



Figure 6.2-12 Bus Route & Timetable



Figure 6.2-13 Bus Bay & Time Board

6.2.5 The South and International Bus Station

(1) Location, Layout and Facility

The South and International Bus Station (SBS) is located on National Road 13 South near junction between NR 13 South and Dongdok Road. SBS was constructed in 1994 and renovated in 2004 by private company, the Southern Bus Station Company, under concession agreement with GOL. The area is approximately 25,000m². This is the gateway to southern provinces and Vientiane. Figure 6.2-14 shows an entrance of SBS.



Figure 6.2-14 Southern Bus Station

In the main building, there are an operation office, ticket counters, shops and restaurant, etc. All building and facilities are new. At the front of the main building, there are parking bay for Sonteo and Tuk-tuk. Figure 6.2-15 and 16 show the above service facilities.



Figure 6.2-15 Main Building



Figure 6.2-16 Ticket Counter

Figure 6.2-17 shows a layout of SBS. The SBS has a main building, guest houses, bus parking area, pickup (Sonteo) parking area and Tuk-tuk parking station.

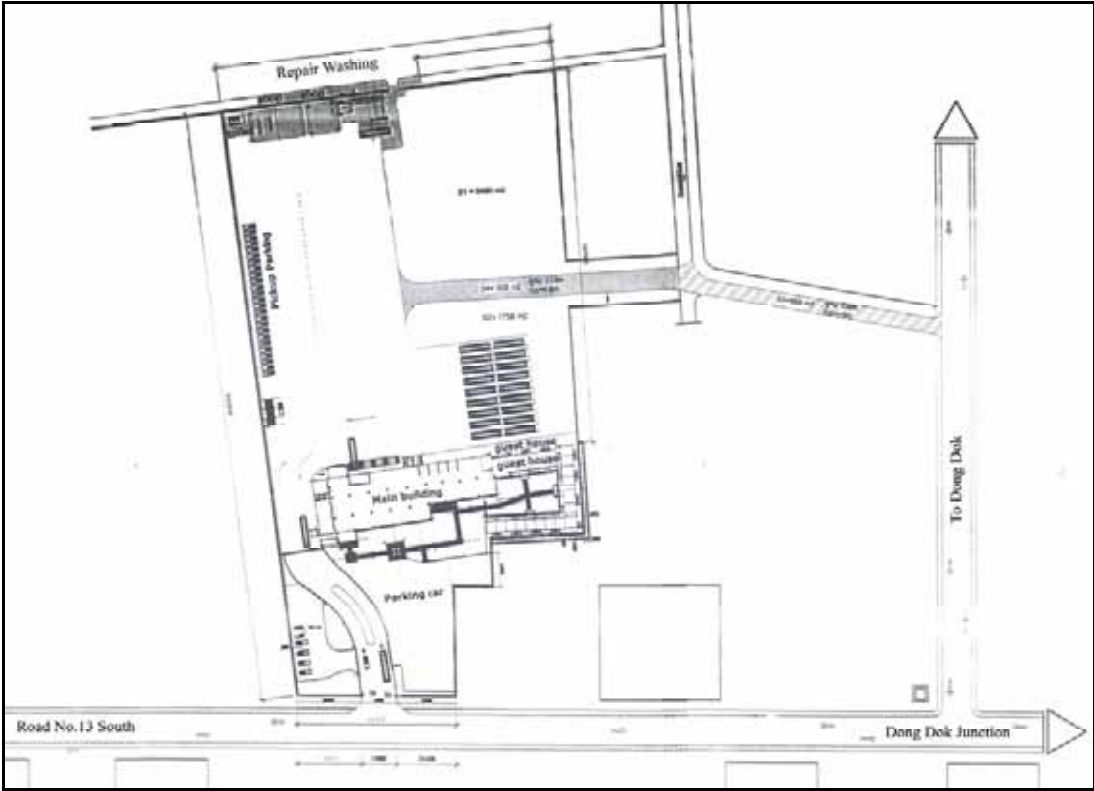


Figure 6.2-17 Layout of Southern Bus Station

(2) Bus Operation at SBS

The SBS is used for providing the transport services to the Southern provinces in Lao PDR and major cities in Vietnam by the state and private bus companies. As shown in Figure 6.2-18, there are three bus services; outer bus (rural areas in Vientiane), provincial bus (mostly the southern provinces in Lao PDR) and international bus (Vietnam). Demarcation of urban and rural transport by using SBS may reduce the congestion at the Central Bus Station (CBS) and then traffic problems around the Morning Market area.

The passengers who want to travel to Vientiane rural areas and the Vientiane Province use either Tuk-tuk or Sonteos for comparatively shorter distance and VSBC and the private bus companies for long distance. To connect to CBS and the Northern Bus Station, they use the VSBC commuter, Sonteo or Tuk-tuk. There is not any service to connect at the Friendship Bridge from SBS.

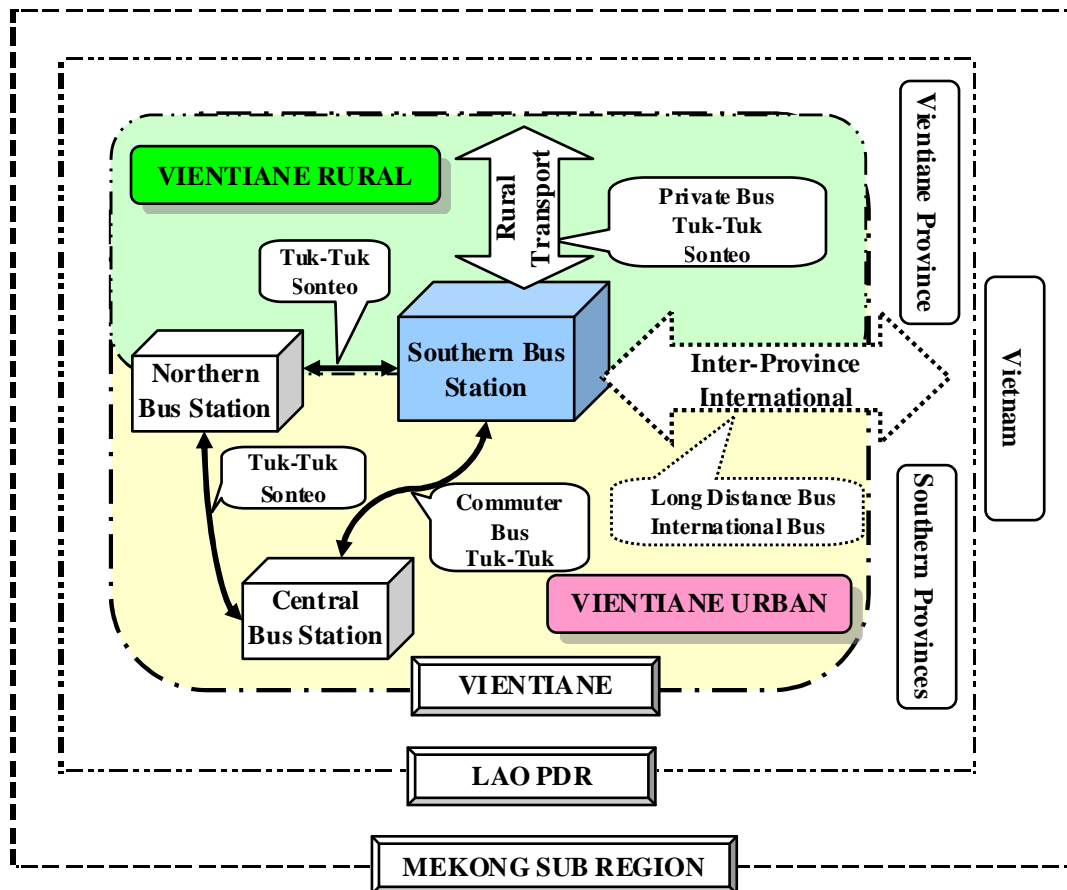


Figure 6.2-18 Operation of Southern Bus Station

6.2.6 Northern Bus Station

(1) Location, Layout and Facility

The Northern Bus Station (NBS), also called T2 Station, is located along ASEAN Road. The area is approximately 18,000m². NBS is owned and operated by the private company, Chitpasong Company under concession agreement with GOL. The Chitpasong Company has own buses and a workshop. NBS is a gateway of Northern provinces and China for Vientiane. Figure 6.2-19 and 20 show entrance and location of NBS, respectively.



Figure 6.2-19 Entrance



Figure 6.2-20 Northern Bus Station

In the NBS area, there is a bus station building with passenger waiting areas, ticket counters, a hotel facility and a bus parking area. Sonteo and Tuk-tuk stations are also provided. Figure 6.2-21 to 22 show facilities of NBS.



Figure 6.2-21 Bus Parking Area



Figure 6.2-22 Waiting Area

(2) Bus Operation at Northern Bus Station

The NBS is the gateway for the Northern provincial transport connecting to Vientiane and used by all the domestic private bus companies and the Chinese Bus Company for the international transport for Kunming in China. The inter-province services are about 38 to 41 buses per day and the international service is two (2) buses per day, on every Thursday and Sunday. Figure 6.2-23 shows the bus operation at NBS. Average passenger using this station ranges 150 to 300 passengers per day.

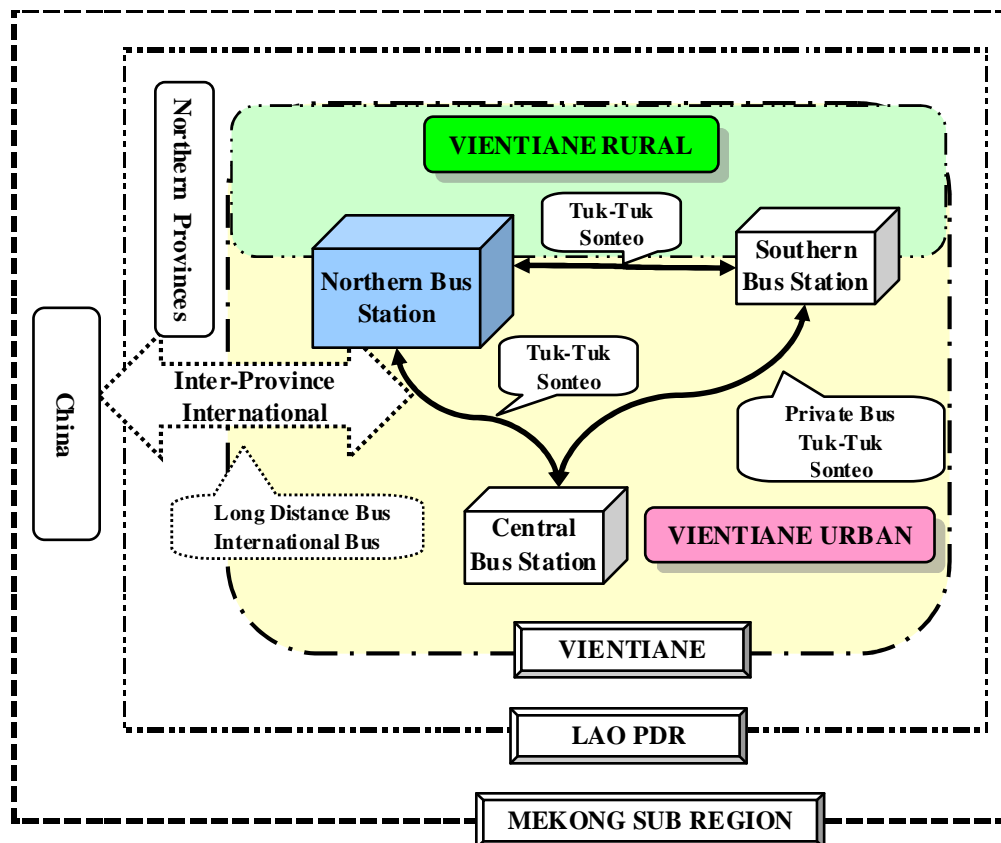


Figure 6.2-23 Bus Operation at Northern Bus Station

6.3 PARATRANSIT TRANSPORT INDUSTRY

6.3.1 Paratransit Association

There are three paratransit associations in Vientiane. Table 6.3-1 shows outline of the paratransit associations. Among the paratransit modes, there is service area demarcation. Tuk-tuk and Jambo are used for the public transport in Vientiane urban area (Vientiane Urban), while Sonteo is used for public transport in Vientiane rural area (Vientiane Rural)⁴.

Table 6.3-1 Outline of Paratransit Association

Association	Registered Number	Association Conditions		
		Operation Number	Conditions (kip/month. unit)	Insurance
Tuk-tuk/ Jumbo	2,090	1,887	Tax:77,000 kip/month Fee:70,000kip/year	177,000 kip/ kip/year
Sonteo	262	262	Tax:220,000 kip/month Fee:120,000kip/year	388,000 kip/ kip/year
Taxi	132	132	Tax:83,000 kip/month Fee:180,000kip/year	263,000 kip/ kip/year

Source: Data from each association.

6.3.2 Vientiane Tuk-tuk & Jumbo Association⁵

(1) Membership

Table 6.3-2 shows association members in 2003 to date.

Table 6.3-2 Association Membership Statistics from 2003-2007

Year	Jumbo	Tuk-tuk	Total
2003	1,125	1,106	2,231
2004	1,035	982	2,017
2005	1,175	955	2,130
2006	1,120	970	2,090

Source: Vientiane Tuk-tuk & Jumbo Association, as of 14 May 2007

The number of member of Tuk-tuk and Jambo joining in the association were averagely 2,100 from 2003 to 2006. The number of damaged and stopped membership is 450. Yellow plate holders are 350 and individual business plate holders are 45. There are some members moved to other provinces.

⁴ For the public transport, the Study uses Vientiane Urban and Vientiane Rural for the service area.

⁵ VTE DCTPC, River-Land Transport Office, Tuk-tuk & Jambo Association, Report on the Tuk-tuk & Jambo Service 2006-2007, 14 May 2007 by President of Association

(2) Management and Operation

The Tuk-tuk & Jumbo Association has President, Vice-president, office staffs of eight persons, including one female employee.

(3) Operation of Queues Management

The association has regulations for queues and station allocation management (See Figure 6.3-1). There are major queues and stations allocated to a large number of members; Faculty of Medical Science station, Lao-Thai Bridge station, the Moming market station and Central Bus Station and Southern Bus Station. The association nominates the staff to work on monitoring of fare, route, and parking in order to get all organized. All members should have stickers indicating route, queue on the roof in



Figure 6.3-1 Tuk-tuk Queue at CBS

order for easy checking. Last year the association urged all members to go through vehicle inspection; any members who were found not to follow the instruction were not to be allowed to get the annual permissions. In 2004-2005 the members were encouraged to participate in the driving license test A1 type, 12 times per year. There were total 720 members participated and 695 passed. In 2006, the monitoring staff carried out 975 times of inspections of queues and station, provided warning and disciplinary actions against 512 drivers (poor vehicle inspection, no plate numbers, yellow plate, expiry of permission, fake documents, etc.)

The Queue Arrangement is to provide the designated station to each Tuk-tuk in the five zones in the urban districts, as shown in Table 6.3-3. There are 14 staffs responsible for the queue management and 220 staffs on duty at all queues for control. Since January 2005 the association has set up the regulation management team which consists of three officers and two traffic polices. The team coordinates and monitors Tuk-tuk operation at each queue (waiting station) and also provides warning and training for those against the regulations.

Table 6.3-3 Queue Arrangement in Vientiane Urban

Zone	Service Area	Queue	Member
Zone 1	Sisattanak-Hatsaifong	22 queues	791 members
Zone 2	Saysettha	13 queues	240 members
Zone 3	Chanthabouly	28 queues	343 members
Zone 4	Sikhottabong	16 queues	326 members
Zone 5	Saythany	7 queues	187 members
	Total	86 queues	1887 members

6.3.3 Vientiane Sonteo Association

The Sonteo operates for the urban-suburbs or rural transport. The operator should be a member of the Sonteo Association. The Sonteo are registered by the operation route and designated station. There are Vientiane and district Sonteo associations; they all cooperate with an agreement which allows member's Sonteo to operate at the other association's station to load passengers to back home station, when they transport passengers outside their designated areas. Main routes are; the Paksan route: 28 cars/day, the Ban Keuan (Thoulakhom District in Vientiane Province) route: 150 cars/day. In addition, Sikhay Market station which is located at NR 13 North has the Thalad (Keooudom District in Vientiane Province) route: 150-180 cars/day (with 7- minute head); the Vangvieng route: every 20 minutes per car approximately 50 cars/day; and the Kasi route: every 20 minutes approximately 50 cars/day.

There are 262 registered Sonteo in Vientiane in 2007. Main function of the association is to accumulate all independent Sonteo to come to be group for running the business. For enter a member of the association, an operator has to submit his application form with fully important documents as ID card, registered home No., Car ID, Technical Inspection ID, Insurance ID, and Driving License ID. Then they will be followed by the member processing. Each member has to pay for status member association fee for 120,000 Kip per year. Regulation of the association have to set up under the Transport Law and regulations related to. A mini- truck is also categorized in Sonteo and increases the number of registration.

There is no standardized fare applied to each Sonteo operation; they calculate the fare to refer to state public bus fare for baseline. It is very difficult to MCTPC to set up the standard fare for transportation because of controlling the fuel price by other Ministry of Industry and Trade. Moreover, the increased fuel price also is the problems to fix the fare.

Member's revenue is small and the operation is reportedly not profitable. Most of operators consider that this is not permanent occupation and this is a part time business arranged after they finished their farming, trading etc., estimated revenue of the member's operation is set up by the Tax Office. A sample case shows that a member plans its income of about 44,700,000 kip per year with Tax Office, he have to make tax payment up to 2,700,000 Kip per year (230,000 kip per month). Having the tax payment, his income is nearly the same as his expenditure of operation.



Figure 6.3-2 Sonteo Sikhay Station

The Sonteo has designated route at the registered stations: there are four routes in different location in Vientiane: (i) Sikhay Station to connect to Northern part of Vientiane Rural, (ii) Dongdok Station to connect to the southern part, (iii) That Luang Station to connect to some villages around suburban, (iv) Morning Market Station to the destination of Vientiane Rural in demand-base. Appendix 6-4 shows Sonteo operation routes in Vientiane Rural.

6.3.4 Taxi Association

The Taxi association is a small association. The taxi has been registered at the Division of Transport of DCTPC through its Association; 114 cars in 2006, in 2007 only 98 cars have been registered (some of the old car can not be allowed to use for taxi). Member fee is 15,000 Kip/month and Tax is 83,000 Kip/month. Major stations are the Morning Market, the Wattay International Airport, and Lao-Thai Friendship Bridge. Taxi fare varies by the distance. For example the Morning Market to Lao-Thai Friendship Bridge the fare is 60,000 to 90,000 Kip. Some big hotels also provide taxi service (similar to limousine or shuttle taxi).

In addition, 126 “Vans” (9 -12 seats) have been registered for “transport business service by hired contract base”. There is the Association at the Friendship Bridge. Most of Vans operate at Friendship Bridge Station. Only 20 vans have been operated for service at the Wattay International Airport, while there is no Van in Morning Market.

6.4 BUS ROUTE AND OPERATION SURVEY

6.4.1 Survey Routes and Method

On 27 and 28 June 2007⁶, an on-board survey of the VSBC bus route and operation was conducted in cooperation with the Planning Transport Section Office at CBS in order to collect the basic data including departure and arrival time, bus stopping and its locations with GPS, passenger numbers and their categories (Male, Female, Student :Male and Female, Child). Three survey routes were selected because these routes have the busiest service frequency and are proposed to candidate corridors for Bus Rapid Transit System (BRT). The selected routes and sample buses are as summarized in Table 6.4-1.

Table 6.4-1 Survey Routes and Sample Buses

Survey Route (Fare)	Destination	Sample Bus (Time at CBS)	Survey Date and Time
No.29: Dongdok (2,000Kip)	The University of Lao	45 seats with Conductor (8:00am)	27 June 2007 Departure: 8:18 Arrival: 8:50
	CBS	-ditto-	Departure: 8:50 Arrival: 9:25
No.49:Nongthaeng (2,000Kip)	Via International Airport to Viengkham Village	28 seats (13:30pm)	27 June 2007 Departure:13:25 Arrival:14:20
	CBS	-ditto-	Departure: 14:20 Arrival: 15:00
No.14: Thadeua (4,000Kip)	Via Friendship Bridge to Xiengkhoan Village	25 seats (8:35am)	28 June 2007 Departure: 8:35 Arrival: 9:35
	CBS	-ditto-	Departure: 9:40 Arrival: 10:40

6.4.2 Survey Findings

(1) Bus Route No.29

The sample bus with 45 passenger-sheets is shown in Figure 6.4-1. The bus route No.29 connects between CBS and the National University of Lao (NUOL) as shown in Figure 6.4-2. The route runs along the National Road No. 13 South, the four-lane carriageway with good pavement conditions. But the bus stop facilities are poor; mostly no shelter or no bus lay-by except the bus stop near SBS which has a shelter and waiting chair as shown in Figure 6.4-3.



Figure 6.4-1 RN49: Sample Bus at CBS

⁶ The survey was conducted by Public Transport expert, Mr. T. Toda and his assistant, Mr. Chanthara Vorrasing.



Figure 6.4-2 University Campus



Figure 6.4-3 RN49: Bus Stop at SBS

The bus passengers and their categories are summarized in Table 6.4-2. For commuting the University of Lao, the university students were majority of the passengers, although the school was in summer holiday on the survey period⁷. The bus also was used for the local merchants, mostly women carrying the goods from the Morning Market. (See Figure 6.4-4 to 6).



Figure 6.4-4 Use for Goods

Table 6.4-2 Passenger and Category on RN 29: Dongdok

Passenger (Bus Stop 17*)	Male	Female	Student (M)	Student (F)	Children	Total
1.From CBS (16**)	4	5	5	10	-	24
2. To CBS (27**)	11	13	6	8	-	38
Total	15	18	11	18	-	62
Share	24.2%	29.0%	17.7%	29.0%	0.0%	100%

Note: * The number is the designated bus stop ** On-demand stopping



Figure 6.4-5 RN 29 Passengers at CBS



Figure 6.4-6 RN29 Vacancy from NUOL

⁷ If the survey results are to be adjusted by the seasonal factors, the number of the students and their share should be increased.

Loading and Unloading Pattern

Figure 6.4-7 and -8 show loading and unloading patterns on the route. There were 16 bus stops from CBS and 27 bus stops to CBS, both including on-demand and a few fixed bus stops. The passenger occupancy is approximately 50 % and more of vacancy along the most of the bus route in this survey period.

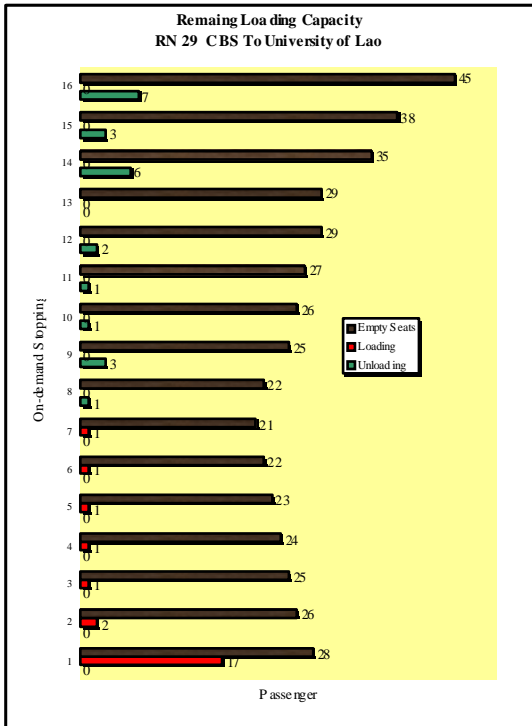


Figure 6.4-7 RN 29 Passenger & Vacancy from CBS

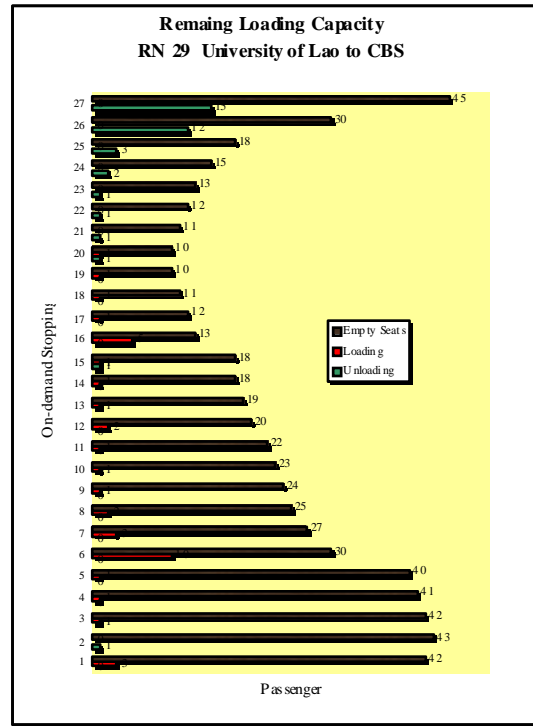


Figure 6.4-8 RN 29 Passengers Vacancy to CBS

(2) Bus Route No.49

The sample bus had 28 sheets as shown in Figure 6.4-9. The bus route connects between CBS and the Viengkam Village through the International Airport on the National Road (NR) No.13 North, which is a four-lane road. At the Nongthaeng junction, the route turned west to the Viengkam Village on the local road having narrow roads with a two-lane DBST pavement in poor conditions and further earth road in the Village that was newly built for the habitants relocated by the Morning Market renovation. All routes had no bus stop facilities or bus lay-by. The passengers used kiosks near bus stop point. Figure 6.4-10 and 11 show the bus stop and the end bus stop at the Viengkam Village. Table 6.4-3 shows the number of passengers and their categories in the sample bus.



Figure 6.4-9 RN49: Sample Bus

Table 6.4-3 Passenger and Category on RN49: Nongthaeng

Passenger (Stop 15*)	Male	Female	Student (M)	Student (F)	Children	Total
1.From CBS (16**)	13	22	0	0	3	38
2. To CBS (23**)	8	15	0	0	2	25
Total	21	37	0	0	5	63
Share	33.3%	60.6%	0.0%	3.0%	3.0%	100%

Note: * The number is the designated bus stop ** On-demand stopping



Figure 6.4-10 RN49: On-demand stop



Figure 6.4-11 RN49 End Bus Stop

Loading and Unloading Pattern

Figure 6.4-12 and 13 show loading and unloading pattern with on-demand stopping. There were 27 bus stops from CBS and 6 bus stops to CBS both mostly on-demand bus stops. No bus stopping at the International Airport. From CBS the sample bus was mostly full until Nongnea Market. But no passenger numbers increased until the final destination. To CBS, almost the vacancy situation continued to the final destination.

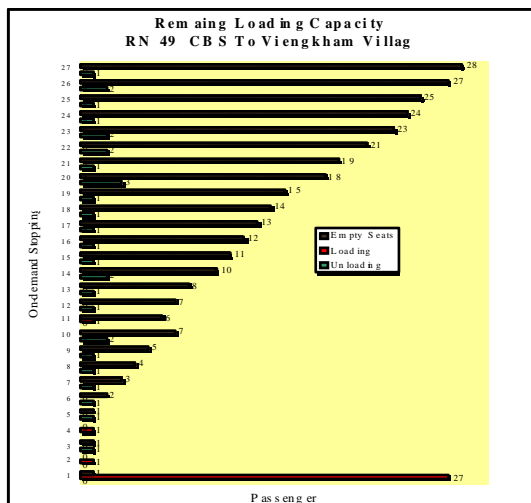


Figure 6.4-12 RN49 Passenger & Vacancy from CBS

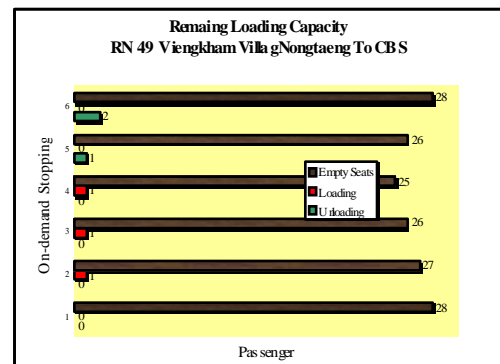


Figure 6.4-13 RN 29 Passenger & Vacancy to CBS

(3) Bus Route No.14

Figure 6.4-14 shows the sample bus with 25 seats. The bus route No.14 runs from CBS through the Friendship Bridge International Bus Terminal to the Xiengkhouan Village on Road No.1. The route is a four-lane road until the Friendship Bridge. But after the Friendship Bridges, the road becomes narrow to a two-lane road with bad DBST pavement conditions. The road improvement is required. Only the bus stop facilities with bus stop lay-by are provided along the sections of Road



Figure 6.4-14 RN 14: Sample Bus

No.1, improved by Japan's Grant Aid. There are no bus stop facilities on the other sections. The passengers must use kiosks for waiting bus arrival. The passenger used the rural bike taxi to connect the urban bus. Figure 6.4-15 and -16 show passengers at CBS and at the Friendship Bridge, respectively. Table 6.4-4 shows the number of passengers and their categories in the sample bus on Route No.49.

Table 6.4-4 Passenger and Category on RN 14: Thadeua

Passenger (Stop 21*)	Male	Female	Student (M)	Student (F)	Children	Total
1.From CBS (27**)	9	19	0	1	1	30
2. To CBS (5**)	2	1	0	0	0	3
Total	11	20	0	1	1	33
Share	33.3%	58.7%	0.0%	0.0%	7.9%	100.0%

Note: * The number is the designated bus stop ** On-demand stopping



Figure 6.4-15 RN14: Crowded passengers at CBS



Figure 6.4-16 RN 14: Passengers at the Friendship Bridge Bus Terminal

Loading and Unloading Pattern

Figure 6.4-17 and 18 show loading and unloading pattern with on-demand stopping. There were 16 bus stops from CBS and 23 to CBS. From the CBS, the bus was overloaded with 37 passengers against 28 seats and it continued until the Friendship Bridge international terminal.

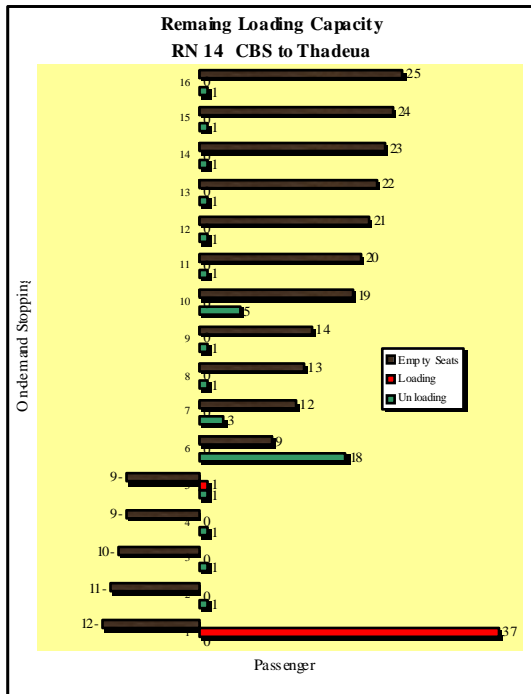


Figure 6.4-17 RN 14 Passenger & Vacancy from CBS

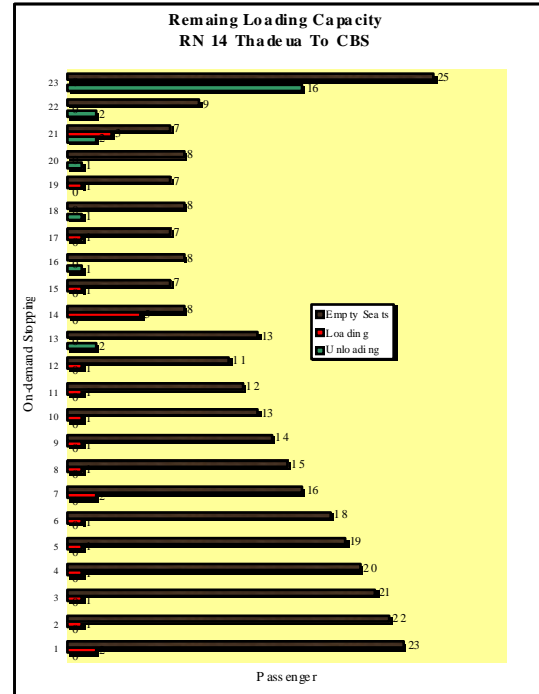


Figure 6.4-18 RN14 Passenger & Vacancy to CBS

6.4.3 Survey Summary

The survey results are summarized as follows:

- The bus route No.29 serves mostly for commuting the university student. The road conditions are sufficient for introducing physical improvement of bus operation. The seasonal and peak hour surveys must be carried out for the further planning.
- The bus route is rural service routes for suburbs. The route also passes the International Airport, but few passengers use the bus services. At present, the passengers for the airport use taxis or shuttle buses. The road conditions and width are sufficient for introducing physical improvement of bus operation on National Road No.1 North.
- The bus route No.49 serves for commuting with international passengers at the Thai border and for industrial areas and suburbs. The road conditions to the Friendship Bridge are sufficient to introducing physical improvement of bus operation.

6.5 PROBLEMS AND CHARACTERISTICS OF URBAN PUBLIC TRANSPORT IN VIENTIANE

6.5.1 Urban Public Transport in Vientiane

(1) Current Public Transport Services

As described in the above sections, the current public transport service in Vientiane Urban is provided by the limited operators; Vientiane State Bus Company (VSBC) and the associations of paratransit, Tuk-tuk, Taxi and Sonteo. Among them the Sonteo are used for the rural transport and excluded from urban public transport services. Maximum daily supply capacity of public transport and its shares are calculated in Table 6.5-1 and Figure 6.5-1, respectively.

Table 6.5-1 Daily Supply Capacity of Public Transport by Modes

Mode	Vehicle No.	Daily Frequency	Passenger per vehicle	Supply Capacity	Trip Type
VSBC	51	296	28-45	36,210	Long to Medium trip
Tuk-tuk	1887	25	8	377,400	Short (On-demand)
Taxi/Van	262	8	12	6,288	Medium (On-demand)
Sonteo	132	2	5	5,280	Long (On-demand)

Note: Frequency estimated by the Study based on the interviews and surveys.

The bus mass transit by VSBC has daily capacity of 36,210 passengers at present. Its share is only 9%. Meanwhile, paratransit of Tuk-tuk for feeder public transport has daily capacity of 377,400 passengers (89%), of which service trip is short, estimated around 5km and 10-minute drive. Taxis and Vans are used only for specific passenger use and Sonteo have small share, only 1%.

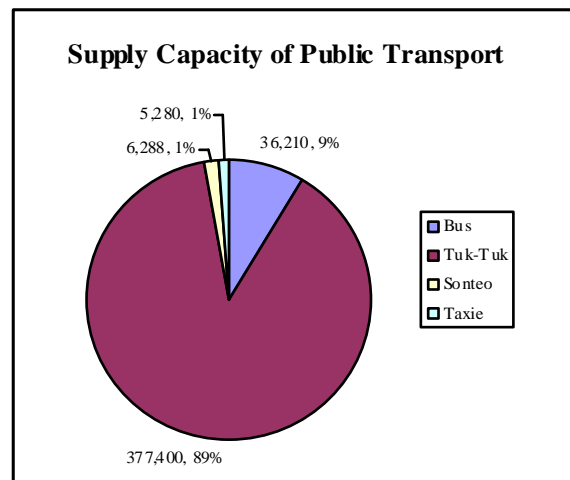


Figure 6.5-1 Vehicle Share of Public Transport

The current supply capacity of public transport in Vientiane is not enough for future demand which will be studied in Chapter 15.

6.5.2 Bus Operation

(1) Bus Operation and Service Problems

As shown in Figure 6.5-2, the number of passengers has decreased with increasing the number of motorcycles and bus fare.

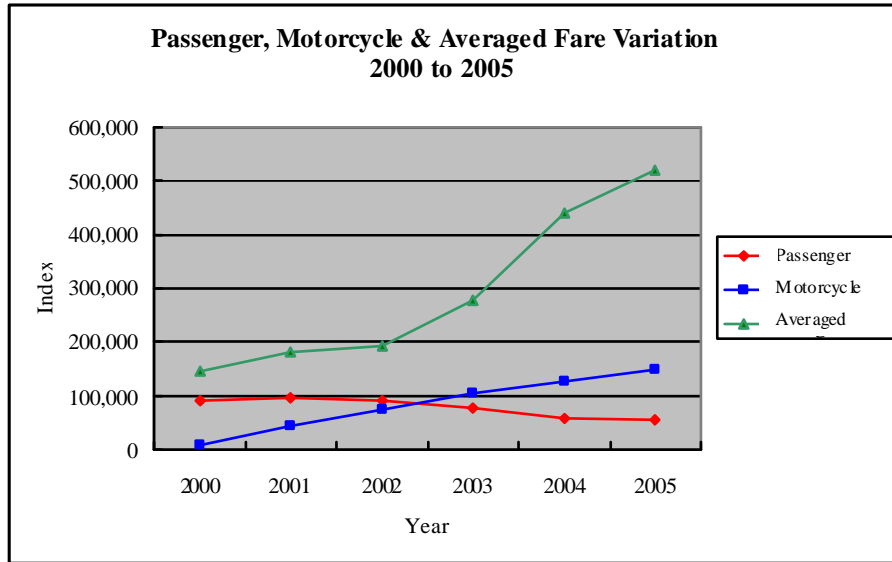


Figure 6.5-2 VSBC Passenger, Motorcycle, Averaged Fare

The problems of the present bus services are analyzed by a problem tree in Figure 6.5-3.

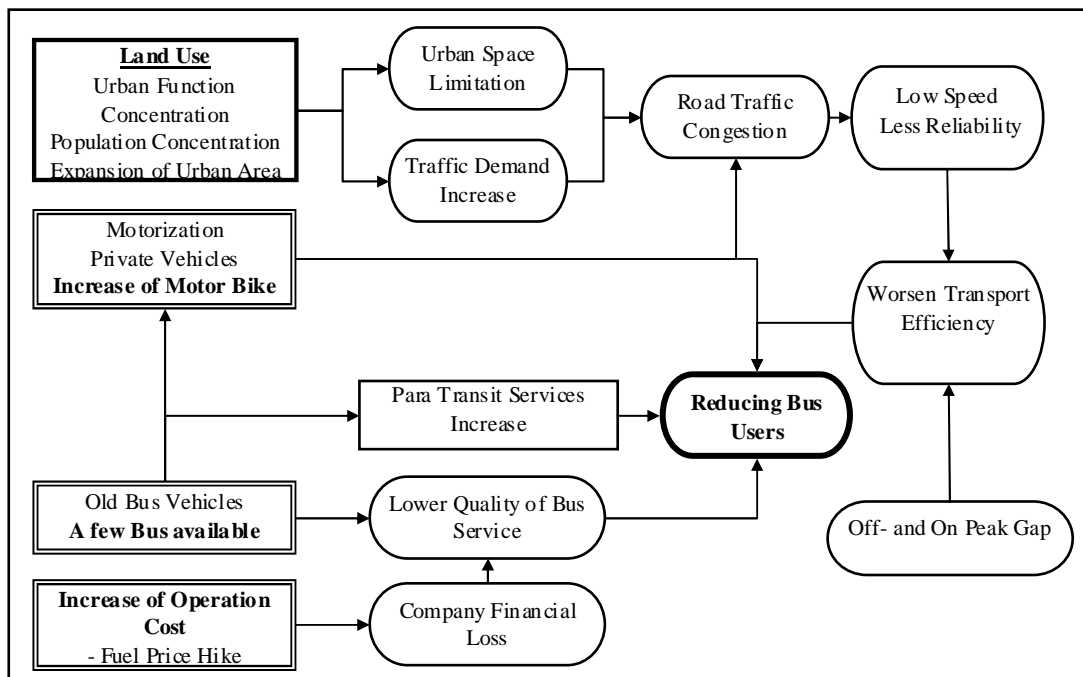


Figure 6.5-3 Problems Tree of Bus Transport

A main problem is to reduce the bus users and its main direct causes are motorcycle increase, small bus number available and operation cost increase due to fuel price hike. In addition, expansion of urban area and bus service area and concentration of urban functions in CBD (Central Business District) due to increase of its population are also main causes which result in physical space limitation and traffic demand increase, then road traffic congestion. They may affect badly low speed and reliability of bus operation and then worsening transport efficiency. An off-peak and on-peak-gap also is a big impact. Bus operation will fall at lower level of service and bus users will be unwilling to use the bus.

(2) Bus Fare and Income

VSBC undertakes the bus operation with a lump sum agreement with the drivers instead of ticketing as other countries. The driver shall return a constant sum of fare collection to the company by its agreement. This system has advantage of increasing the loading the passengers as initiative which means that the bus driver can obtain additional wages based on the numbers of passengers added to the contracted numbers of passengers. Meanwhile this may affect to their revenues collection that means all revenues do not come directly in full amount to the company. The coaches load the number of the passengers more than the standards; it has reportedly increased up to 10% of the passenger in case of a 25-seat coach.

The departure and arrival time is not so accurate to the schedule. There is only departure time schedule at CBS but no timetable at each bus stop on the routes. In addition no timetable is provided at the final bus station. The drive operates by combination of fixed and on-demand stopping that pick up and set down the passenger by the passenger's demand.

VSBC is not entitled to decide the bus fare, and requests the change of bus fare to DTD of MCTPC and the Prime Minister Office that will review and approve it. Sometimes the fare is kept lower than the cost of operation by considering the social costs and benefits.

VSBC reported that the inner city bus services has no profit, meanwhile the outer, provincial and international route services gain the profits, by which the company compensated the loss in urban transport service.

6.5.3 Paratransit Operation

(1) The Tuk-tuk and Jambo Association

Only Tuk-tuk and Jambo provide urban paratransit services. Their operators are organized in the Tuk-tuk and Jambo Association. The association has usually a meeting to solve the problems occurring in the daily operation including queue arrangement (station arrangement). The association assumes its functions for enforcement of proper laws and regulations, coordination with DCTPC, VUDAA, traffic police and all district OCTPCs (Office of Communication, Transport, Post and Construction), and monitoring their responsible zones by

active heads of the zone.

(2) Paratransit Operation Problem

The present problems and solution identified by the association are summarized below.

- Resent traffic volume increase in city center needs more parking spaces for private car users that limit the parking space for Tuk-tuk and Jumbo.
- Some members neglect the association regulations, for example, unorganized parking, overcharged, and fighting for passengers.
- Private vehicles (yellow plate) illegally provide transport services and cause conflict with the passengers and the association members.
- Some vehicles are very poor conditions and have no inspection certificates issued by the center of the association.
- Some members fail to pay tax and do not obtain association permission.
- Without Tuk-tuk & Jambo queue in place, passengers hunting, unorganized parking, and causing the heavy traffic jam will occur.
- In addition, passengers will have difficulties in catching Tuk-tuk, because they can not find which one to choose in terms of the fare, route, and reliability.

(3) Solution by the Association

In order to solve the operational problems, the association prepared an annual management plan in 2007/08 and submitted it to DCTPC. The objectives are summarized below. ⁸

- To continue to carry out training and awareness to all members to properly providing service,
- To encourage members to take driving license, vehicle inspection, proper dressing, name tag, fare board etc.,
- To indicate a name tag, a fare table, an origin-destination clearly on each vehicle,
- To force yellow plate vehicles to participate the association in order to become legal passenger service vehicle,
- To continue to carry out regular checking and inspection at each queue by monitoring staff, and
- To propose DCTPC to coordinate with relevant organization to deal with all yellow vehicles.

⁸ VTE DCTPC, River-Land Transport Office, Tuk-tuk & Jambo Association, Report on the Tuk-tuk & Jambo Service 2006-2007, 14 May 2007 by President of Association