PART V

PRE-FEASIBILITY STUDY

CHAPTER 24

SELECTION OF PROJECTS FOR

PRE-FEASIBILITY STUDY

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24.1 INTRODUCTION

Various projects for achieving smooth, safe and comfortable urban transport are proposed in this Master Plan. These projects are categorized into Short-, Medium- and Long-Term Projects based on such factors as urgency, easiness/difficultness of implementation and magnitude of negative impact.

These proposed projects needs further study before they are actually implemented. However, this Study does not discuss details of implementation of each project because of the nature of the study as a 'master plan' study. Therefore, it is desirable that some examples of outline of project be presented illustrating the process of planning of implementing the proposed projects, including the following:

(i) Preliminary design and preliminary cost estimate (Engineering feasibility)
(ii) Economic and financial analysis (Economic/financial feasibility)

For the above reason, a pre-feasibility study was conducted for a representative project.

24.2 SELECTION OF PROJECTS FOR PRE-FEASIBILITY STUDY

The projects for pre-feasibility study are selected from the Short-Term Projects considering the following factors:

(i) The project which are suitable to serve as 'pilot case' or 'example'
(ii) The project for which large and stable demand is expected

After close consultation between the Steering Committee/Counterpart Team and the Study Team, considering the above-described factors, the following project was selected as the project for pre-feasibility study.

(i) Operation of shuttle bus services between the Central Bus Station and Dongdok (National University of Laos)

Figure 24.2-1 shows the locations of the project.

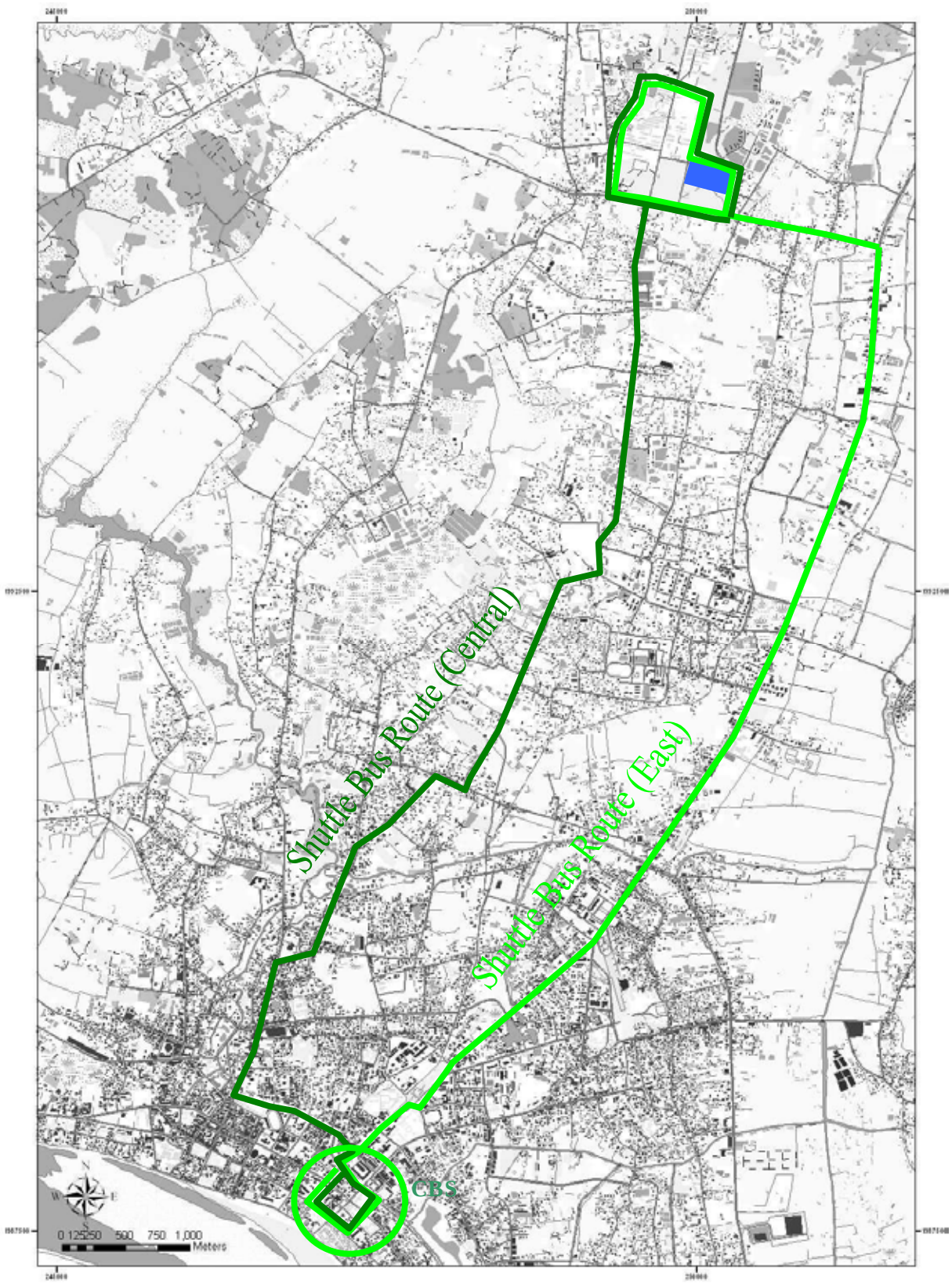


Figure 24.2-1 Location Map of Shuttle Bus Route for Pr-Feasibility Study

CHAPTER 25

SHUTTLE BUS SERVICE BETWEEN

CENTRAL BUS STATION AND DONGDOK

CHAPTER 25 SHUTTLE BUS SERVICE BETWEEN CENTRAL BUS STATION AND DONGDOK

25.1 INTOUDUCTION

25.1.1 Background

The students of National University of Laos (NUOL) are the biggest users of bus services. The Dongdok campus of NUOL has approximately 21,000 students registered as in July 2008. The two thirds are commuting students using either bus or motorcycles. There are two bus operators who use three bus routes to the University from Central Bus Station; Vientiane State Bus Company runs on Bus Rout No. 29 (CBS – Kaysonephovihane – Dongdok – NUOL) , Bus Route 31 (CBS – Phontong – Dongdo - NUOL) and a private bus company , Toglipasi Bus Company, runs on a new bus route of Don Palep Road.

However, the quality of bus services becomes worse due to decay of bus vehicles, sudden cancellation of scheduled buses, and damaged roads; the low level of bus service limits potential students' bus users. Hence, the students are forced to use motorcycles. This causes traffic congestion and flow distortion at the entrance gate and intersections with thorough traffic on Dongdok Road. Unsafe intersection configuration and drivers' violation of the traffic signal also are the biggest factors for serious traffic accidents. More than ten causalities are reported every year. This concerns relevant authorities including Ministry of Public Works and Transport (MPWT) and University Administration.

To solve these problems the Department of Transport of MPWT and Administration of the University requested JICA Study Team to assist them in preparing a plan of shuttle bus service in January 2008. The Study Team carried out two studies; "a student interview survey" and "bus user survey at CBS" from 18 to 22 February 2008, and a pre-Feasibility Study in May 2008. Following the survey results, the Project is planned for additional demands of the students who will intend modal shifts from motorcycle to bus. This chapter will include the following contents and a location map is shown in Figure 25.1-1.

- Bus Operation and User Survey
- Shuttle Bus Operation Plan
- Proposed Shuttle Bus Routes and Improvement
- Proposed Terminal Facility
- Project Component
- Fare and Fare Policy
- Financial and Economic Analysis
- Pre-EIA
- Recommendation

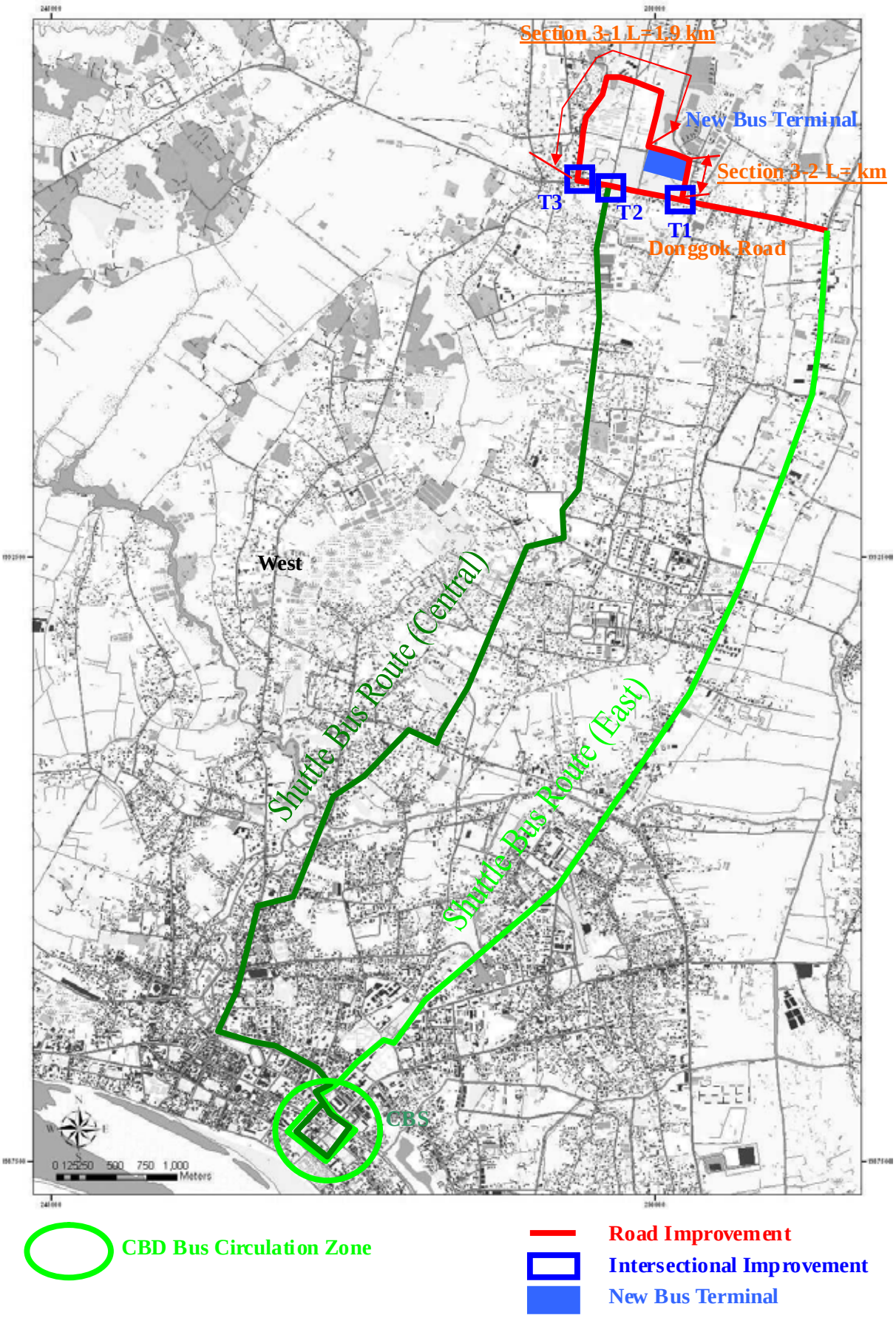


Figure 25.1-1 Location Map: Shuttle Bus between CBS and Dongdok

25.1.2 Objectives

The Project is planned as a pilot project to promote bus public transport to materialize the policy and strategies adopted in the Master Plan as well as those the National EST policy and strategy prepared by MPWT and UNCRD[1]. In this context, the Project will contribute to the "Sector-based Approach" for reduction of CO_2 emission. The Project objectives will contain as follows.

- Promotion of bottom-up approach on sectoral basis of "Cool Earth Promotion" by EST.
- A pilot project to achieve both emissions reductions and economic growth, and to contribute climate stability in Vientiane urban area.
- Provision of shuttle bus services for shifting traffic mode from motorcycle to bus public transport
- Bus route improvement including critical section of roads and intersection
- New bus terminal in the university zone.
- Reliable operation system and acceptable fare for bus promotion
- Traffic accident reduction & safety enforcement
- Preservation of environment in the university zone from increasing through traffic measures

25.2 BUS OPERATION SURVEY AND USER SURVEY

25.2.1 Preliminary Survey and Pre-Feasibility Survey

(1) Preliminary Survey

The Preliminary Survey was carried out by the University staff and students in February 2008 to obtain basic date for the pre-Feasibility Study. The Preliminary Survey contained two surveys; a student interview survey and a preliminary bus user survey at CBS. Sample numbers of interviewees were 1,079 students, which represented 6.7% of total students in Dongdok Campus of NUOL.[2]

(2) Pre- Feasibility Survey

The Pre-Feasibility survey was carried out to clarify the present situation of bus service between CBS and the University in May and June 2008. The following surveys were conducted. The survey results are summarized below. The details are attached to Appendix 25-1~25-3.

[1] DOT(MPWT)/PWTI, "the National Strategy and Action Plan on Environmentally Sustainable Transport, Lao PDR (draft)", June 2008

[2] The answers are more than the sample number because some students take two or three classes.

- Passenger on board survey of all buses of the university for three days
- Road inventory on the Dongdok to University Roads and West Bus Route
- Traffic count on 4 intersections of bus routes and topographic survey at three sections on Dongdok Road
- Interview data analysis for 1,074 answer sheets

25.2.2 Results of survey on Commuting Students and Demand Analysis

(1) Class Shift

Table 25.2-1 shows the shift of class.

Table 25.2-1 University Class Shift and Study Hours

Class Shift	Class Time	Students
1. Morning Class	8：00～12：00	Full- time Students
2. Evening Class	13：00~16：00	Additional class of full time students and public officers
3.Night Class	17：30~20：30	Mainly permanent employees

Source: NUOL

(2) Origin of Student's Trip

Total numbers of all students are obtained from Register Office of NUOL. Using results of sample survey, the student population and origin of trip by class are estimated as shown in Table 25.2-2, and shown in Figure 25.2-1 and Figure 25.2-2, respectively.

Table 25.2-2 Present Student Origin Place (unit: person)

Original Place	Morning Class	Evening Class	Night Class	Total
Home (Commuter)	3,145	3,376	5,028	11,549
Dormitory (University)	2,576	2,359	1,044	5,979
Dormitory (Private)	817	1,327	830	2,974
Other	272	262	189	723
All Student	6,810	7,324	7,091	21,225

Source: Total number of all students from Register Office of UOL as in July 2008.

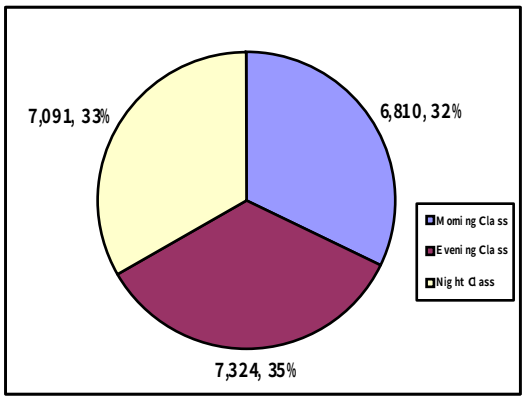


Figure 25.2-1 Student Population by Class

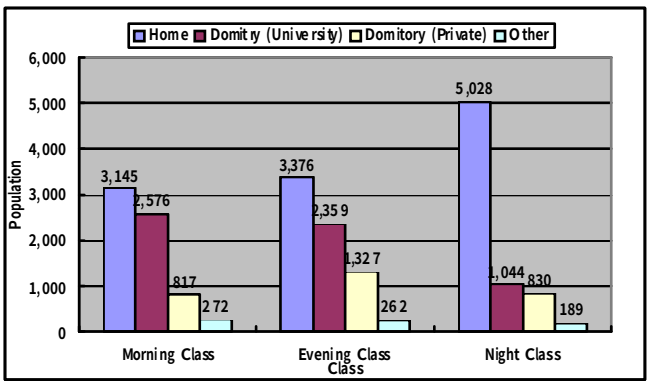


Figure 25.2-2 Student Origin by Class

(3) Present Traffic Mode

The number of students' trip communication by traffic mode and its share are as presented in Table 25.2-3 and Table 25.2-4, respectively.

Table 25.2-3 Present Student Traffic Modes (Unit: Person)

	Morning Class	Evening Class	Night Class	Total
Walk	2,687	1,631	838	5,156
Bicycle	112	215	72	399
Bus	1,112	831	599	2,542
Paratransit	75	31	0	106
Motorcycle	2,561	4,512	5342	12,415
Car	238	31	216	485
Others	25	73	24	122
All Student	6,810	7,324	7,091	21,225

Table 25.2-4 Present Student Traffic Mode Share

Mode	Morning Class	Evening Class	Night Class	Average
Walk	39.5%	22.3%	11.8%	24.3%
Bicycle	1.7%	2.9%	1.0%	1.9%
Bus	16.3%	11.3%	8.5%	12.0%
Paratransit	1.1%	0.4%	0.0%	0.5%
Motorcycle	37.6%	61.6%	75.3%	58.5%
Car	3.5%	0.4%	3.0%	2.3%
Others	0.4%	1.0%	0.3%	0.6%
Total	100%	100%	100%	100%

(4) Traffic Mode Share Plan

According to the Master Plan, the share of motorcycle for school is to be reduced by 40% by 2013. Based on this policy, the planned numbers of students are calculated. For example, by reducing the present motorcycle users in total: 12,415 by 40% =4,966 and shifting 4,966 to the planned bus users; hence 12,415-4,966=7,499 for planned motorcycle users and 2,542+4,966= 7,508 for planned bus users. The results are as shown in Table 25.2-5.

Table 25.2-5 Planned Numbers of Students by Traffic Mode (Unit: Person)

Mode	Morning Class	Evening Class	Night Class	Total
Walk	2,687	1,631	838	5,156
Bicycle	112	215	72	399
Bus	2,136	2,636	2,736	7,508
Paratransit	75	31	0	106
Motorcycle	1,537	2,707	3,205	7,449
Car	238	31	216	485
Others	25	73	24	122
All Student	6,810	7,324	7,091	21,225

The planned traffic mode share rate is shown in Table 25.2-6.

Table 25.2-6 Planned Traffic Mode Share by Class

Mode	Morning Class	Evening Class	Night Class	Average
Walk	39.5%	22.3%	11.8%	24.3%
Bicycle	1.7%	2.9%	1.0%	1.9%
Bus	31.4%	36.0%	38.6%	35.4%
Paratransit	1.1%	0.4%	0.0%	0.5%
Motorcycle	22.6%	37.0%	45.2%	35.1%
Car	3.5%	0.4%	3.0%	2.3%
Others	0.4%	1.0%	0.3%	0.6%
Total	100%	100%	100%	100%

The present bus users may use the present bus operation. Thus the target passengers for shuttle bus service are those who will shift the modes from motorcycle to bus. 4,966 students in total are estimated as shown in Table 25.2-7.

Table 25.2-7 Target Student by Traffic Mode

Mode Share	Morning Class	Evening Class	Night Class	Total
Bus Share	+15.0%	+24.6%	+30.1%	+23.4%
Bus (trip / student)	+1,024	+1,805	+2,137	+4,966
Motorcycle Share	-15.0%	-24.6%	-30.1%	-23.4%
Motorcycle (trip /student)	-1,024	-1,805	-2,137	-4,966

(5) Change of Commuting Mode

At present motorcycle is the major mode for the students of all classes to commute as shown in Figure25.2-3 Bus has small passengers in all classes. Table 25.2-8 shows that motorcycle shares increase from 37.6% in the evening to 75.3% in the night class; but bus shares decrease from 16.3% to 8.5%. The night class students are part-time students who attend the class after work. Bus service is terminated after class.

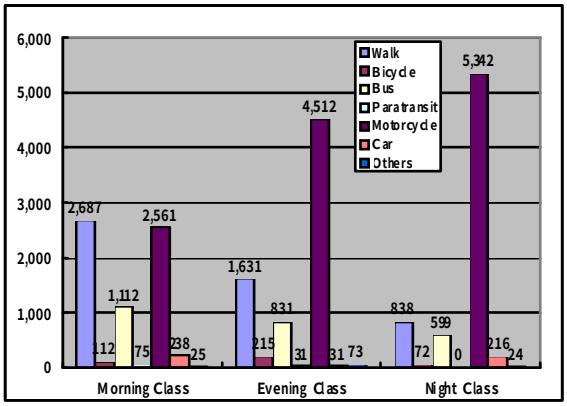


Figure 25.2-3 Traffic Modes for Commuting

Table 25.2-8 Present Mode Share between Bus & Motorcycle by Class

Mode	Morning Class	Evening Class	Night Class	Average
Bus	16.3%	11.3%	8.5%	12.0%
Motorcycle	37.6%	61.6%	75.3%	58.5%

Figure 25.2-4 shows traffic mode plan after introduction of shuttle bus. Mode shift is expected to occur and bus will be the major commute mode in the morning and evening class while motorcycle still the major share in the night class. Table 25.2-9 shows modal share affect implementation of the Project. Night Bus Service for major destinations will be provided after closure of the night class. The detailed is discussed later. Figure 25.2-5 and Figure 25.2-6 compare of mode share rate before and after the implementation of the Project.

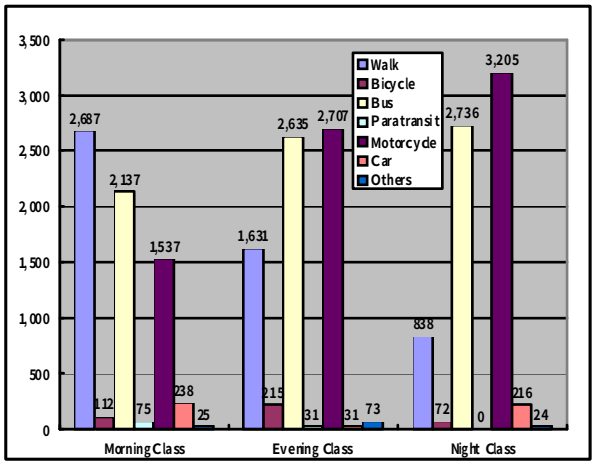


Figure 25.2-4 Traffic Mode Plan

Table 25.2-9 Planned Mode Share between Bus & Motorcycle by Class

Mode	Morning Class	Evening Class	Night Class	Average
Bus	31.4%	36.0%	38.6%	35.4%
Motorcycle	22.6%	37.0%	45.2%	35.1%

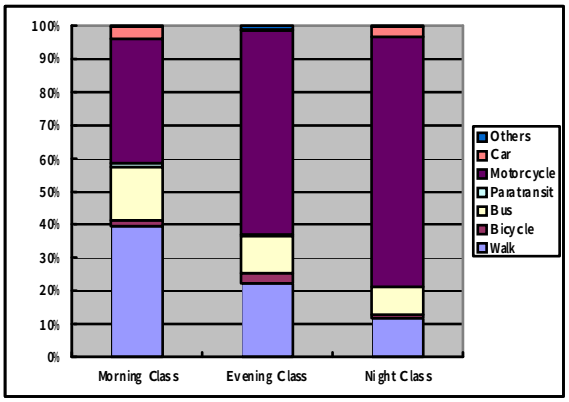


Figure 25.2-5 Present Traffic Mode Shares

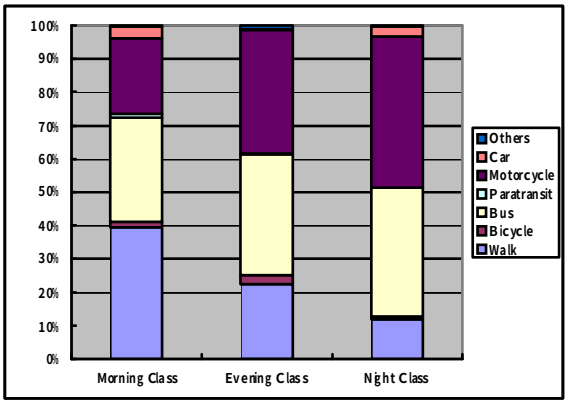


Figure 25.2-6 Planned Traffic Mode Shares

(6) Targeted Students and Required Bus Trips

New shuttle buses will transport approximately 5,000 students who transfer from motorcycle to bus. Target number of passengers of the student and required number of bus trips by a standard bus having 50 passenger-sheets are shown in Table 25.2-10.

Table 25.2-10 Additional Number of Shuttle Bus Trips

	Morning Class	Evening Class	Night Class	Total
Bus Passenger	1,024	1,805	2,137	4,966
Bus Trips	20	36	43	99

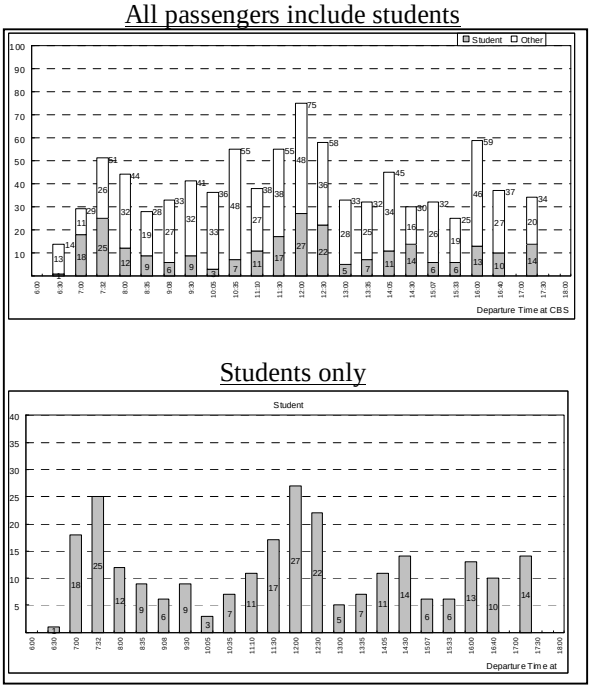
25.2.3 The Present Bus Operation

(1) Number of Passengers

Figure 25.2-7 and Figure 25.2-8 show the total number of the passengers and the number of students from CBS to NUOL.

The East Route bus carries more than 50 passengers at the peak time. The largest number of 75 was recorded in the bus which departed at 12:00; whereas the Central Route bus carries around 50 passengers at the peak time. East Route bus is medium type which has 45 seats and Central Route bus is mini type which has 25 seats. All buses run with passengers more than full capacity at the peak time. Maximum bus occupancy rates are 1.31 in East Route and 1.68 in Central Route.

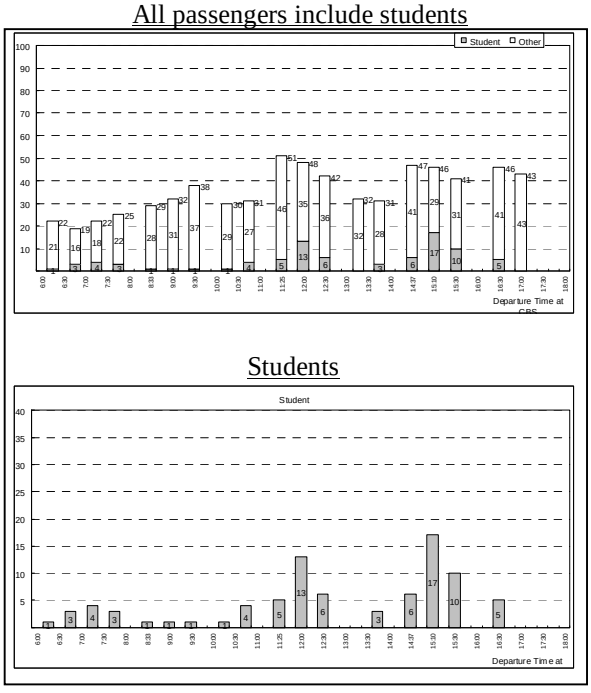
All passengers include students



Students only

Figure 25.2-7 Passengers from CBS to NUOL (East Route, 29/5/2008)

All passengers include students



Students

Figure 25.2-8 Passengers from CBS to NUOL (Central route, 3/6/2008)

(2) Commuting Peak Hour for the Student

Figure 25.2-7 and Figure 25.2-8 above show the numbers of student passengers during the peak hours. Peak hours are clear in the morning (6:30-7:30) and in the afternoon (11:30-12:30), but unclear in the evening (15:30-17:00). Figure 25.2-9 shows congested situation on board at the peak hour. Half of the passengers are student.

Figure 25.2-9 Congestion at the peak hour

(3) Bus Riding Quality at Peak Hour

Figure 25.2-9 shows bus riding quality at peak hour. Most of the passengers ride on at CBS and get off at NUOL. Because the bus is full loaded along the bus route, additional students could not get on at on-route bus stops during the peak hour. The Shuttle Bus is to be designed to pick up such potential commuting students.

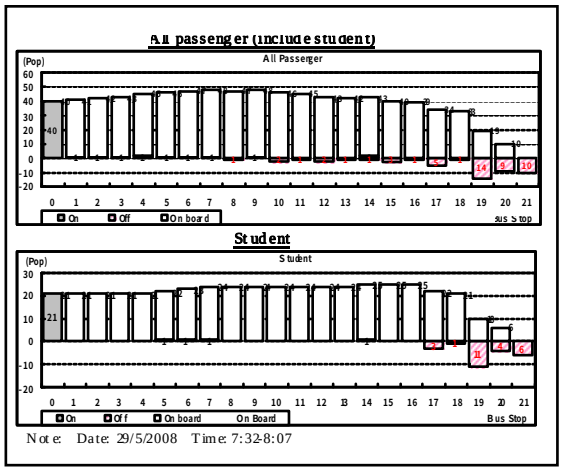


Figure 25.2-10 Passenger Maneuver at Peak Hour (East Route)

(4) Travel time

Average travel time for round trip of East Route is about 70 minutes for East Route and about 90 minutes for Central Route. Though round trip distance of East Route is 2km longer than that of Central Route, travel time is about 20 minutes shorter due to the road and traffic conditions. The roads of Central Route are to be improved soon and the travel time is expected to be shortened. Table 25.2-11 and Table 25.2-12 show average travel time from CBS and Round Trip for East Route and Central Route, respectively.

Table 25.2-11 Average Travel Time : CBS to NUOL and Round Trip (East Route)

Time	Average Travel Time (minute)	
	CBS - NUOL	Round Trip
6:30- 7:30	36	66
10:30-12:30	35	68
15:30-17:00	37	73
All day	37	69
Travel Distance (km)	12.1	24.2

Survey date: 27/5/2008-29/5/2008

Table 25.2-12 Average Travel Time: CBS to NUOL and Round Trips (Central Route)

Time	Average Travel Time (minute)	
	CBS - NUOL	Round Trip
6:30- 7:30	47	88
10:30-12:30	46	89
15:30-17:00	47	90
All day	46	89
Travel Distance (km)	11.2	22.4

Survey date: 3/6/2008-6/6/2008

(5) Congested Hour for Bus Travel

Figure 25.2-11 and Figure 25.2-12 show bus travel time for round trip from CBS. Travel speed of Eastern Route is in the range of 18-24km/h whereas that of Central Route is around 15km/h. Evening time (15:30-16:30) is the most congested hour of traffic on the route and for bus travel speed becomes lowest.

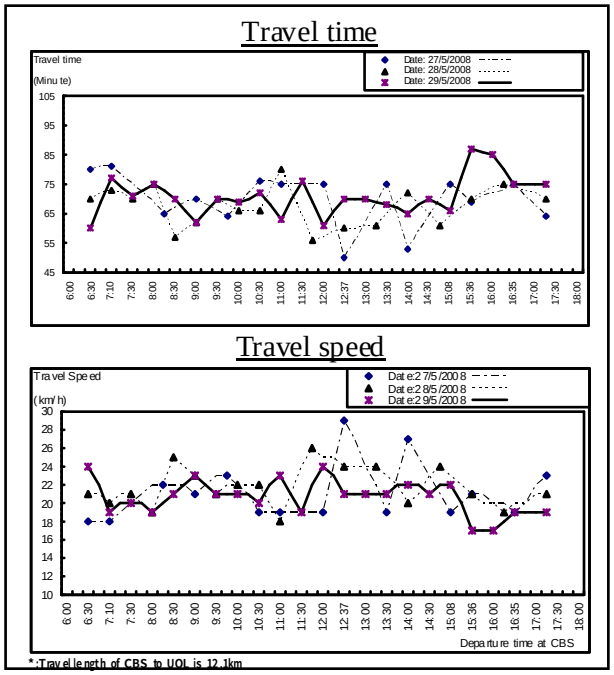


Figure 25.2-11 Bus travel time & speed for round trip (East Route)

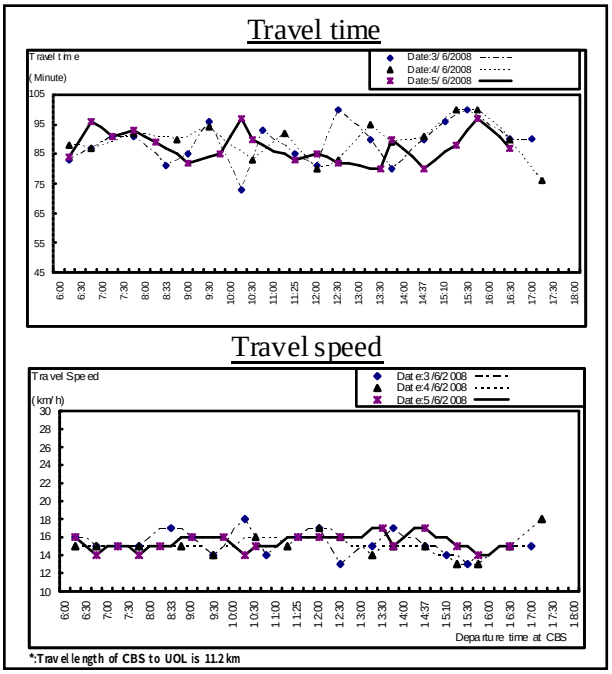


Figure 25.2-12 Bus travel time & speed for round trip (Central Route)

(6) Operation Frequency and Waiting Time

Table 25.2-13 and Table 25.2-14 show the present operation frequency and waiting time.

Table 25.2-13 Operation Frequency and Waiting Time: East Route

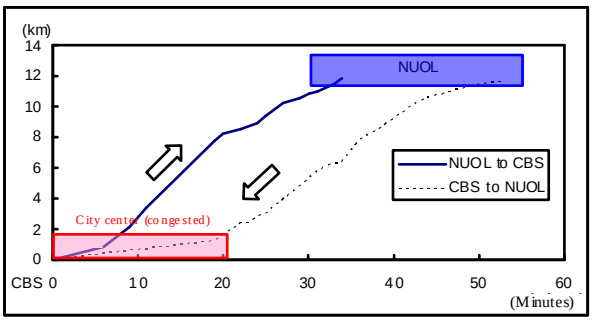
	Number of bus in hour (vehicle/hour)	Headway (minutes)	Number of trip a bus (trip/hour)
6:30- 7:30	2.7	33	0.90
10:30-12:30	2.2	36	0.73
15:30-17:00	1.6	38	0.53
All day	1.5	37	0.50

Table 25.2-14 Operation Frequency and Waiting Time: Central Route

	Number of bus in hour (vehicle/hour)	Headway (minutes)	Number of trip a bus (trip/hour)
6:30- 7:30	2.3	35	0.77
10:30-12:30	2.0	37	0.67
15:30-17:00	2.0	38	0.67
All day	1.5	38	0.50

(7) Bus Travel Speed

Figure 25.2-13 shows the relation between the time after departure and distance from CBS. In this figure, a slope of the line indicates the travel speed. Around 2km from CBS, bus travel speed decreases. Short stopping time is given for loading and unloading. Even at the NUOL, the bus returns as soon as possible. As NUOL is the terminal, it should have timetable and adjust the headway to the behind. Otherwise passengers do not know how long they need to wait for the next bus.

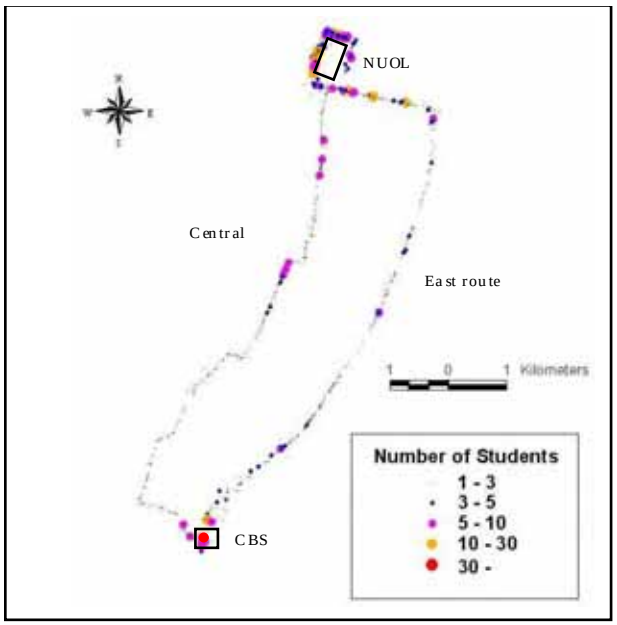


Survey date 29/5/2008 CBS to NUOL) 15:33-16:07. NUOL to CBS) 16:10-17:00

Figure 25.2-13 Bus Travel Speed

(8) Bus Stop

Figure 25.2-14 shows number of students getting on and getting off at each bus stop. Although there are fixed bus stops (500m to 1km), most of them stop the bus in an ad-hoc locations and get on/off. The major loading and unloading locations are CBS and the University zone. Scattered points on the route show that the passengers get on/off all over the route and each stop has a few loading/unloading of passengers. Along the way, there are some points where students are concentrated.



East Route survey: 27-29/5/2008. Central route survey: 3-5/6/2008

Figure 25.2-14 Student on-off points on Bus Route

25.3 SHUTTLE BUS OPERATION PLAN

25.3.1 Bus Operation

(1) Present Bus Operation

The present bus operation is shown in Table 25.3-1. For comparison, it is seen that the plan provide very much improved service.

Table 25.3-1 Present Bus Operation

Item	Morning Class	Evening Class	Night Class	All day
Class Hour	8:00~12:00	13:00~16:00	17:30~20:30	-
Peak Hour at CBS	6:30~7:30	10:30~12:30	15:30~17:00	-
1. East Route	L=12.1km RL=24.2km			
Travel Time (CBS to UOL) (minutes)	36	39	41	37
Round Trip (minutes)	73	68	77	69
Averaged Speed (km/hr)	19.8	21.4	18.9	21.0
Headway (minutes)	33	36	38	37
Operation Service Time	6:30~17:20			
2. Central Route	L=11.2km RL=22.4km			
Travel Time (CBS to UOL) (minute)	47	46	50	46
Round Trip (minute)	91	86	94	89
Averaged Speed (km/hr)	14.8	15.6	14.3	15.1
Head Time	35	37	38	38
Operation Service Time	6:15~17:25			

(2) Bus Operation Plan

Bus operation plan is summarized in Table 25.3-2. The roads of Central Route are to be improved by 2009 and bus travel speed is expected to be increased.

Table 25.3-2 Bus Operation Plan

	Morning Class	Evening Class	Night Class
Class Hour	8:00~12:00	13:00~16:00	17:30~20:30
Peak Hour at CBS	6:30~7:30	11:30~12:30	15:30~17:00
Peak Period	1 hr = 60mts	1.0hrs=60mits	1.5 hr = 90mts
Bus Passenger	1,024	1,805	2,137
Total Bus Trips Number	20	36	43
Applied Speed* (km/hr)	17.0	18.2	16.4
Required Travel Time(hr)	1.37	1.28	1.42
Required Numbers (unit)	20	36	40
Head Time for one route (minute)	3	1.6	2.1
Max Head Time for two route (minute)	6	3.2	4.2

Note: Applied speed is averaged speeds both for east and central routes.

(3) Required Number of Bus

Table 25.3-3 shows the relation between the number of bus and occupancy rate. Number of bus may vary by class, from 26 to 43 units. Considering the cost of procurement of bus unit and operation 40 is adopted in this plan.

Table 25.3-3 Required Number of Bus and Occupancy rate

Investment	Unit	Occupancy Rate		
		Morning Class	Evening Class	Night Class
Minimum	20	1.00	1.80	2.15
Medium	36	0.56	1.00	1.19
Maximum	43	0.46	0.90	1.00
Optimum	**40**	**0.50**	**0.90**	**1.08**

Note: The spare number of bus units is not considered in the planning stage.

25.3.2 Improvement of Level of Service

(1) The Present Reliability

Table 25.3-4 and 5 show the result of the survey on reliability of the present bus service. The reliability, which is expressed in terms of percentage of on-time operation, is very low as on-time percentages are 22.9%-37.5%, though Highway Capacity Manual 2000(HCM 2000) recommends level of service from 80%. The present LOS is very low for attracting the bus use.

Table 25.3-4 Reliability of Bus Service on East Route

Date	Designed Schedule		Survey Result			Cancellation	On-Time Percentage
	Hours	Numbers of Service	Hours	Numbers of Service	On-Time Departure from CBS (delay 5min and less)		
27/5/2008	6:00-18:00	48	6:30-17:20	15	11	33	22.9%
28/5/2008	6:00-18:00	48	6:30-17:15	18	15	30	31.3%
29/5/2008	6:00-18:00	48	6:30-17:15	22	18	26	37.5%

Table 25.3-5 Reliability of Bus Service on Central route

Date	Designed Schedule		Survey Result			Cancellation	On-Time Percentage
	Hours	Numbers of Service	Hours	Numbers of service	On-Time departure from CBS (5min and less delay)		
3/6/2008	6:00-18:00	48	6:15-17:00	19	17	29	35.4%
4/6/2008	6:00-18:00	48	6:15-17:25	16	13	32	27.1%
5/6/2008	6:00-18:00	48	6:15-17:00	18	13	30	27.1%

(2) Improvement of Level of Service

Table 25.3-6 compares the "LOS" before and after introduction of Shuttle Bus. Brief explanation of LOS defined in Highway Capacity Manual 2000 is given in Appendix 25-4.

Table 25.3-6 Present LOS and Improves LOS

	Present LOS	Improves LOS	Remark
Frequency	E: Service available once a hour	A: Passengers don't need schedules	Approximately 3minitus
Hours of Services	D: Daytime service provided	B: Late evening service provided	Special night bus
Passenger Load	East route) E: Maximum schedule load Central route) F: Crush load	B / D B: Passengers can choose where to sit D: Comfortable loading for standees	Night class:1.45
Reliability	F: Not reliable	B: 2 late buses per month	Target

25.4 PROPOSED SHUTTLE BUS ROUTES

25.4.1 Selection of Shuttle Bus Service Routes

The shuttle bus service routes are shown in Table 25.4-1 and Figure 25.4-1 below. Among the present bus routes, the Study considered two major routes on which no major improvement are required.

Table 25.4-1 Proposed Shuttle Bus Route

Route	Bus Company	Route	Length (km)	Conditions
1 (East)	VSBC	CBS - Lan Xang Av. - Kaysene Phomvihane Rd - Dongdok Rd – Campus	12.1	4-lane AC (no improvement)
2 (Central)	VSBC	CBS - Thongkhankham Rd - Savang Rd – Campus (2-lane DBS)	11.2	2-lane AC (by 2009)
3 (West)	Private (Toglipasi Bus Company)	Post Office (near CBS) -Thongkhankham Rd - Savang Rd -Dong Palep Rd. - Ban Tannixay Junction - Dongdok Rd - Campus	10.9	Need substantial improvement

Figure 25.4-1 shows the present road conditions of the West Route which needs rehabilitation of pavement and widening. However, there is no such plan of improve, at least at present. The Project will use East and Central Routes.

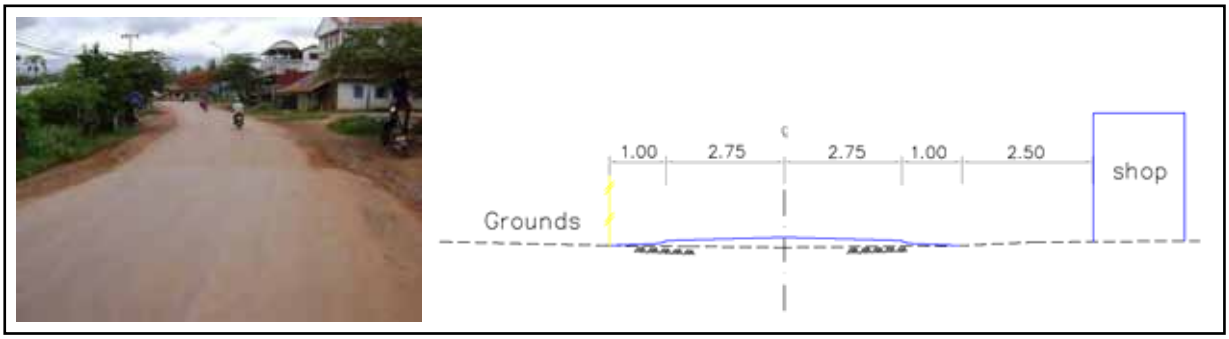


Figure 25.4-1 Road Conditions: Route 3 West (KM6+850) RW=10m

25.4.2 Improvement of Shuttle Bus Service Routes

(1) University Section of Dongdok Road

The section of Dongdok Road in front of the University requires the environmental consideration. A new toll highway to be connected to Dongdok Road at the intersection of South 13 Roads is being planned. This toll road will carry the heavy trough traffics from/to the Friendship Bridge. This heavy traffic will pass the front of the NUOL campus. However, the present road is 2-lane carriageway without any slow moving lane or walk way. The present road and intersections cannot carry and manage the future heavy traffic. Much more traffic congestions and accidents are expected. Hence the road needs to widen to a 4-lane road with slow moving vehicle lane; and bus priority lane and bus private way will be planned. The present three intersections also will be improved with the bus traffic flows. Figure 25.4-2 shows Dongdok Road Conditions with its cross section.

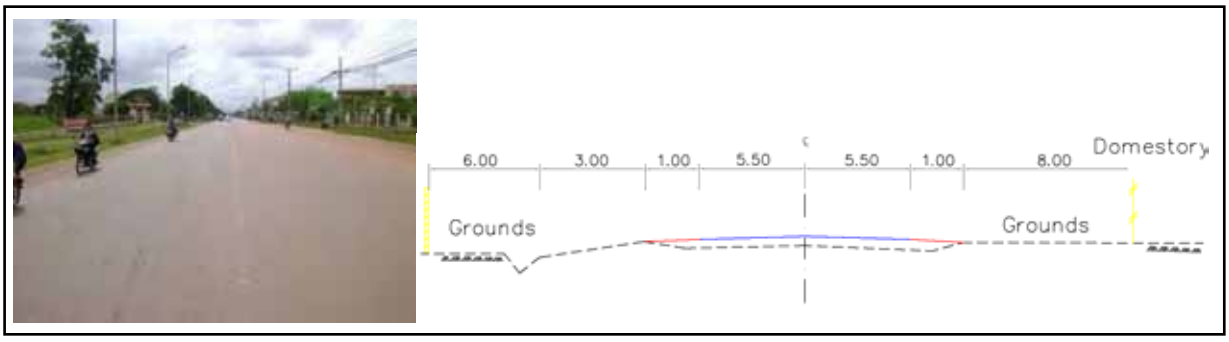


Figure 25.4-2 Road Conditions: Route 1 East (KM0+600) RW=30m

(2) Intersection

Figure 25.4-3 shows location of Intersections where traffic survey is conducted. (T4/I2 and T3/I1) Average and peak traffic flows at intersections are shown in Figures25.4-4 and 5. According to traffic survey, three intersections still have sufficient capacity when the Shuttle Bus is operated. However, intersection's configuration and left turn lane arraignment is

required as traffic safety measures. The survey results are attached to Appendix 25-5.

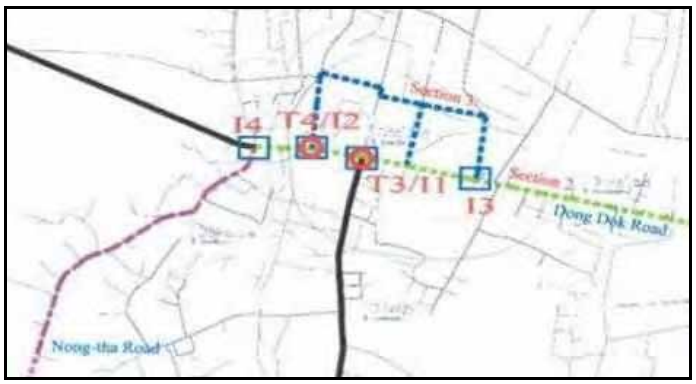


Figure 25.4-3 Intersection Location at NUOL

(a) Location T1

Figure 25.4-4 shows traffic flow volume for one hour from each legs of the intersection.

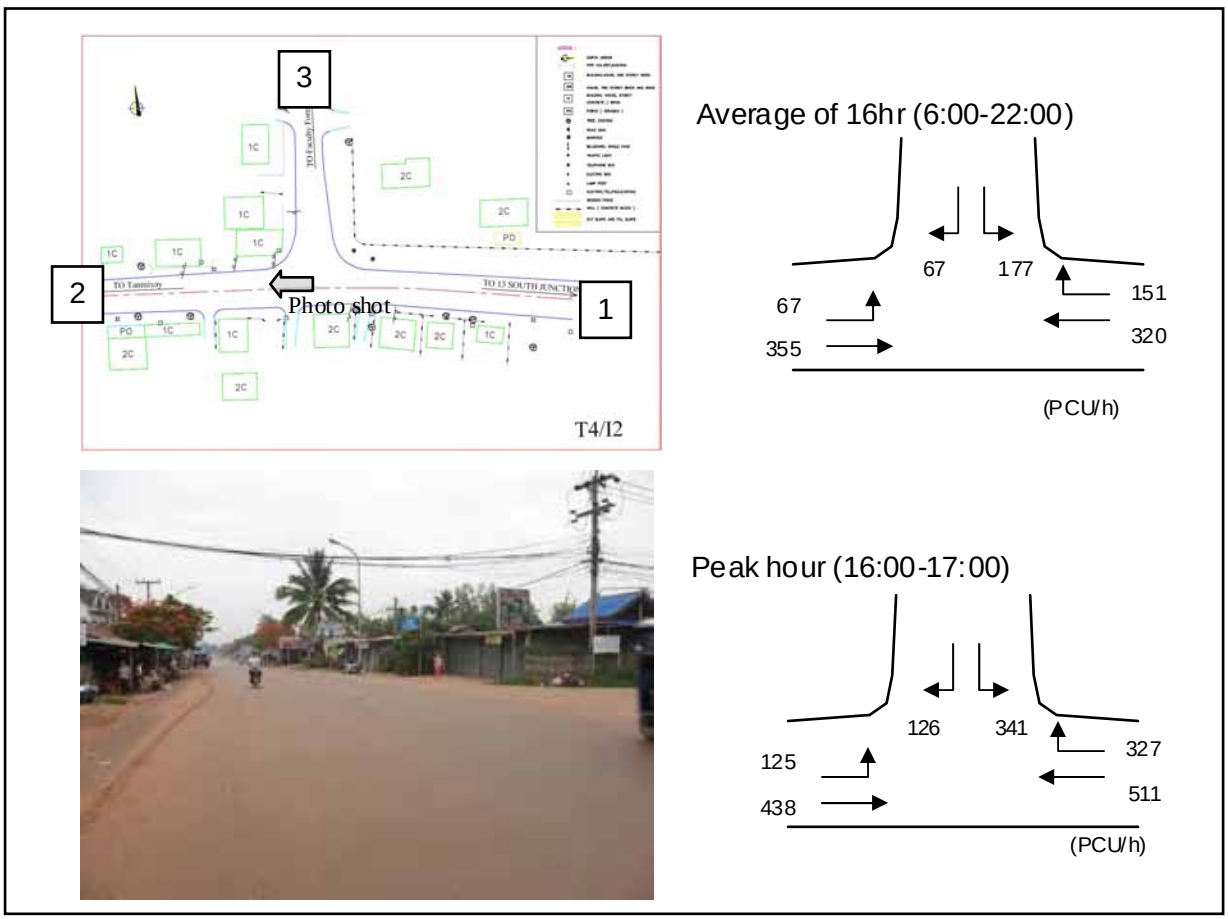


Figure 25.4-4 Directional Traffic Volume at Intersection T1[3]

[3] Date : 22/5/2008. Time: 6:00-22:00

(b) Location T2

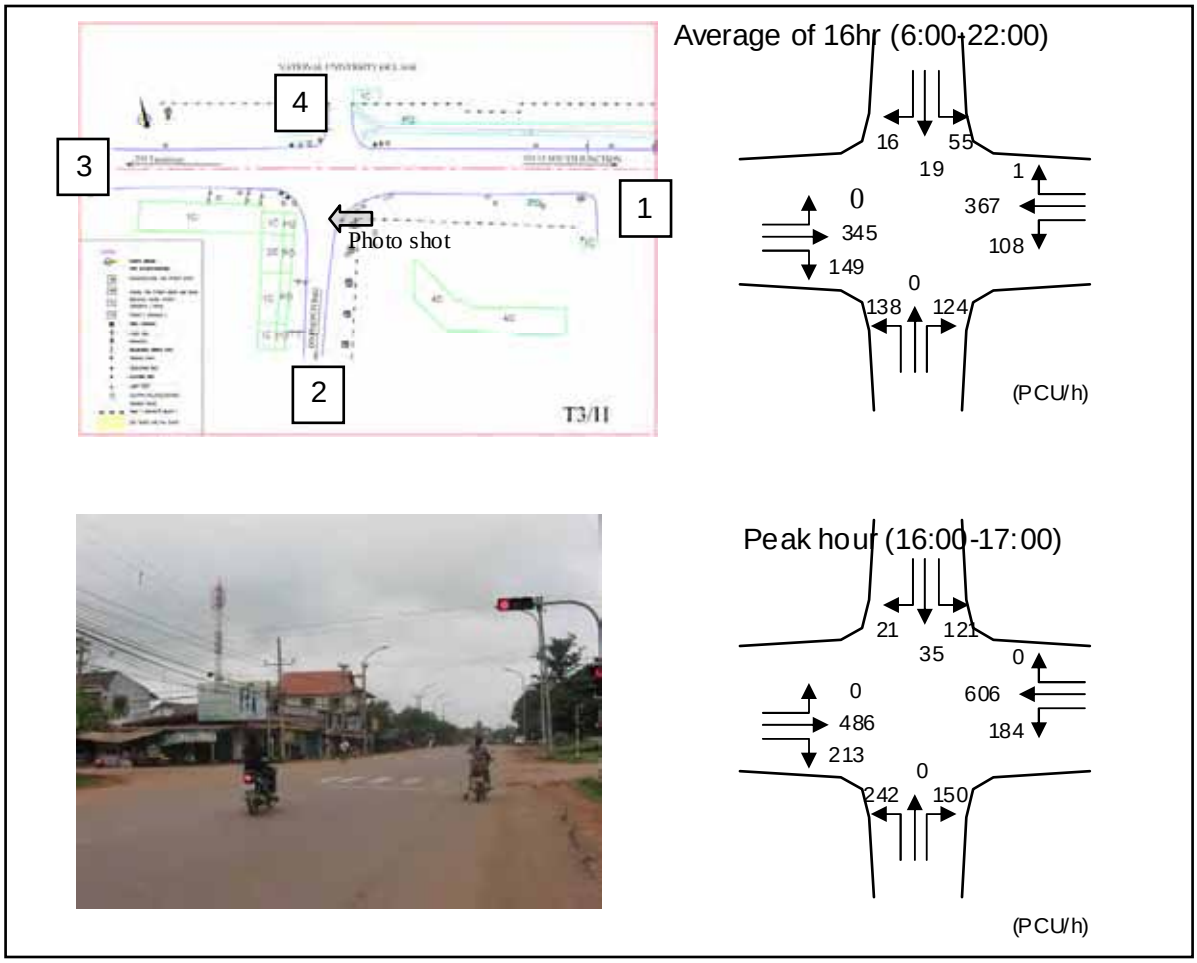


Figure 25.4-5 Directional Traffic Volume at Intersection T2[4]

(3) The University Road

The present buses enter the minor roads surroundings the University Campus after the intersection of the Dongdok Road. These minor roads are approximately 19.5 m wide then become narrow, to 9 to 12m wide. Thus, road improvement is required. Figure 25.4-5 shows the present road conditions.

[4] Date: 21/5/2008. Time: 6:00-22:00

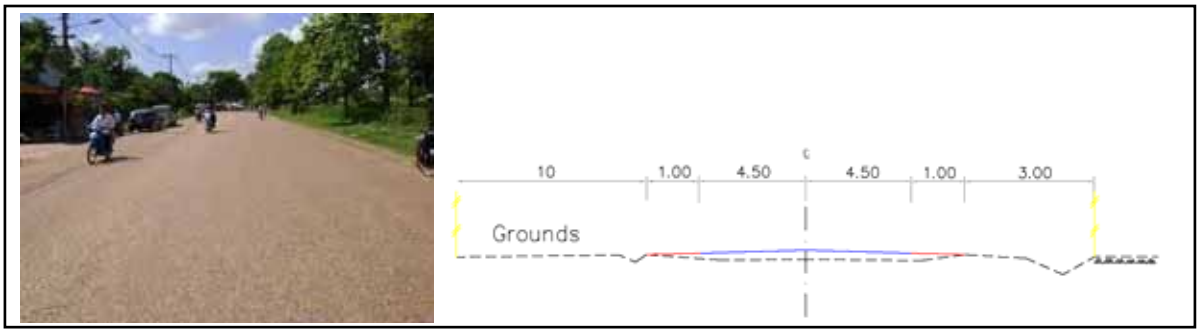


Figure 25.4-6 (1) Present University Road Condition: (KM 0+150) RW=20m
(To M/C Parking)

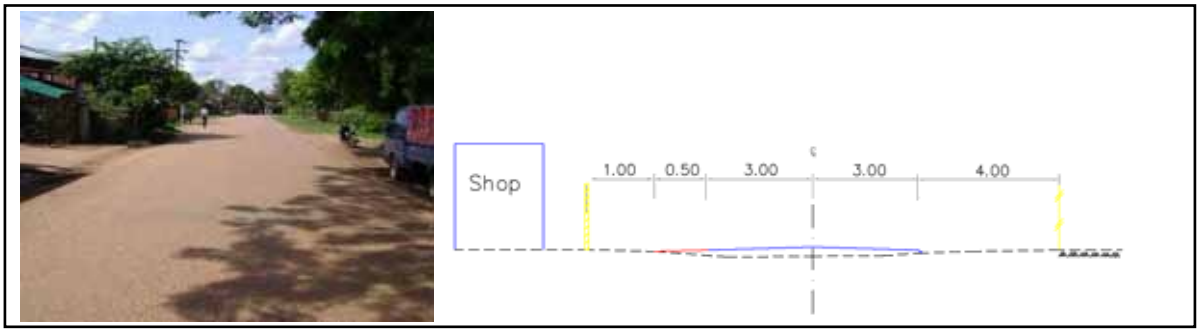


Figure 25.4-6 (2) Present University Road Condition: (KM 0+450) RW=9~12m

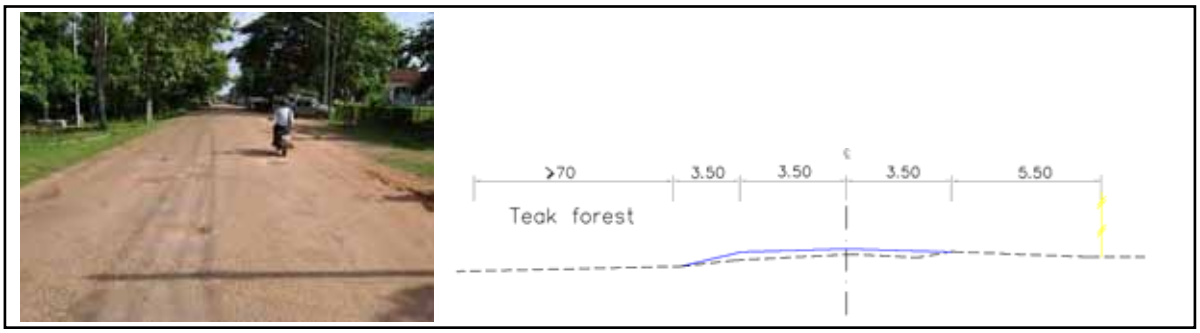


Figure 25.4-6 (3) Present University Road Condition: (KM1+550) RW >20m
(New Bus Terminal)

(4) Bus Circulation Plan in the University Zone

A bus circulation plan is shown in Figure 25.4-7 and three Intersections improvement in Figure 25.4-8. At the present, all buses that come through three routes (East, Central and West) turn at the intersection of T4/I2 (3-legas) and enter the University Road up to the turning place on the road side. Traffic congestions caused by large number of motorcycle and narrow road section with house encroachment hamper smooth bus operation. Therefore bus circulation plan is required. The plan is to improve the present 2-lane carriage way road with slow moving for motorcycle lane and introduce a one way bus private lane. All entering buses will run the bus private lane to the new bus terminal and exit to Dongdok Road at the intersection of I3 for returning each route. A bus priority lane also will be also provided for the returning bus on Dongdok Road.

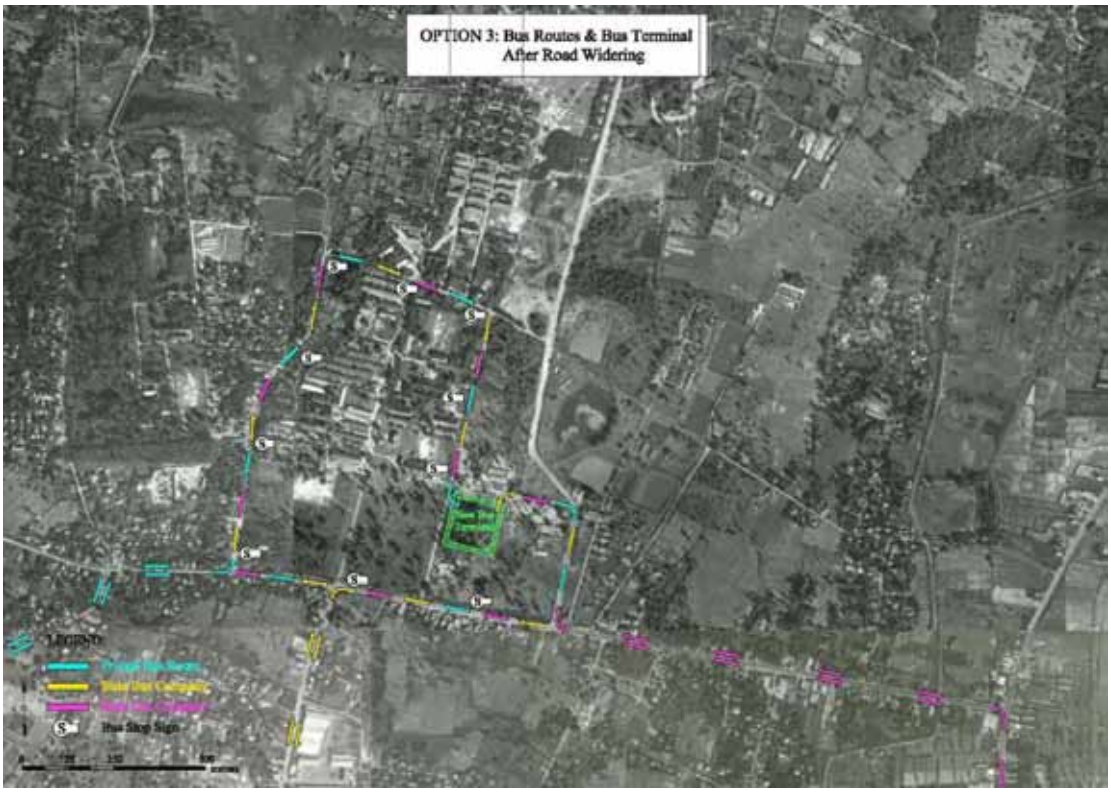


Figure 25.4-7 Bus Circulation Plan in University Zone

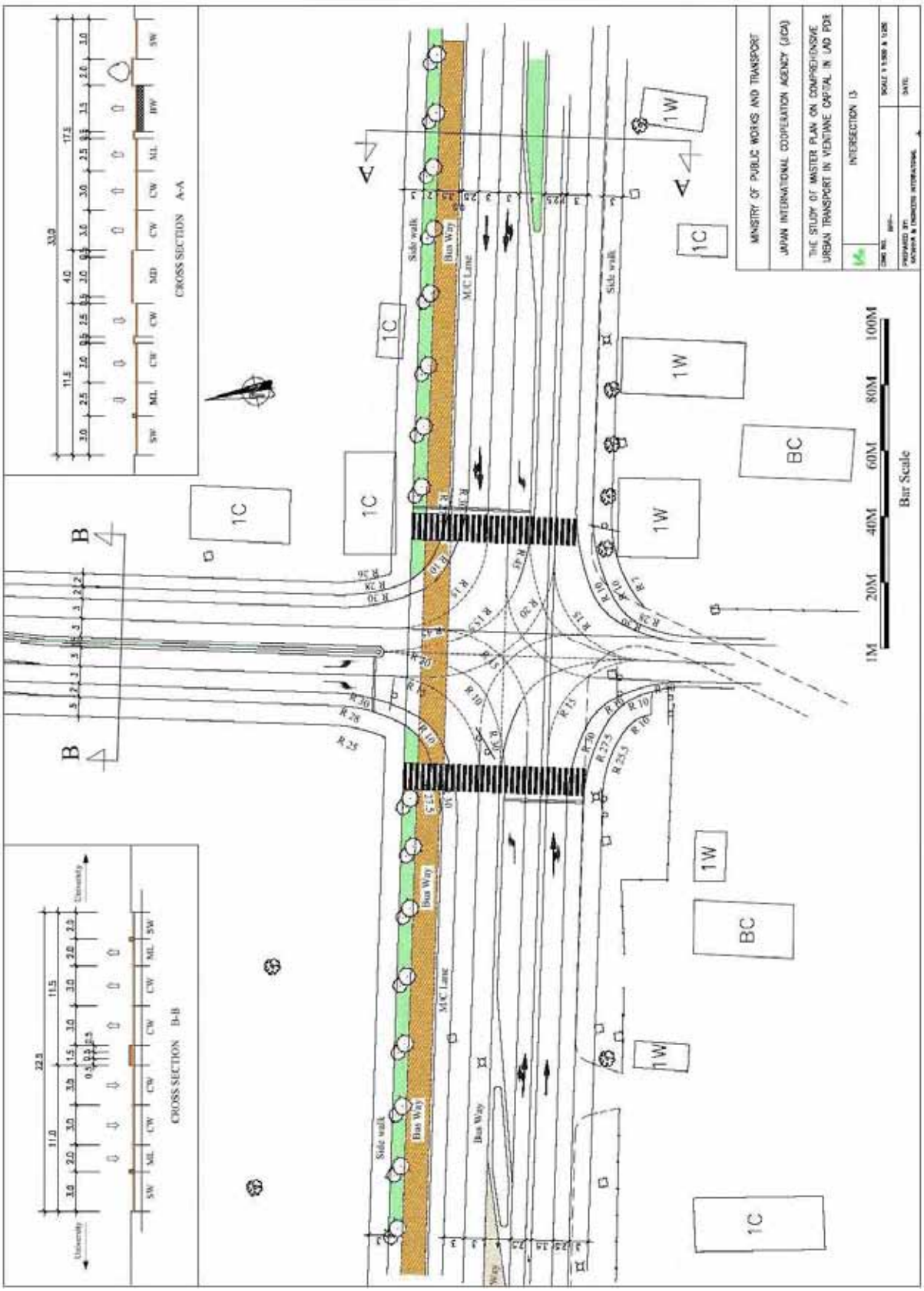


Figure 25.4-8 (1) Intersection Improvement (I3)

Exit from New Bus terminal

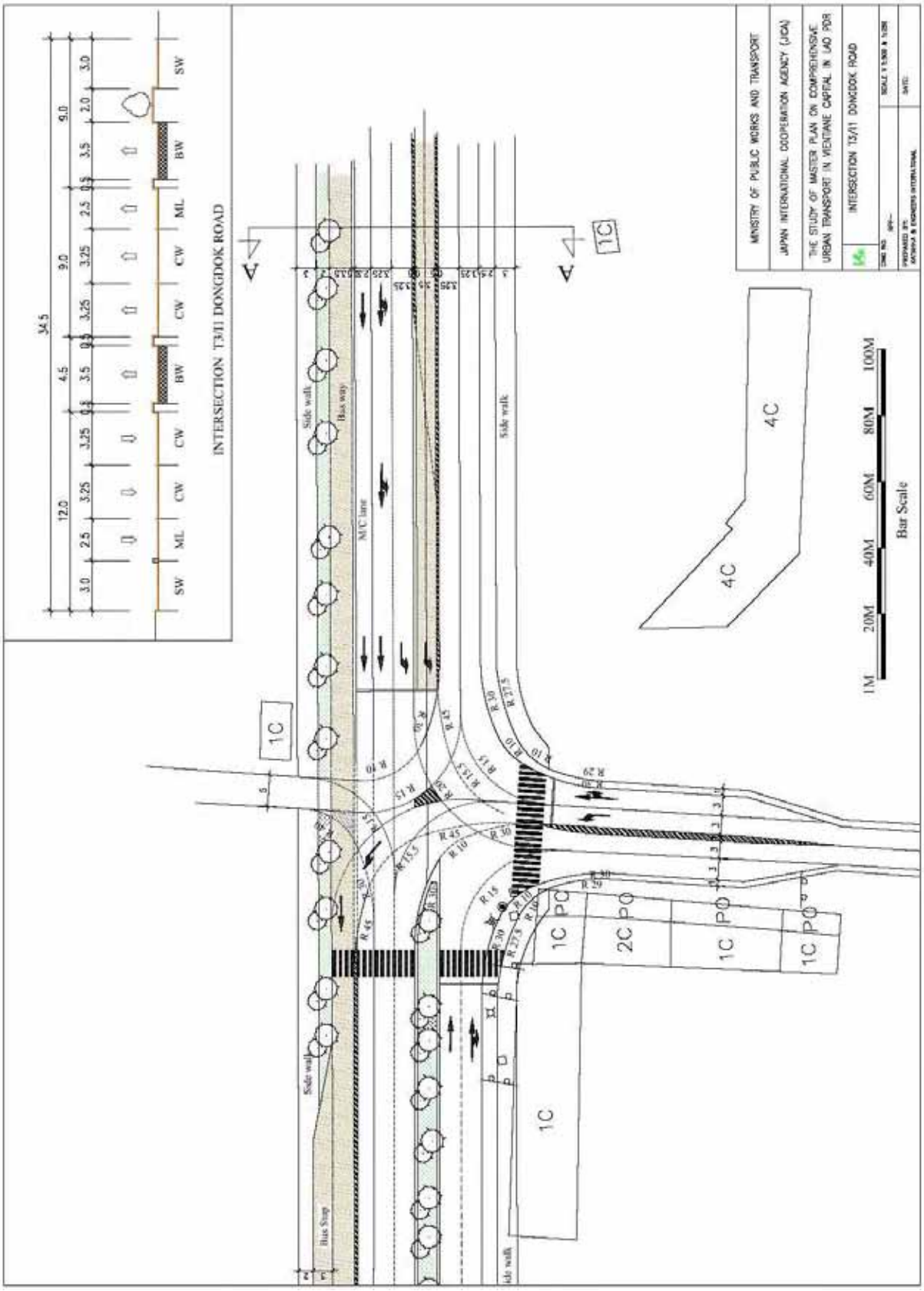


Figure 25.4-8 (2) Intersection Improvement（T3/I1）
University Entrance Gate and Central Route

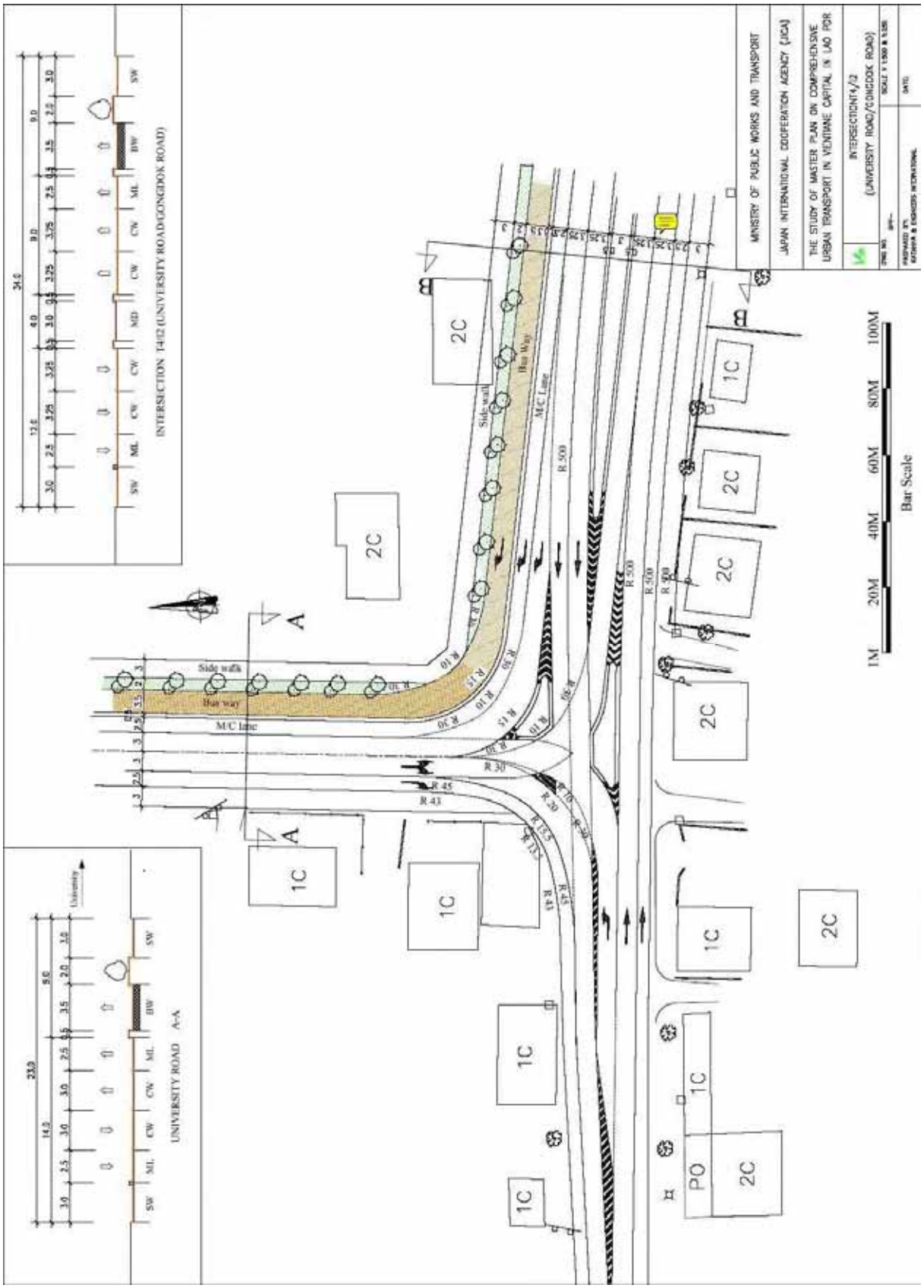


Figure 25.4-8 (3) Intersection Improvement（T4/I2）
Entering to University Road

25.5 PROPOSED TERMINAL FACILITIES

25.5.1 University Bus Terminal

There is no bus terminal in the University Zone. All buses stop and park at the road side which has enough space to turn the vehicle. A new university bus terminal is planned at the place adjacent to the turning point. There is vacant place with a few trees as shown in Figure 25.5-1.

Figure 25.5-1 Candidate Site for New Bus terminal

The proposed site can be accessed by two roads separately for the entrance and the exit. The university bus terminal will provide motorcycle or bicycle parking area and Sonteo parking area for "Park and Ride" facility. Figure 25.5-2 shows a conceptual plan of the University Bus Terminal.

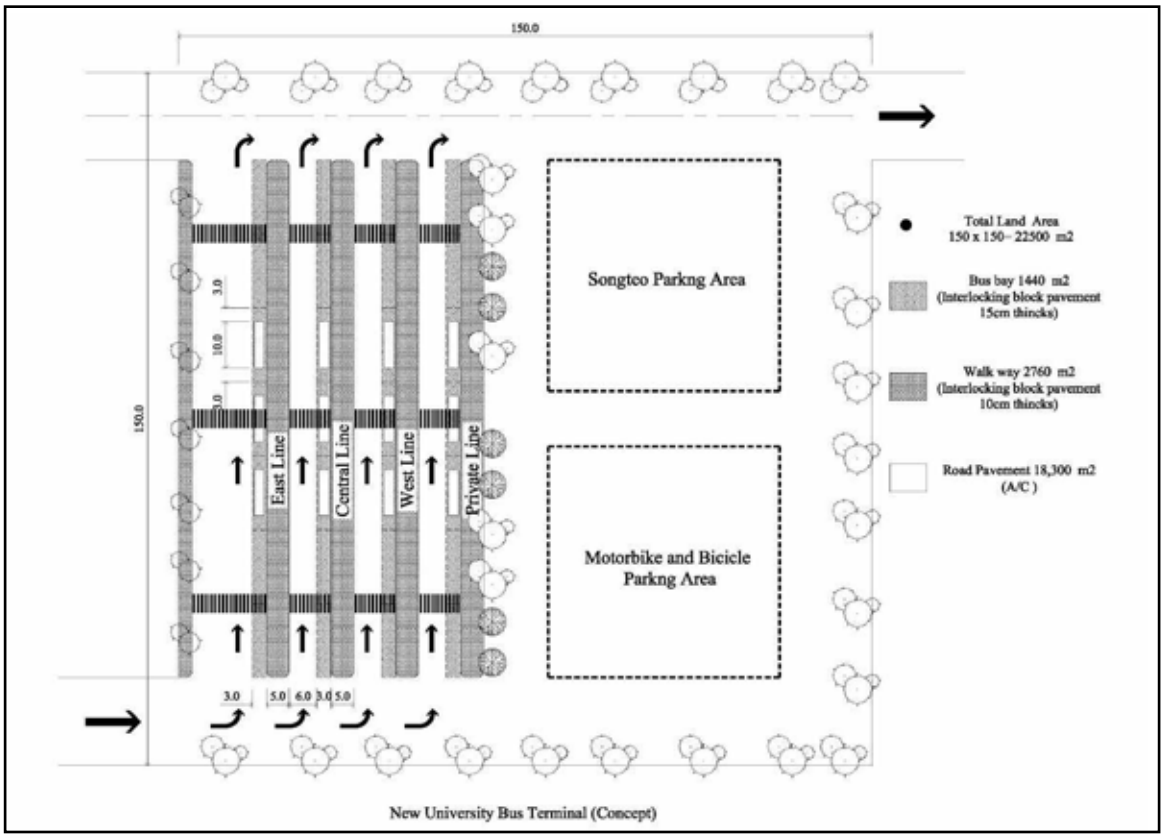
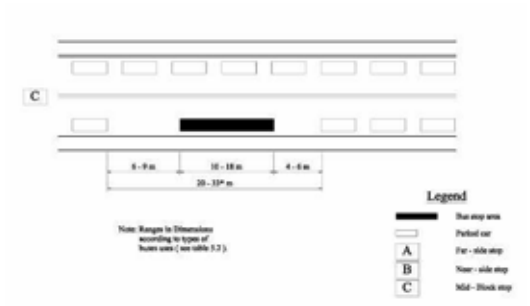


Figure 25.5-2 University Bus Terminal Plan

25.5.2 CBD Area Bus Terminal

Central Bus Station (CBS) has no surplus capacity for additional bus operation. For the Shuttle Bus Service, road side bus stop shall be provided near CBS. Figure 25.5-3 shows the bus circulation route and bus stops around Central Business District (CBD).



Road Side Bus Stop

Figure 25.5-3 Langxan Road Traffic

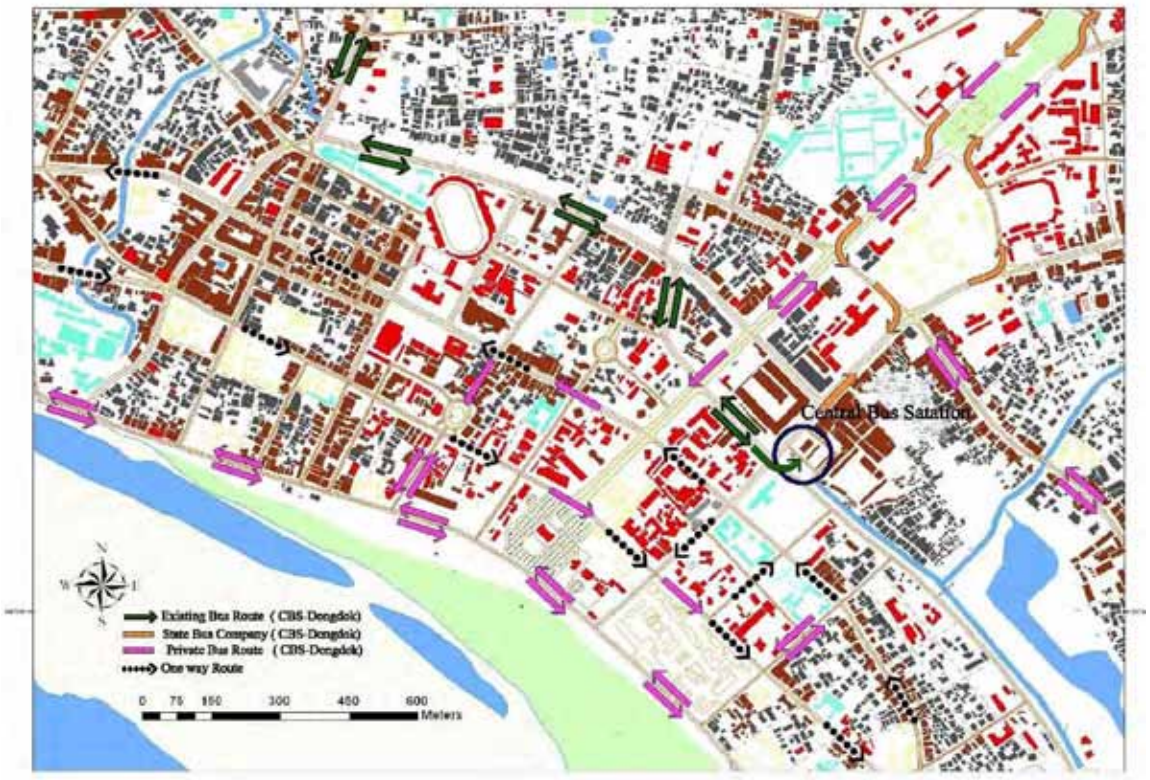


Figure 25.5-4 CBD Bus Circulation Plan

25.5.3 Bus Stops Improvement

Bus stop locations need to be fixed and arrival time to be reliable. Table 25.5-1 and Table 25.5-2 show acceptable of waiting time at bus stop and walking minutes. Acceptable distance of bus stop is 500m for 84% of the surveyed students. The Project proposes at least 200m interval in CBD and the University area and 500 intervals in the other areas. Bus waiting time will be improved when bus trip frequency is increased.

Table 25.5-1 Acceptable Walking Time to Bus Stop

minute		Percentage	Total	Morning	Evening	Night
5-10	(7.5)	84%	751	317	261	173
10-15	(12.5)	12%	107	40	37	30
15-20	(17.5)	4%	40	16	19	5
total		100%	898	373	317	208

Table 25.5-2 Acceptable Waiting Time at Bus Stop

Minute	Percentage	Total	Morning	Evening	Night
10	74%	819	338	284	197
20	22%	247	88	100	59
30	3%	34	10	16	8
Total	100%	1,100	436	400	264

Timetable of bus operation needs to be posted at a bus stop. Major bus stops (ideally all bus stops) should have a shelter and a seat for waiting passengers.

Figure 25.5-5 Bus Stop at University Gate

Figure 25.5-6 Bus Stop Sign at University Road

25.6 PROJECT COMPONET

25.6.1 Project Component

The project components contains procurement and operation of buses, bus route improvement (Dongdok Road (three major intersections and University road), and University bus terminal construction.

Table 25.6-1 Project Component

Component	Specification	Quantity	Agency
1. Bus Procurement	50 sheets with air conditioning Low bed deck	40 units	Bus Operator
2. Route Improvement			
2.1 Dongdok Road Upgrading	4-lane carriageway Bus private/priority lane Slow moving lane Walk way	0.9 km	MPWT
2.2 Intersection Improvement	Left turn lane Traffic Signal Walk Crossing	3 T-Section	MPWT
2.3 University Road improvement	2-lane carriageway Bus private lane/Walk way	2.3km (section 3.1) 1.1km (section 3.2)	MPWT
3. University Bus Terminal construction	Bus lane/Bus bay Paratransit Parking Motorcycle/ bicycle parking		MPWT/ University

25.6.2 Project Cost Estimate

The project cost is estimated as shown in Table 25.6-2.

Table 25.6-2 Project Cost Estimate (Unit: x1000US$)

Component	Unit	Q'ty	Unit Price	Finance	Economic	Remark
1. Bus Procurement	Unit	40	90.605	3,624	2,409	-
2. Route Improvement						
2.1 Dongdok Road Upgrade	km	0.9	1,502	1,352	1,217	-
2.2 Intersection Improvement	No	3	(Included in the above)			-
2.3 .1University Road	km	2.3	1,100	2,530	2,277	Section 3.1
2.3.2 University Road	km	1.1	1,206	1,327	1,194	Section 3.2
3. University Bus Terminal	100m2	22.5	5	113	101	-
Total				8,964	7,198	-

25.7 FARES AND FARE POLICY

25.7.1 Fare System

(1) Operation Cost Analysis

Operation cost analysis was carried out by tow methodology; Vehicle Operating Cost (VOC) by cost breakdown, and Company Experienced Cost (CEC) of VSBC. The vehicle operating cost covers all expenditure for running bus service and consists of operating, management, and overhead. Details analysis is described in Section 25.8. The VOC is estimated by composing desegregated market price of vehicle, fuel, labor, etc. and its depreciation or consumption rates. The company experienced cost is based on unit cost of passenger-km which is derived from historical company expenditure records or the recent balance sheets.

On the other hand, CEC estimation is depend on actual bus operation conditions such as the present aged buses, management and staff structure etc. The Study worked out VSBC financial records in 2006 and compared it with estimated VOC. For deciding the fare level of Shuttle Bus Service, CEC will be applied, but there are small rooms to rationalization and modernization to reduce the expenditure up to theoretical VOC. When the private company or the University itself decides to operate, VOC is to be applied for the basic fare level. Table 25.7-1 shows VSBC CEC and VOC.

Table 25.7-1 VSBC and VOC

Cost of Operation	US$/km	Kip/km
VSBC CEC	0.475	4,133
VOC	0.451	3, 924

VOC: As of July 2008. 1US$=8,700kip

Bus fare review needs an approval of MPWT. Vientiane Times reported the recent fare hike due to the fuel increase by 20 to 30%. Fuel and lubricant cost is reported at 60% of operation cost. World fuel price increase hits the public bus operator seriously.

(2) Fare Differentiation Policy

For the Shuttle Bus Service, fare differentiation policy to the students shall be adopted. The student will have different fares from the normal fares, for example, a school bus pass; during off-peak shuttle bus service the other passengers also who buy multiple-journey ticket or seasonal ticket receive a discount in comparison with passengers who make only occasional use of transport service. The detailed fare structure and level will be discussed in the following sections.

(3) Fare Levels and Willingness to Pay

The extent of the "need" for transport is determined by many factors. The Study surveyed the fare level and "willingness to pay" through interview. Figure 25.7-1 shows 85% of student is willing to pay 2,000kips which is the present bus fare and 17% pay more than 2,000kips.

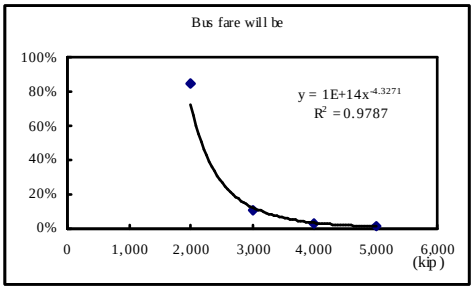


Figure 25.7-1 Acceptable Bus Fare

Table 25.7-2 Willingness to Pay for Bus Service

kip	Percentage	Total	Morning	Evening	Night
2,000	85%	1,034	435	377	222
3,000	11%	130	45	36	49
4,000	3%	34	12	17	5
5,000	2%	22	7	8	7
total	100%	1,220	499	438	283

(4) Fare Systems

MPWT adopts flat fare by route for urban bus transport and distance-based fare for rural bus transport. Table 25.7-2 shows the fare system adopted in Vientiane. Flat fare is easy to collect fare from passengers; but a short distance passenger over-pays and a long distance passenger pays less when "the difference between the mean journey length and the most frequency, the greater may be the adverse effects."[5] The Study shows OD of motorcycle users. Averaged distance is approximately 7.5km. To facilitate for the potential users, combined system with the pre-paid student pass will be introduced.

Table 25.7-3 Fare Systems and Vientiane Bus Service

Fare Systems	Content	Vientiane Bus Service
a. Flat Fare	Charged regardless of the distance covered.	Adopted by route
b. Distance-based fare	1. Kilometric Fare: by distance covered	Adopted to rural bus
	2. Stage Fare: a section of the route by 2 to 3 km	Not adopted
	3. Zonal Fare: simplified stage fare by zone belt from CBD	Not adopted
c. Combined System	Combined above three	(To be recommended for shuttle bus services)

[5] G.A. Giannopoulos, Bus Planning and Operation in Urban Area: Practical Guide, 1989

(5) Type of Fare

Table 25.7-4 shows type of bus fare. The Shuttle Bus Service will be adopted a reduced fare for promoting use of bus transport instead of motorcycle use. Fare level will be discussed in Financial Analysis. In addition, the night bus service is to be introduced in the night class. At the class closing time of 20:30, all city bus service end. Night bus service to CBD and major destinations, and paratransit services will be applied. A further user survey is recommended when the shuttle bus is operated. In this case supplementary fare will be considered.

Table 25.7-4 Type of Fare

Type	Passenger/Service	Adoption
Basic Fare	Majority	Equivalent to CEC or VOC
Reduced Fare	Targeted passengers (student/aged/poor)	Fare allowance Fare concession
Supplementary Fare	Specific services	Night travel, express service

Fare allowances are granted as quantity or period discounts because the agency envisages higher revenue in this case, without any increase in expenditure. Table 25.7-5 summarizes main type of allowance. If fare reduction needs to increase in expenditure and exceeds profit breakpoint, fare concession with subsidy is required. For the student service, seasonal ticket is preferable; but no additional expenditure for the bus operator arises.

Table 25.7-5 Main Type of Fare Allowance

Type	Passenger	Adoption
Multiple-journey ticket	Majority	
Season ticket	Targeted passengers	Fare concession, allowance
Pensioners' ticket	Specific passengers	
Special offers	Off-peak period Special categories Network ticket	Night travel, express service

Source: G.A.Giannopoulos, Bus Planning and Operation in Urban Areas: Practical Guide, 1989

(6) Specific Consideration

Free Travel is option for the shuttle bus services. General optional financial sources are public transport tax from habitants in the service zones or the entire city. For the Shuttle Bus Service, the University may use the motorcycle and car park fees, fully or partially, to cover the cost of bus operation.

25.7.2 Financial Condition of Vientiane State Bus Company

(1) Financial Conditions

In order to ascertain the operating condition, financial condition of Vientiane State Bus

Company is analyzed and compared. The financial condition of VSBC from year 2002 is summarized in Table 25.7-6.

Financial condition of VSBC can be said not so bad. However, from year 2004 became to show loss every year. Because raised up of operating cost consists of fuel cost as main items, although revenue also increased, but could not catch up the expenditure. The situation must be worsened considering recent raise up of crude oil price. The diesel fuel was raised up 40% for October 2007 to June 2008.

Using this figures, unit expenditure of vehicle-kilometer for operating and management costs are 4,209 and 516 million Kip per year. It is 543,100 US$ using exchange rate of US$1.00 = 8,700 Kip (June 2008). This value is almost same as operating cost of 503,000 US$ derived from financial VOC.

Table 25.7-6 Financial Condition of VSBC

year	Operating cost	Management cost	Total Expenditure	Fare	Others	Revenue	Profit
2002	12,831	4,952	17,783	16,995	674	17,669	-114
2003	15,662	5,619	21,281	21,101	369	21,470	189
2004	18,512	6,775	25,287	24,725	441	25,167	-121
2005	22,604	7,609	30,213	28,429	464	28,893	-1,320
2006	23,264	7,675	30,940	28,771	487	29,258	-1,681
2007	23,630	8,072	31,702	29,941	555	30,496	-1,205

Source: Financial division of VSBC

(2) VSBC Capacity for Shuttle Bus Service

VSBC has operated approximately 120 units of bus. When they start shuttle bus operation with 40 units of bus, they need to increase 33% of VSBC capacity, which may be reasonably absorbed in the present capacity with proper technical assistance for reliable bus operation. They also operate the workshop, granted by Japan in 1999/2000, to repair and maintain operating bus. Spare parts were purchased their own revenue. All buses are decayed, but still they try to operate at maximum efforts. The workshop needs minor renovation.

25.7.3 Fare Level for the Shuttle Bus Service

Introduction of big reduced bus fare is quite difficult under the unexpected fuel price hike in the world market. This has increased operator costs and recent VSBC has experiences in loss of balance sheets. According to the financial analysis based on a 2007 balance sheet, 20% of the discount will be possible without additional Company expenditure. A pre-paid seasonal student pass will be introduced with flat fare. But this is not count the Government business tax. Therefore, the Government may allow the bus public transport operators to have a title of

tax reduction or exemption for the portion of revue from the student pass from the business tax. Preferable tax for imported bus or spar parts is also an option to reduce the operation cost. The above fare policy may be adapted to the socially vulnerable peoples. In addition, it will be the strong tools for promoting the bus public transportation if traffic control management will be introduced together.

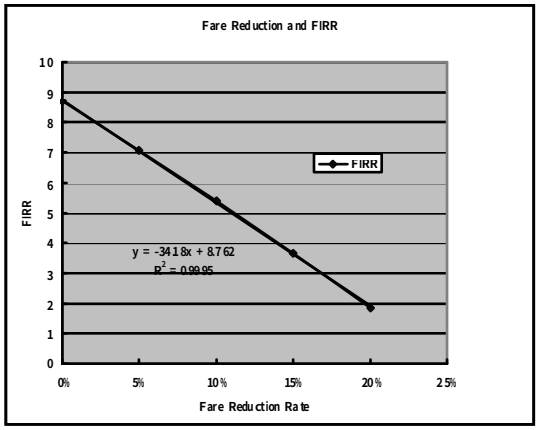


Figure 25.7-2 Fare Reduction Rate and

Table 25.7-7 Fare Reduction rate and FIRR

Fare Reduction Rate	20%	15%	10%	5%	0%
FIRR	1.86	3.67	5.41	7.08	8.7

25.8 FINANCIAL AND ECONOMIC ANALYSIS

25.8.1 Financial Analysis

(1) Methodology

Financial analysis is carried out assuming that the costs consist of vehicle purchase cost and operating cost, revenue consist of fare for shuttle service.

(2) Project Costs

The costs considered is only bus operation cost. Road improvement cost is under the road project for the financial analysis. Table 25.8-1 summarizes financial cost.

Table 25.8-1 Financial Cost Components

Items	Costs
Bus price (US$)	90,606
Number of bus (Unit)	40
Total purchase costs (US$)	3,624,200

Vehicle operating financial cost is obtained applying financial costs for the items as shown in Table 25.8-2 and Table 25.8-3.

Table 25.8-2 Distance Dependent Financial VOC (Unit: US$/km)

	M/C	Car	Sonteo	Bus	Truck
Fuel	0.084	0.129	0.198	0.238	0.252
Lubricant	0.009	0.018	0.068	0.014	0.111
Tire	0.000	0.006	0.008	0.034	0.045
Maintenance	0.000	0.001	0.001	0.003	0.002
Spare Parts	0.000	0.006	0.011	0.049	0.027
Depreciation	0.017	0.177	0.083	0.025	0.076
Crew	0.000	0.019	0.043	0.047	0.047
Total	**0.111**	**0.356**	**0.413**	**0.410**	**0.560**

To make the analysis simpler time voc is converted to distance voc with speed of 15 km/hour. And depreciation cost is deducted in order to avoid double counting, as the main cost item is vehicle price. Table 25.8-3 shows the financial VOC thus obtained.

Table 25.8-3 Distance Dependent Financial VOC (Unit: US$/km)

	M/C	Car	Sonteo	Bus	Truck
Operating	0.111	0.356	0.413	0.410	0.560
Overhead	0.012	0.043	0.047	0.041	0.064
Total	0.130	0.472	0.514	0.451	0.708

(3) Revenue

Revenue consists of fare for the shuttle service paid by the students; In this case 2,000 Kip/trip is applied. Daly revenue is 4,966 x 4,000 (Kip) = 19,864,000 (Kip) for round trip. Annual revenue in 1,000 US$ is 19,640 x 365/8700 = 833.4

(4) Financial Evaluation

Using above mentioned factors the project is economically evaluated as shown in Table 25.8-4. And the indices thus obtained are presented in Table 25.8-5.

Table 25.8-4 Financial Analysis

No.	Year	Cost				Revenue		Revenue-cost
		Purchase	OM	Total	12%	4000 kip	12%	
0	2009	3,624.2		3,624.2	3,624.2		0.0	-3,624.2
1	2010		329.2	329.2	294.0	833.4	744.1	504.1
2	2011		329.2	329.2	262.5	833.4	664.4	504.1
3	2012		329.2	329.2	234.3	833.4	593.2	504.1
4	2013		329.2	329.2	209.2	833.4	529.6	504.1
5	2014		329.2	329.2	186.8	833.4	472.9	504.1
6	2015		329.2	329.2	166.8	833.4	422.2	504.1
7	2016		329.2	329.2	148.9	833.4	377.0	504.1
8	2017		329.2	329.2	133.0	833.4	336.6	504.1
9	2018		329.2	329.2	118.7	833.4	300.5	504.1
10	2019		329.2	329.2	106.0	833.4	268.3	504.1
11	2020	-362.4	329.2	-33.2	-9.5	833.4	239.6	866.6
	Total	3,261.8	3,621.5	6,883.3	5,475.0	9,167.1	4,948.4	2,283.8

Note: Bus residual value is assumed at 10% of purchase cost.

Table 25.8-5 Financial Index

Index	Value
FIRR	8.7
B/C ratio	0.9
NPV (US$)	-527,000

For the public corporation like VSBC, tax of bus purchase could be reduced to 1% (analysis so far adopted tax of 30%). Applying the reduced rate, a financial evaluation is carried out using the costs and revenue thus obtained. The financial indices thus obtained are FIRR= 14.0%, B/C ratio = 1.03, NPV = US$ 60,000. These figures indicate that the Shuttle Bus Service is financially viable if low import tax is allowed for procurement of busses.

(5) Risk and Sensitivity Analysis

To examine how these indices are affected by the variation of the cost and benefit is analyzed. It is same as the sensitivity analysis undertaken for the M/P study mentioned in Chapter 21. In this case 10% of variation is used. The results are presented in Table 25.8-6.

Table 25.8-6 Results of Sensitivity Analysis

		Item	Cost		
			-10%	0%	10%
Benefit	10%	FIRR	15.4%	11.8%	8.7%
		B/C	1.10	0.99	0.90
		NPV	516	-32	-579
	0%	FIRR	12.1%	8.7%	5.7%
		B/C	1.00	0.90	0.82
		NPV	21	-527	-1,074
	-10%	FIRR	8.7%	5.4%	2.5%
		B/C	0.90	0.81	0.74
		NPV	-474	-1,021	-1,569

(6) Cash Flow Analysis

To examine feasibility of Shuttle bus service cash flow analysis is conducted. Total debt is calculated for 20 years in interest rates from 12% to 3%. 7% is evaluated as financially feasible shown in Table 25.8-7. Results of other interest rates are shown in Appendix 25.8-7.

From this analysis, it can be said that financially feasible interest as business is less than 7%. And this project is feasible as international organizations such as JBIC and ADB finance with interest rate less than 3%.

Table 25.8-7 Cash Flow Analysis

	year	Expense			Revenue	Interest	Total Debt
		Procurement	OM	Total	4,000kip	7%	
0	2009	3624.2		3624.2			3624.2
1	2010		329.2	329.2	833.4	253.7	3373.7
2	2011		329.2	329.2	833.4	236.2	3105.8
3	2012		329.2	329.2	833.4	217.4	2819.0
4	2013		329.2	329.2	833.4	197.3	2512.2
5	2014		329.2	329.2	833.4	175.9	2183.9
6	2015		329.2	329.2	833.4	152.9	1832.7
7	2016		329.2	329.2	833.4	128.3	1456.8
8	2017		329.2	329.2	833.4	102.0	1054.6
9	2018		329.2	329.2	833.4	73.8	624.3
10	2019	3261.8	329.2	3591.0	833.4	43.7	3425.6
11	2020		329.2	329.2	833.4	239.8	3161.3
12	2021		329.2	329.2	833.4	221.3	2878.4
13	2022		329.2	329.2	833.4	201.5	2575.8
14	2023		329.2	329.2	833.4	180.3	2251.9
15	2024		329.2	329.2	833.4	157.6	1905.4
16	2025		329.2	329.2	833.4	133.4	1534.7
17	2026		329.2	329.2	833.4	107.4	1138.0
18	2027		329.2	329.2	833.4	79.7	713.5
19	2028		329.2	329.2	833.4	49.9	259.3
20	2029	-362.4	329.2	-33.2	833.4	18.1	-589.2
	Total		3292.3	10178.3	8333.7		

Note: Bus residual value is assumed at 10% of purchase cost.

Economic life of Bus is assumed 10 years.

25.8.2 Economic Analysis

(1) Methodology

Economic benefit considered for the project would be reduction of VOC. Saving of TTC would not be included, because it can be considered only for workers but not student who does not work for contributing for GNP. The reduction of VOC mainly is attained by modal shift form motorcycle (M/C) to bus. The VOC are aggregated for M/C and bus based on the assumptions.

Table 25.8-8 Premise for Economic Evaluation

Items	Used Value
Number of students	4,966
Number of M/C	3,820
Number of bus passenger	50
Number of Bus operation	100
Trip distance of M/C	8.5 km
Travel distance of Bus	11.15 km
Operating speed of Bus	15 km/hour
Unit VOC	Same as M/P study

(2) Economic Benefit

Unit VOC which is used for M/P study is applied for the project, however to make the evaluation simpler, time dependent VOC is converted to distance using speed of 15 km/hour, then aggregated as distance dependent VOC.

Table 25.8-9 Economic Benefit

	M/C	Bus
Number of vehicle	1,685	40
Operating distance	15	23.3
Volume (veh-km)	57,300	2,330
VOC ($/day)	3,894	1,020
Benefit ($/day)	2,874	

(3) Economic Cost

As for cost of the project, purchase cost of bus and VOC are considered. A same VOC as used in M/P study is applied, however for a bus price, new bus. CIF 52,000, economic price 60,237 and financial price 90,605 is used. (All price in US$)

Table 25.8-10 Factor Considered in Economic Evaluation

	Unit cost	Value
Number of Bus to be purchased	40	-
Economic price ($) of Bus	60,237	1,807,110
VOC ($/km)	0.438	-
Total operating length	100 x 23.3	2,330
Operating cost (1,000 $/year)		372.5

(4) Economic Evaluation

Using above mentioned factors the project is economically evaluated as shown in Table 25.8-11. And the indices thus obtained are presented in Table 25.8-12.

Table 25.8-11 Economic Evaluation

No.	year	Cost				Benefit		Benefit -Cost
		Procurement	VOC	total	12%	VOC saving	12%	
0	2009	2,409.5		2,409.5	2,409.5		0.0	-2,409.5
1	2010		372.2	372.2	332.3	1,049.0	936.6	676.8
2	2011		372.2	372.2	296.7	1,049.0	836.3	676.8
3	2012		372.2	372.2	264.9	1,049.0	746.7	676.8
4	2013		372.2	372.2	236.5	1,049.0	666.7	676.8
5	2014		372.2	372.2	211.2	1,049.0	595.2	676.8
6	2015		372.2	372.2	188.6	1,049.0	531.5	676.8
7	2016		372.2	372.2	168.4	1,049.0	474.5	676.8
8	2017		372.2	372.2	150.3	1,049.0	423.7	676.8
9	2018		372.2	372.2	134.2	1,049.0	378.3	676.8
10	2019		372.2	372.2	119.8	1,049.0	337.7	676.8
11	2020	-240.9	372.2	131.3	37.7	1,049.0	301.6	917.7
	Total		4,094.4	6,262.9	4,550.4	11,539.0	6,228.8	5,276.1

Table 25.8-12 Economic Index

Index	Value
EIRR	26.1
B/C ratio	1.37
NPV (US$)	1,678,000

(5) Sensitivity Analysis

To examine how these indices are affected by the variation of the cost and benefit is analyzed. It is same as the sensitivity analysis undertaken for the M/P study mentioned in Chapter 21. In this case 10% of variation is used. The results are presented in Table 25.8-13.

Table 25.8-13 Results of Sensitivity Analysis

		Item	Cost		
			-10%	0%	10%
Benefit	10%	EIRR	36.7%	30.9%	26.1%
		B/C	1.67	1.51	1.37
		NPV	2,756	2,301	1,846
	0%	EIRR	31.5%	26.1%	21.6%
		B/C	1.52	1.37	1.24
		NPV	2,133	1,678	1,223
	-10%	EIRR	26.1%	21.1%	16.8%
		B/C	1.37	1.23	1.12
		NPV	1,510	1,055	600

25.9 PRE-EIA

Pre-EIA is conducted to evaluate environmental and social impacts that the priority project for pre-F/S are likely to have, analyze alternative plans and prepare adequate mitigation measures and monitoring plans in accordance with regulation on Environmental Assessment in the Lao PDR and JICA guidelines.

25.9.1 CO_2 Reduction Effects

The Project is expected to make positive environmental effects that will reduce CO_2 emission by shifting transport modes of approximately 5,000 students from motorcycle to bus. Total reduction weight of CO_2 is calculated as follows.

The emission rate by mode of CO_2 is assumed in Table 25.9-1.

Table 25.9-1 CO_2 Emission Rate by Mode (unit: g- CO_2/person・km)

Item	Bus	Motorcycle	Car
CO_2	51	85	173

Source: For Bus and Car from White Paper on Land, Infrastructure and Transport of Japan (2008) and for Motorcycle from Kato, Nagoya University.

The amounts of CO_2 gas emitted by "Do-Nothing" and "Shuttle Bus Services" are as shown in Table 25.9-2. The results show that "Shuttle Bus Services" contributes to 13.3%reduction, hence doing to global warming prevention which is one of important objectives of EST.

Table 25.9-2 Reduction of CO_2 Emission (unit: kg/day)

	CO_2			
Scenario	Vehicle	Weight	Total	Difference (Reduction Rate)
Do-Nothing	Bus	2,593	25,375	0 (0)
	Motorcycle	21,107		
	Car	1,675		
Shuttle Bus Operation	Bus	7,658	21,998	- 3,377 (13.3%)
	Motorcycle	12,665		
	Car	1,675		

Note: Each vehicle is assumed to travel 20km both ways from CBS to UOL per day.
Para-transit mode is neglected in this calculation.

When students go to University 200 days per year, the amount of reduction is equivalent to 63.7 ha of forest using 10.6 t- CO_2/ha, CO_2 absorption rate of forest per year (Good Practice Guidance on Land Use, Land Use Changes and Forestry, 2005).

25.9.2 Baseline Survey

(1) Purpose of baseline survey

To identify adverse impact on natural and social environments caused by project activities,

the details of baseline surveys of affected lands, houses, shops and other structures, air quality (including dust and pollutants), noise, flora and fauna; and others are required.

Table 25.9-3 shows baseline survey required for the pre-EIA study.

Table 25.9-3 Baseline Survey for the Pre-EIA study

Type of Survey	Item	Location	Method
Air Quality*	TSP, PM10, NOx, CO, weather condition data	1) 2 points along the roads for University Shuttle Bus Services for pre-F/S. 2) 2 points: 1 point in commercial district and 1 point in residential district	Installation of air quality measurement equipment
Noise	dB[A] (Leq8, Leq24 and Lmax)	Ditto (4 points)	Installation of noise level measurement equipment

* Refer to "Air quality and Noise Survey in Vientiane Capital city by MIH and STEA in 2002-2003"

(2) Results of baseline survey

1) Air Quality

At present, there is no official standard for controlling air quality in Lao PDR. However, the international standard has been used for comparison. All the parameters as shown in Table 25.9-4 (1) and (2) are within the standards.

Table 25.9-4 (1) Air quality survey along the Road for Shuttle Bus Service

Parameter	St.1 (Sivilay Market)	St.2 (Wat Phonthong)	International Standard	Japanese Standard
TSP (mg/m3)	0.090	0.105	0.330**	
PM10 (mg/m3)	0.037	0.075	0.10*	0.10
SO2 (ppb)	2.3	3.2		40
NO2 (ppb)	4.1	15.9	273*	40 - 60
CO (ppm)	0.5	0.8	35**	10

*World Bank, **US-EPA

Table 25.9-4 (2) Air quality survey in Commercial and Residential Districts

Parameter	St.3 (Ban Phonkheng)	St.4 (Ban Xieng Yeun)	International Standard	Japanese Standard
TSP (mg/m3)	0.052	0.032	0.330**	
PM10 (mg/m3)	0.047	0.023	0.10*	0.10
SO2 (ppb)	2.7	10.2		40
NO2 (ppb)	13.1	4.7	273*	40 - 60
CO (ppm)	0.6	0.6	35**	10

*World Bank, **US-EPA

2) Noise

The same as air issue, there is no official standard for controlling noise in Lao PDR. In 2006 MCTPC issued the Ministerial Agreement on Technique and sign of Transport Vehicle to control noise, however only horn issue has been determined. Noise source in Vientiane are almost generated from motorcycle driving. The noise levels at St.1 and St.2 are within Japanese standard, however, those at St.3 and St.4 exceed the standard (Table 25.9-4 (3), (4)). Leq24 at St.4 exceeds US-EPA recommended level, 70dB.

Table 25.9-4 (3) Noise level survey along the Road for Shuttle Bus Service

Parameter		St.1 (Sivilay Market)	St.2 (Wat Phonthong)	Japanese standard
Leq (dB)	Daytime	67	62	70
	Nighttime	61	55	65

Table 25.9-4 (4) Noise level survey in Commercial and Residential Districts

Parameter		St.3 (Ban Phonkheng)	St.4 (Ban Xieng Yeun)	Japanese standard*
Leq (dB)	Daytime	61	68	60
	Nighttime	63	78	50

* Area category C: for commerce and industry as well as for a significant number of residences.

25.9.3 Alternatives of the Project

Table 25.9-5 shows project description for alternative 1(with project) and do-nothing (without project).

Table 25.9-5 project description of alternatives 1 and do-nothing

Project	Alternative 1 (With Project)	Do Nothing (Without Project)
Description	Shuttle Bus Service: between CBS and UOL Procurement: 40 units of buses Intersection improvement: three around UOL Road improvement: 3.1 km around UOL New bus terminal: one	Would lead to traffic congestion when existing roads are overloaded and public transport is not sufficiently served

25.9.4 Scoping for Pre-EIA

A comparison of potential impacts of the two alternatives is shown in Table 25.9-6.

Table 25.9-6 Scoping of the Environment and Social Considerations

SHUTTLE BUS SERVICES BETWEEN CENTRAL BUS STATION AND DONGDOK

	Aspect of environment	With Project		Without Project	
		Rating*	Explanation	Rating*	Explanation
Social environment	1. Involuntary Resettlement	B	Minor land acquisition for intersection improvement.		Not applicable.
	2. Local economy such as employment and livelihood, etc.	+	Job opportunities and service activities will be induced around the university.		Not applicable.
	3. Land use and utilization of local resources		No effect is expected.		Not applicable.
	4. Social institutions such as social infrastructure and local decision-making institutions	+	Improved accessibility to social institutions are expected due to reduction of traffic congestion.	B	Low accessibility to social institutions due to traffic congestion should prevail.
	5. Existing social infrastructures and services such as transport and life facilities	++	Transport will be improved due to reduction of traffic congestion.	B	Past trend of transport and utility will prevail.
	6. The poor, indigenous and ethnic people		No effect is expected.		No change will take place for local people.
	7. Misdistribution of benefit and damage		No effect is expected.		Not applicable.
	8. Cultural heritage		No such resources are known to exist.		Not applicable.
	9. Local conflict of interests		No effect is expected.		Not applicable.
	10. Water Usage or Water Rights and Rights of Common		No such right/common is known to exist.		Not applicable.
	11. Sanitation	+	Reduction of traffic congestion will improve health condition of people living along the road.	B	Air quality may worsen along the road.
	12. Hazards (Risk) Infectious diseases such as HIV/AIDS		No effect is expected.		Not applicable.
Natural environment	13. Topography and Geographical features		No significant impact is anticipated.		Not applicable.
	14. Soil Erosion	B	Minor erosion during construction may occur.		Not applicable.
	15. Groundwater		No effect is expected.		Not applicable.
	16. Hydrological Situation		No effect is foreseen.		Not applicable.
	17. Coastal Zone (Mangroves, Coral reefs, Tidal flats, etc.)		No such areas are involved.		Not applicable.
	18. Flora, Fauna and Biodiversity	B	A few shrubs or common trees may need to be removed for a new bus terminal.		Not applicable.
	19. Meteorology		No effect is expected.		Not applicable.
	20. Landscape	+	The green buffers are accommodated along the university campus.	B	Past trend of transport will be prevail.
	21. Global Warming	+	CO2 emission is reduced by shifting transport modes of approximately 2,000 students from motorcycle to bus.	B	CO2 emission from growing vehicles contributes to global warming..
Pollution	22. Air Pollution	+	Air pollution will be improved by reducing the total number of traffic.	A	Air pollution will prevail in the future.
	23. Water Pollution		No significant impact is expected.		Not applicable.
	24. Soil Contamination		No such possibility is foreseen.		Not applicable.
	25. Waste		No significant impact is expected.		Not applicable.
	26. Noise and Vibration	+	Noise and vibration will be improved by reducing the total number of traffic.	B	Present noise should prevail.
	27. Ground Subsidence		No effect is foreseen.		Not applicable.
	28. Offensive Odor	+	Emission-free automobiles will increase.	B	Exhaust gas from vehicles will cause some offensive odor.
	29. Bottom sediment		No effect is expected.		Not applicable.
	30. Accidents	++	Reduced motor cycle students and an improved intersection will reduce traffic accidents.	A	Traffic accidents increase due to growing motorcyclists and poorly designed intersections.

* A: Serious impact is expected; B: Some impact is expected; C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progresses.); No Mark: No impact is expected. IEE/EIA is not necessary.

Where positive impact is expected,
++: Significantly positive impact is expected; +: Some positive impact is expected.

25.9.5 Expected Environmental Impacts of the Pre-FS and Mitigation Measures

Shuttle bus service proposed by the master plan would bring some impacts on natural and social environments, especially positive impacts that will reduce CO_2 emission by shifting transport modes.

The other positive impacts will be anticipated:

- By reducing the motor cycle student and improving the intersection configurations and traffic signals, the number of the traffic accidents, in particular, of motor cycle users, will be reduced. At the present approximately ten fatalities are reported every year.
- By reducing the total number of traffic, traffic congestions will be mitigated along the commuting routes between UOL and CBD.
- To accommodate the green buffers along the university campus, the university zone will be protected from traffic noise and pollution caused by through traffic on Dong Doc Road. After connecting with a toll highway between National Road No13 and the Friendship Bridge will increase through traffic dramatically.

The following negative impacts will be anticipated.

- Minor land acquisition for intersection improvement.
- As an option for land acquisition of the private house, the surrounding road widening by approximately 5m will encroach into the university property. In this case fencing and green buffer will be required to protect university atmospheres and landscaping.
- For a new bus terminal proposed in the adjacent area of the university campus, preservation measure of the trees and green will be required.
- Temporary pollution and traffic congestion during construction stages will be occurred.

Mitigation Measures;

- Where acquisition of local residential land and relocation of local people are required, resettlement action plans with appropriate compensation measures will be prepared to minimize significant adverse impact on local residents especially, on the poor and vulnerable group of people.
- Propose fencing and green buffer to protect university atmospheres and landscaping.
- Preservation measure of the trees and green should be taken for a new bus terminal proposed in the adjacent area of the university campus.
- Proper signage and information dissemination should be prepared by the contractor during construction period to avoid an accident.
- Appropriate traffic control measure and traffic management plan should be prepared during construction periods.

- Water spray for earth road surface during construction period can minimize negative impact.
- All vehicles, equipment and machinery used for construction shall be regularly maintained and correctly operated (including the use of dust filters or hoods) so that air quality conforms to acceptable standard.
- Construction materials (sand, gravel and rock) and spoil materials will be transported by truck covered with tarpaulins, and storage of construction materials must be appropriate, especially inflammable and explosive materials.

25.9.6 Environmental Management Plan

According to "Regulation on Environmental Impact Assessment of Road Projects in Lao PDR (2004)", provided with guidance for environmental assessment requirements and procedures, regulation for assessing a project in road sector, EIA is required by projects involving the following activities;

1) New construction or major rehabilitation within the ROW.
2) New construction or construction outside the original ROW.
3) Construction in Environmentally sensitive areas such as: human settlement, protected forest areas, areas of historical and cultural heritage preservation, etc.

Therefore, the project does not require EIA but IEE because of small rehabilitation within the original ROW without passing through environmentally sensitive areas.

Table 25.9-6 shows General Contents of IEE report in the Lao PDR.

The IEE report to be submitted to STEA should include;

- Institutional Requirement
- Environmental Monitoring and Management Plan
- Environmental and Monitoring Cost

For details, refer to Section 4 of Chapter 22.

Table 25.9-7 General Contents of IEE report in the Lao PDR

Chapter 1: Introduction
- Name and address of project owner
- Name, address and affiliation of the author of the report
- Purpose of the report
- Objectives of the project

Chapter 2: Project Description
- Type, size and location of project
- Project activities and their timing/ sequence
  - Construction period
  - Operation period
  - Closure period
- Quantity and quality of raw material to be used
- Quantity and quality of waste products generated by the project
- Project costing

Chapter 3: Environmental Description of Project Area (baseline data)
- Physical
- Biological
- Economic
- Social

Chapter 4: Environmental Impacts
- Impacts during project construction period
  - Physical (air, water, land)
  - Biological (fauna and flora)
  - Economic
  - Social
- Impacts during project operation period
  - Physical (air, water, land)
  - Biological (fauna and flora)
  - Economic
  - Social
- Impacts during project closure phase
  - Physical (air, water, land)
  - Biological (fauna and flora)
  - Economic
  - Social

Chapter 5: Environmental Management Plan
- Protective or reductive measures for environmental impacts
- Compensation measures (if any)
- Institutional arrangements, timing and budgets for implementation of EMP
- An environmental monitoring programme

Chapter 6: Description of Public Involvement Activities during IEE

Chapter 7: Conclusions and Recommendations

25.9.7 Actions to be Taken for the Further IEE

Shuttle bus service proposed would bring some impacts on natural and social environments, especially positive impacts that will reduce CO_2 emission by shifting transport modes.

To conduct IEE, the followings are recommended;

- Land acquisition plan;

It is important that the Laos government obtains the consent from land owners and leaseholders concerning land acquisition. The government computes the compensation expense based on land, trees, etc. In the project is needed land acquisition for intersection improvement and road widening (5m x 3.1km) which has alternatives- acquisition of residential or university side.

- Environmental monitoring plan;

Drawing up an environmental monitoring plan, it is important that the government builds a monitoring organization. In order to prevent bad influence on environment during and after construction a monitoring organization is built for monitoring dust discharge, maintenance of the construction vehicles, noise, vibration and generation of turbid water. A plan contains a monitoring organization, monitoring items, places to be monitored, number of times, networking, reporting and budget.

- Detailed project plan

The Lao EIA regulation stipulates that the detailed project plan determined at F/S or B/D stage should be included in the IEE report.

25.10 RECOMMENDATIONS

1. Students who want to use bus if the preferable bus service starts is 93%. It is very high figures.
2. Estimation of the number of students to be expected to make modal shifts by improvement of service levels cannot be exactly estimated due to a lack of an experiment. Therefore, at the beginning of the operation, passenger surveys are recommended.
3. The government may consider a public transport promotion policy with introducing favorable taxes to be provided to both the state and the private companies.
4. VSBC will be the most suitable candidate for the shuttle bus operation. When they intend to operate shuttle bus services, technical assistance of shuttle bus operation is recommended to be provided.
5. A Shuttle Bus Service Committee will be established by the university administration

and bus operator to discuss bus timetables, bus routes, bus stops, bus fares, etc.

6. Vehicle types must be considered for financially feasible operation, in particular, engine type. Electric engine is strongly recommended.

PART VI

CONCLUSION AND RECOMENDATIONS

CHAPTER 26

CONCLUSION AND RECOMMENDATIONS

CHAPTER 26 CONCLUSION AND RECOMMENDATION

26.1 CONCLUSION

Based on the results of various surveys and analyses, the future of urban transport in Vientiane was forecasted. Strategies and measures to cope with the future transport demand were discussed and proposed. These discussions and proposals are summarized below.

26.1.1 Urban Transport Master Plan

(1) Urban Transport System

- It is foreseen that Vientiane will become one of the main hubs of transport in the Greater Mekong Sub-region.
- A comprehensive transport plan is proposed integrating the development plans and considering future socio-economic growth of Vientiane.
- The proposed transport master plan is expected to bring about smooth and safe traffic condition which results in better living environment including better air quality.
- Combination of 'Completion of Road Network Scenario' and 'Bus Favored Scenario' (with co-existence of para-transit and a long-term vision of LRT) is selected as the optimum scenario.
- It is proposed to set a target of converting 40 % of trips carried by motorcycles and private cars to public transport in year 2025.
- It is expected that implementation of the Master Plan reduce HC and CO by about 50 % and NOx and CO2 by about 30 % compared with the case where nothing is done.

(2) Road Network Development

- A road network with a basic pattern consisting of radial arterial roads and circular arterial roads is proposed. Arterial roads in radial direction are No. 13 North Rd. (Luan Phabang Rd.), Lane Xang Ave./Kaysone Phomvihane Rd./No. 13 South Road and Thadeua Rd. while circular arterial roads are Inner Ring Road and Outer Ring Road.
- This road network is to connect major planned development project sites, as well as to accommodate international traffic.
- The traffic condition in the Study Area is not severely congested at present but congestion is anticipated in the future due to rapid growth of vehicle ownership.

- Thus, it is proposed to start preparation for widening of existing streets/road, construction of missing links and improvement of problematic intersections.

- Such widening, construction and improvement are proposed to be implemented in stages to cope with the growth of traffic volume.

- It is proposed that the Government start actions for securing ROW for future widening by designating the future ROW in the urban plan and regulating construction of new buildings in the designated ROW.

- In total, 50 road projects, 5 bridge projects and 7 intersection improvement projects are proposed.

- These projects are to be implemented in 3 terms as follows:

  Short Term: Year 2009 – 2013
  Medium Term: Year 2014 – 2018
  Long Term: Year 2019 – 2025

- A case study on New Construction of Missing Link of Inner Ring Road was conducted.

  - Preliminary design for the section was prepared between Dong Palaep Rd. and Nong Duag Rd. based on the necessary surveys.
  - The length of the section is estimated to be approximately 4.7 km.
  - The proposed cross section consists of one full lane and one motorcycle lane for one direction.
  - The project cost is estimated at approximately US$ 12.96 million.
  - This Project yields good economic return as shown below:
    EIRR = 18.5%, B/C Ratio = 1.57, NPV = US$ 6.8 million
  - Surveys for pre-EIA were conducted and no serious negative impact on natural and living environment is anticipated.
  - As for social impact, relocation of about 10 houses is anticipated in either case of the alternative routes.

(3) Public Transport Development

- Strengthening of public transport is necessary for providing safe, smooth and comfortable mobility to various people including commuters, students and disadvantaged people.

- Strengthening public transport is also necessary to reduce the use of private vehicles, including motorcycles, and thus, reduce vehicle emission.

- The large share of the current public transport is borne by para-transit consisting of Tuk-tuk, Jumbo and Songtheo, and the share of bus is limited.

- Thus, it is proposed to strengthen the bus services.

- The existing para-transits are proposed be gradually shifted to feeder transport and short-distance transport, and later transformed to modern, short-distance and on-demand type transport.

- It is anticipated that LRT may become necessary and/or feasible in the long future.

- It is estimated that the following number of buses are required to transport the people who will shift from motorcycles and private cars to buses:

  - 264 units by year 2013 (End of Short Term)
  - 310 units by year 2018 (End of Medium Term)
  - 352 units by year 2025 (Target year or end of Long Term)

- The main operator of large buses is supposed to be VSBC considering the fact that it has sufficient experience of operating fixed route buses, while the present operators of para-transit are proposed to switch to the operators of mini buses or similar transport and provide the services of feeder transport and local bus services.

- The main routes of bus operation should cover all of Primary Arterial, Arterial and Collector streets of the proposed road network.

- Express bus with large capacity is proposed along the routes where high demand is expected.

- To secure smooth and reliable operation of bus services, such facilities as fixed bus stops with shelter and pool for para-transit, bus-priority lane and/or exclusive bus lane and traffic light system adjusted to bus operation should be provided.

- In the Long Term, Bus Rapid Transit (BRT) system with segregated bus lane and bus stops should be introduced.

(4) Traffic Management and Traffic Safety

- GOL is studying and implementing various measures of traffic management and traffic safety with support of the donors.

- Installation of raised median and properly designed pavement markings is expected to

improve traffic flow and reduce traffic accident.

- Provision of left-turn lane in the approaches of some intersections is expected to effectively improve the traffic flow.

- Enforcement against illegal parking should be strengthened.

- There needs to be standard guideline for traffic control devices (traffic signs, pavement markings etc) to minimize the confusion on the side of drivers.

- Establishment of computerized data collection and analysis system of traffic accidents is proposed to identify the accident black spots and prepare proper safety measures.

- Education of drivers and pedestrians should be enhanced.

- A total of 7 black spot intersections are selected and measures of improvement are proposed.

(5) Financing Plan

- The amounts of fund needed for implementing the Master Plan projects, including road network development, public transport development and traffic management/safety, for Short-, Medium- and Long-Term are US$ 99 million, US$ 114 million and US$ 143million, respectively.

- For the road network development, the maximum required annual budget is estimated to be approximately US$ 20 million which is considered to be within possible range in view of the current budget amount of roads in Vientiane.

- It is anticipated that the Government needs to borrow fund from foreign aid agencies to fill the financial gap between the amount required for road projects and its own fund up to year 2016, but will have surplus of fund and will be able to amortize the loan as the economy grows.

- For procurement of buses, US $ 8.5, 17.4 and 25.7 million are needed for Short-, Medium- and Long-Term, respectively.

- In view of the present tight financial condition of VSBC, the Government needs to consider either introducing foreign financial assistance or Government's own fund for procurement of the required bus fleet.

- There is a possibility that the financial condition of VSBC be improved as the number of

bus unit increases and the revenue increases because the relative share of fixed cost generally decreases as the revenue increases.

- Although private participation should be promoted, it is not expected that bus services operated by private investors bear large share.

- The amount of cost for installing public transport facilities, such as bus lane, is relatively small compared to the cost of the proposed Road Projects. Therefore, implementation of such facilities should be planned together with the relevant road projects.

(6) Economic Evaluation of Master Plan

- The Master Plan projects yield good economic return as shown in the tables below.

Table 26.1-1 Results of Economic Analysis for Road Network Development

	V/C Ratio	Travel Cost (US$1,000)	EIRR (%)	B/C	NPV (US$1,000)
Do-Nothing	1.38	516,172	-	-	-
Master Plan (Scenario 3)	0.71	414,736	18.1	1.54	87,237

Table 26.1-2 Results of Economic Analysis for Public Transport Development

	V/C Ratio	Travel Cost (US$1,000)	EIRR (%)	B/C	NPV (US$1,000)
No-Action on PT (Alt. 1)	0.71	414,736	18.1	1.54	87,237
Master Plan (Alternative 3)	0.47	269,815	39.6	4.17	551,257

(7) Environmental Evaluation

- No serious negative impact for natural environment is foreseen since the Master Plan proposes projects mainly already developed area.

- Some negative social impact is anticipated widening and new construction of roads. Such impact can be mitigated by designating the future ROW and regulate building new house within the designated ROW.

- The Master Plan, as a whole is expected to reduce traffic congestion and air pollution.

26.1.2 Pre-Feasibility Study

(1) Selection of Projects for Pre-Feasibility Study

- Projects of shuttle bus service between the Central Bus Station and Dongdok (National University of Laos) are selected considering their urgency and large benefit.

- Shuttle Bus Services Between Central Bus Station and Dongdok (National University of Laos)

- Because the present bus operation between the Central Bus Station (CBS) and the National University of Laos (NUOL) in Dongdok is not fully satisfying the demand, many students are obliged to commute by motorcycles.

- Commuting by motorcycles results in unfavorable situations including increased traffic accidents and traffic congestion.

- The outline of the planned Shuttle Bus Service is as follows:

  - Service Hours: 6:30 AM (Departure from CBS) – 9:00 PM (Departure from NUL)
  - Frequency: Around 1 per 3 min. during peak hours
  - Target Number of Passengers: 4,000 passengers/day (one way)

- Forty (40) units of buses are required to provide the above service

- It is desirable to improve the roads and intersections around NUOL so that the buses can run smoothly.

- Total cost of the entire Projects, including procurement of new bus fleet, improvement of roads and intersections, and construction/improvement of bus terminals and bus stops, is estimated at US$ 8.96 million.

- Economic return of bus operation, excluding improvement of associated facilities, yield good economic return as summarized below:

  EIRR = 26.1 %, B/C Ratio = 1.37, NPV = US$ 1.68 million (With discount rate of 12 %)

- On the other hand, financial analysis shows low return:

  FIRR = 8.7 %, B/C Ratio = 0.90, NPV = US$ -527,000 (With discount rate of 12 %)

- This relatively large difference between economic indicators and financial indicators may, at least partly, be attributed to the duty and other taxes imposed on import and sales of buses.

- Surveys for pre-EIA were conducted and no serious negative impact on natural living environment is foreseen.

- Positive impact of the project is reduction in vehicle emission: Reduction of CO2 equivalent to 63.7 ha of forest absorption is expected.

26.2 RECOMMENDATIONS

(1) Authorization of Master Plan

- This Urban Transport Master Plan has been prepared incorporating future development plans and forecasted socio-economic growth of Vientiane and is expected to support sound urban development of Vientiane and healthy and comfortable lives of the citizens.

- The Master Plan proposes various projects for achieving the objective of Master Plan. These projects are technically and economically feasible.

- Also, these projects can be financed by the Government's own fund and/or foreign assistance which can be amortized in the near future.

- In view of the rapidly growing worldwide concern on global warming and soaring of fuel prices, the Master Plan increases its significance.

- However, because of large-scale investment and necessity for change of social paradigm, the Master Plan needs political commitment if it is to be implemented.

- Therefore, it is strongly recommended that the Master Plan be authorized by being incorporated into the national environment policy and/or development plan of Vientiane.

- Above others, the target of "shifting 40 % of trips using motorcycle and private cars to public transport" should be adopted in the national policy on environment and transport.

(2) Urgent Action

- The current traffic congestion in Vientiane is not severe compared with those in the capital cities of other ASEAN countries.

- However, due to rapid increase of motorcycles and private cars, severe traffic congestion is anticipated in the future.

- Therefore, it is recommended that the Government take urgent actions to secure right of way for future widening of the roads/streets.

- For securing future right of way in a manner with minimum negative social impact, it is recommended that the government designate the future right of way and regulate building of new houses within the designated right of way.

- The current VSBC is considered to possess sufficient capacity/experience for operation of bus services. However, there is no well-recognized future business plan.

- This situation is hampering VSBC from taking actions necessary to improve its transport services.

- Therefore, it is recommended that the Government prepare, in close consultation with VSBC, the future business plan of VSBC which covers plan of increasing bus fleet and financing plan for it.

- Planning and implementation of urban transport measure need participation and coordination of various concerned parties. Therefore, it is recommended that a committee for discussing the problems of urban transport be established.

(3) Pilot Project

- The projects for which pre-feasibility study was conducted in this Study is intended to serve as the 'Pilot Project' for public transport project, respectively, proposed in this Master Plan.

- It is expected implementation of this projects give great amount of valuable knowledge for actually implementing the Master Plan Projects.

- Therefore, it is recommended that the Government implement these projects. If necessary, the Government should seek financial and/or technical assistance of multi-lateral and/or bilateral donors.