

(4) Results and Analysis

a. Passenger Characteristics (refer to Table 20.2-2, Figure 20.2-5 and Figure 20.2-6)

- The total number of bus passengers from 1 to 30 June was 103,239 (Line 1: 60,276 and Line 2: 42,963). The average daily passengers and passengers/bus are 3,441 and 156 (Line 1: 126 and Line 2: 206). The maximum number of daily passenger was 5,487 recorded on 4 June. The percentage of transfer passengers out of total passengers was approximately 25%.
- Average numbers of daily passengers by fare level were 4,687 for 500 riels and 2,738 for 800 riels.
- Peak hour of passengers was 8:00 - 9:00 for Line 1 and 16:00 - 17:00 for Line 2. Peak hour ratio was 10.2% and peak hour passenger was 351.
- The busiest bus stop was Chabar Ampauv (bus stop no. 1-2) with 1,741 boarding/alighting passengers/day and the bus stop with the largest number of students was also Chbar Ampauv with 540 students, according to the bus passenger count survey by bus stop on 29 June.
- A relatively large numbers of passengers, between 600 and 1,030, including transfer passengers, get on/off at Central Market (41) and at four (4) transfer bus stops (Line 1: Preah Yukunthor (17, 17N & 18) and Central Market – West (25 & 26) and Line 2: Khan Prampi Makara (47) and Preah Monivong (56)).
- The percentage of student passengers is relatively high, especially along Line 2, along which many schools are located. The percentages of students at Preah Sisowath (43) and Chak Tokmuk (44) was 76.6% and 79.1%, respectively.
- Based on the passenger OD survey results the desire lines between bus stops were constructed. The 56 bus stops are clustered into seven (7) groups and the resultant desire lines are shown in Figure 20.2-6. The busiest desire line is between Chabar Ampauv and Monivong Blvd. in the central area along Line 1 (400 trips/day). The busiest desire line between the two bus lines (with transfer) is between Chabar Ampauv of Line 1 and West side of Monivong Blvd. of Line 2 (185 trips/day).

b. Operational Characteristics

- Bus travel speed is summarized in Table 20.2-3. Actual travel speed was higher than the estimated figure which had been calculated before the Experiment. This was more evident for Line 1 than Line 2. Consequently, many waiting buses were observed parked at the bus turning points, such at Chbar Ampauv.

Table 20.2-3 Bus Travel Speed

Unit: km/hour

Line	Peak/Off-peak	Estimated (Before experiment)	Actual (During experiment)	Difference
Line 1	Peak	10.3	13.4	3.1
	Off-peak	11.8	14.4	2.6
Line 2	Peak	10.8	11.7	0.9
	Off-peak	12.5	14.5	2.0

Note: Bus travel speed at peak period is the average speed between 6:30-8:30 and 16:30-18:30
 Bus travel speed at off-peak period is the average speed from 8:30-16:30.

- Average trip length per bus was approximately 95 km and average fuel consumption per bus was 4.5 km/liter.
- Bus availability was 85% (23 operational buses against the total of 27 buses).
- Number of staff per bus was 3.3 (actual total number of staff was 88).

c. Results of Interview Survey of Bus Passengers, Shop Owners, Residents and Motodop Drivers

- Degree of awareness and social acceptance of the city bus system
 - The degree of awareness of the city bus system by the citizens of Phnom Penh was high not only before the Experiment but also after the Experiment. In particular the degree of awareness was almost 100% after the Experiment (refer to Figure 20.2-7 A).
 - Television and radio were the most effective media for promoting awareness of the Bus Operation Experiment. After television and radio, the street banner was the next most effective method of promotion (refer to Figure 20.2-7 B).
 - The degree of acceptance of the Experiment was very strong and there was a great deal of positive feedback from the participants. For instance, a number of passengers were of the opinion that the bus operation should not only be continued but expanded as well increased, especially after the Bus Operation Experiment (refer to Figure 20.2-7 C).
- Utilization of bus
 - More than 60% of interviewees at Central Market and Olympic Market had used the buses. The percentage of those who had used the bus two times or more was 53.3%. On average those interviewed had used the buses 4 times (refer to Figure 20.2-7 D).
 - The patronage of the bus service of residents along the bus routes was higher than that of people interviewed at the markets. On average residents along the bus routes had used the buses 12 times. (refer to Figure 20.2-7 D).
 - Of the total number of interviewees, 49.2% were students and 15.2% were housewives. Consequently the trip purpose for 26.3% of the interviewees was “to/from school” and trips for private purpose was 22.1% of the total. (refer to Figure 20.2-7 E)
 - The percentage of “to/from school” trips was smaller on 28 June than on 13 June, and consequently the percentage of other trip purposes such as “to/from work,” “to/from business,” and “to/from shopping” became larger. As the days of the experiment went by, the trip purpose of bus passengers became varied (refer to Figure 20.2-7 E).
- Evaluation of bus system by the bus passengers (refer to Figure 20.2-7 F).
 - All of the evaluation items under “degree of satisfaction of bus passengers” received high marks. This indicated that bus passengers were almost fully satisfied with the service.
 - At the beginning, the degree of satisfaction for operational speed and frequency was relatively low, compared with the other items such as comfort. As the Experiment progressed, the degree of satisfaction for operational speed and frequency gradually improved.

For the better urban life and environment of the City



Bus Body Sticker

Table 20.2-2 Bus Passenger Characteristics

Items		Unit	Figures	Remarks
Number of passenger	One-month total	Line 1	60,276	
		Line 2	42,963	
		Line 1+2	103,239	
	Daily average	Line 1	2,009	
		Line 2	1,432	
		Line 1+2	3,441	
	500 riels flat fare	Line 1	2,454	
		Line 2	1,893	
		Line 1+2	4,347	8,400 *1
	800 riels flat fare	Line 1	1,693	
Line 2		1,115		
Line 1+2		2,808	4,800 *1	

Items		Unit	Figures	Remarks
Peak hour ratio	Line 1	%	10.7	8:00-9:00
	Line 2	%	11.3	16:00-17:00
	Line 1+2	%	10.2	8:00-9:00
Percentage of transfer passenger	Line 1	%	20.9	
	Line 2	%	30.0	
	Line 1+2	%	24.7	
Passengers/bus	One-month total	Line 1	126	
		Line 2	206	
		Line 1+2	156	
	500 riels flat fare	Line 1	153	
		Line 2	274	
		Line 1+2	198	
	800 riels flat fare	Line 1	106	
		Line 2	159	
		Line 1+2	128	

Note. *1: Estimated before experiment

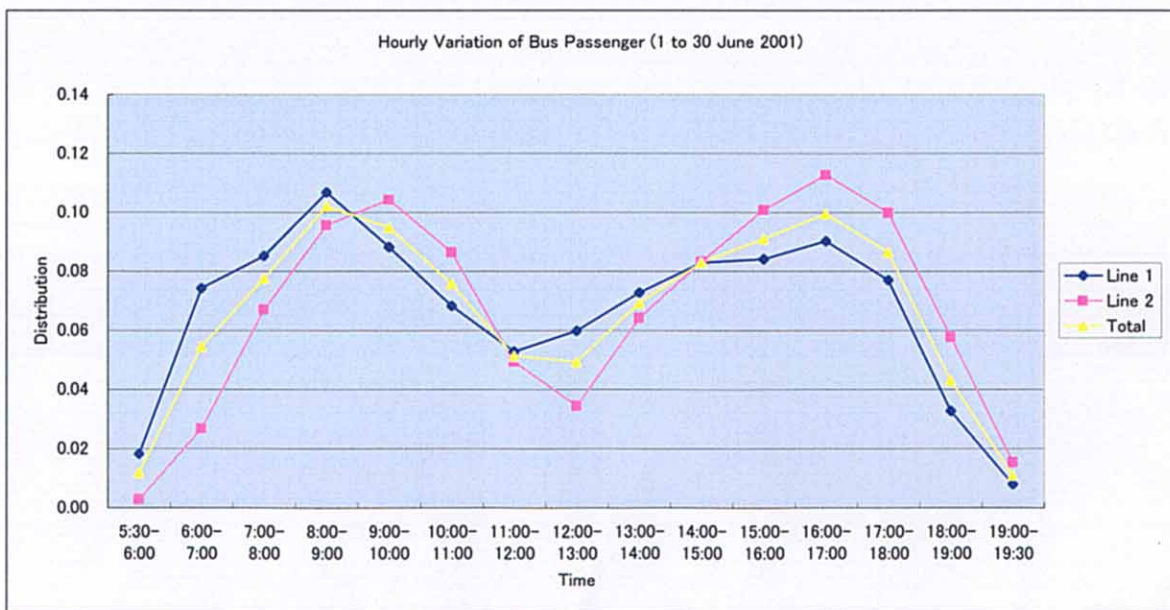


Figure 20.2-4 Bus Passenger Characteristics

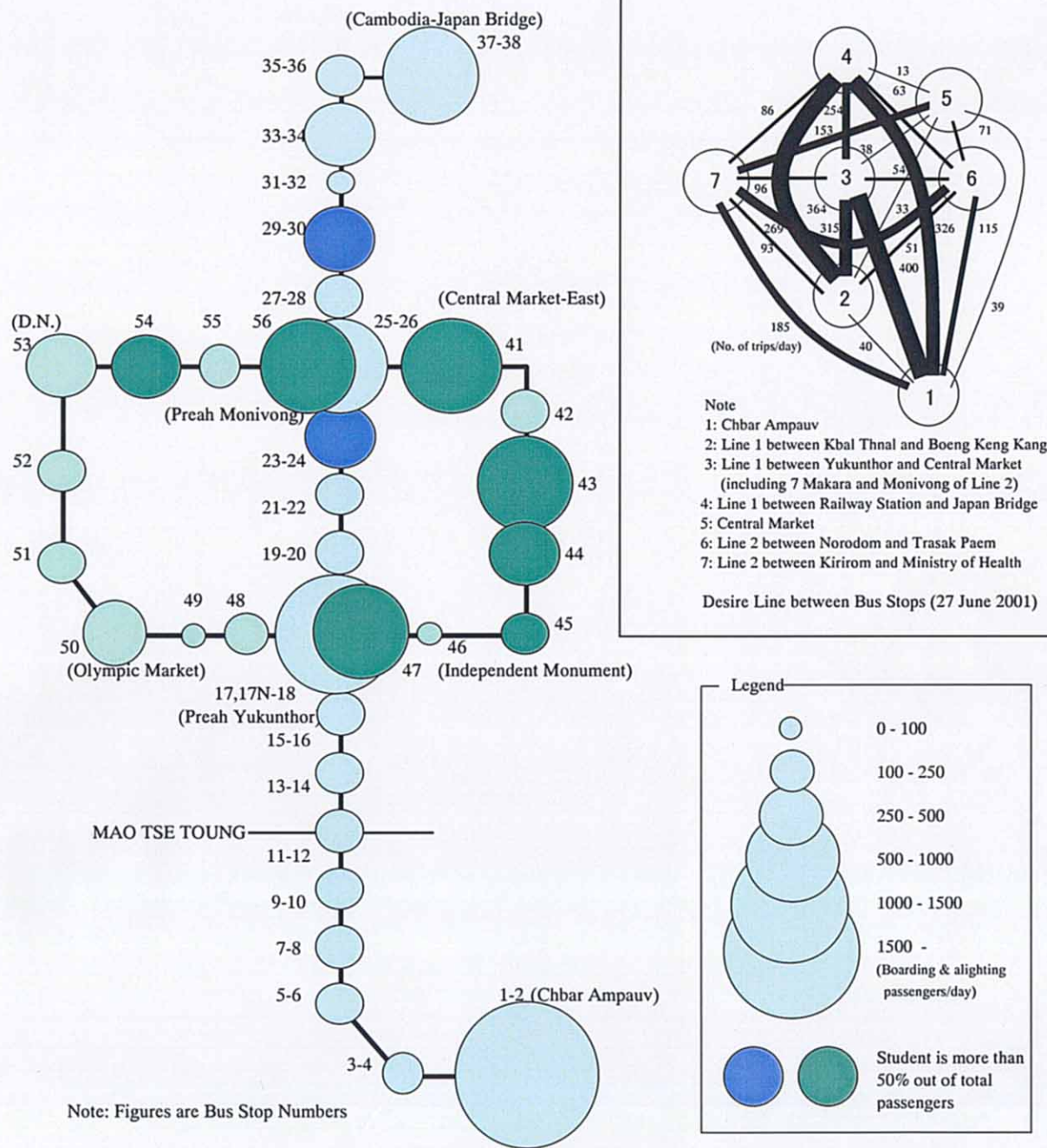
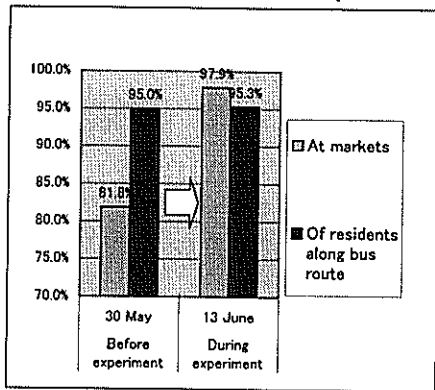
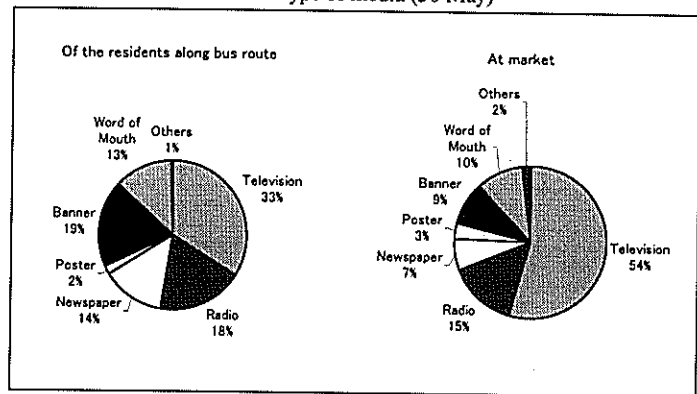


Figure 20.2-5 Boarding and Alighting Passengers by Bus Stop (29 June 2001)

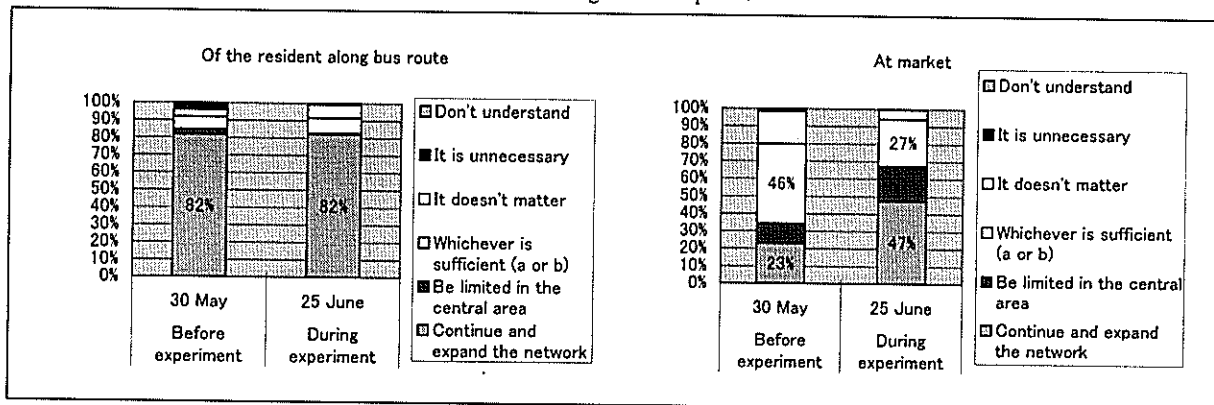
A. Degree of awareness of the experiment



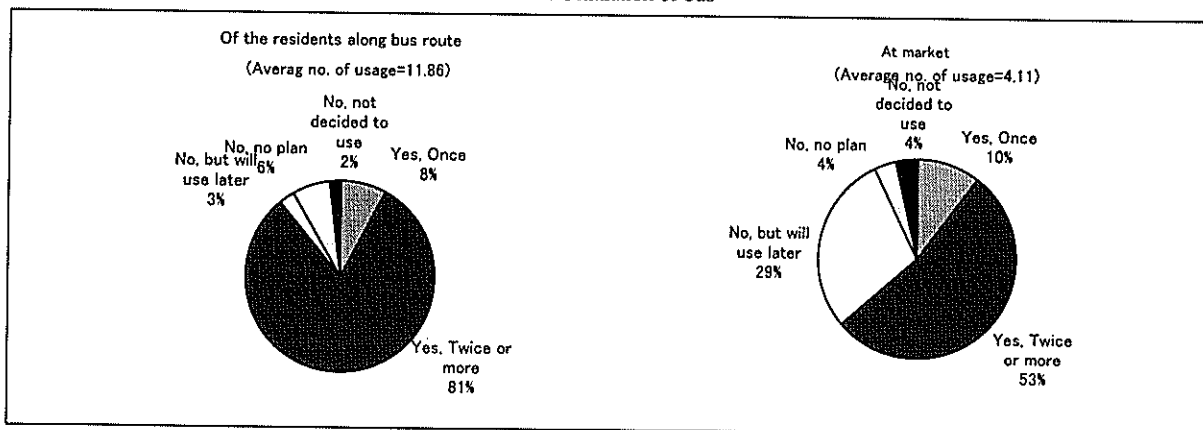
B. Type of media (30 May)



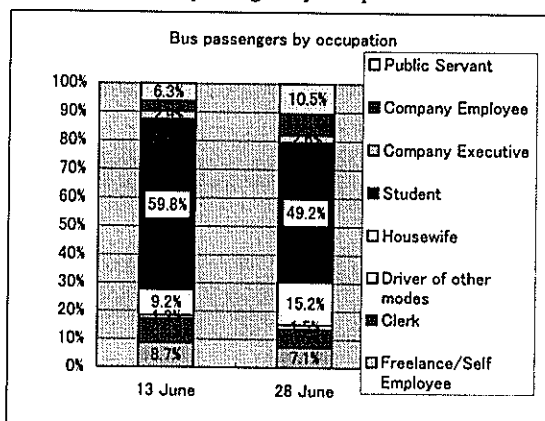
C. Degree of acceptance



D. Utilization of bus



E. Bus passengers by occupation



F. Degree of satisfaction

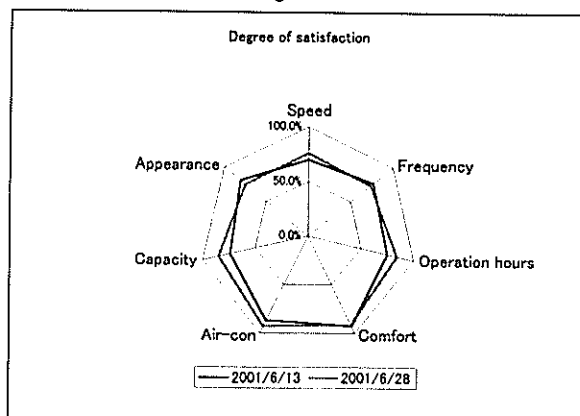


Figure 20.2-6 Results of Interview Survey

20.2.2 Experimental Prohibition of 2-Wheel Vehicles

At present the traffic congestion in the Study Area is being amplified by the mixed traffic condition. There is a rule that 4-wheel vehicles use the left lane and motorcycles, bicycles and cyclos use the right lane on 4-lane road, and this rule is observed fairly well. However, the difference in characteristics of movement between 4-wheel vehicles and motorcycles often disturbs traffic flow, causing congestion. In addition, the continuous flow of motorcycles on the right lane also tends to obstruct buses at bus stops and hinders the smooth operation of buses.

One of the measures to solve this problem is to exclude 2-wheel vehicles on certain designated roads. This regulation, however, may cause social conflict. Therefore an experiment was necessary to evaluate the reaction of the general public to the prohibition of 2-wheel vehicles on certain roads. For this reason, an experiment on Preah Monivong Blvd was planned and implemented during the same period as the Bus Operation Experiment in June 2001.

In the experiment, vehicles other than motored 4-wheel vehicles (motorcycles, bicycles, motorbikes, cyclos etc; referred to as "2-wheel vehicles") were prohibited to enter the section of Preah Monivong Blvd between Samdach Preah Sihanouk Blvd and Charles de Gaulle Blvd (Figure 20.2.1) during the period (1 to 30 June) and time zone (5:00 AM to 7:30 PM) of the Bus Operation Experiment.

(1) Improvement/Repair of Pavement of Detour Route

Selection of Detour Route

When 2-wheel vehicles are excluded from the Preah Monivong Blvd, they need to be directed to appropriate detour routes. These detour routes require to be in desirable condition for the smooth and safe movement of the detoured traffic. Street 63 (Oknha Trasak Paem) and Street 105(107) were chosen as the main detour routes for the reason that the both roads are running close and parallel to Preah Monivong Blvd. (Figure 20.2-9)

St. 63 runs on the east side of Preah Monivong Blvd from St. 466 (Oknha Nhek Tioulong) in the south of Mao Tse Toung Blvd to the Central Market. The road was paved, but the pavement had deteriorated. There were many pot holes on the pavement and vehicles had to slow down to avoid the holes. As a result, the road was not functioning to its full capacity. St. 105 was an unpaved street stretching from Oknha Tep Phan Street to St. 432, on the west side of Preah Monivong Blvd. Because it was unpaved, the street was little used. St. 107 runs on the west of St. 105 from Russian Blvd to Preah Sihanouk Blvd. This road is paved and in fair condition, except the section between Russian Blvd. and Kampuchea Krom Blvd. St 105 and St. 107 were expected to function as the detour route in combination.

Improvement of Pavement Condition of the Detour Route

To improve the travel environment of the detour roads, the pavement of St. 63 was repaired and St. 105 was paved with asphalt concrete. The works started on 26 December 2000 and were completed by 15 March 2001.

The section of the pavement improvement of St. 63 was from the Central Market to St. 278. The repair works included;

- (i) Filling the pot holes with selected granular materials,
- (ii) Resurfacing with 5 cm-thick asphalt concrete,
- (iii) Repairing damaged curbs,
- (iv) Painting road markings (lane mark, stop line, pedestrian crossing etc) and repairing/installing traffic signs, and
- (v) Cleaning and repairing clogged drainage pipes and catch basins adjacent to the street.

For St. 105, the section between Oknha Tep Phan Street (St. 182) and St. 278 was newly paved. Also, the section of St. 278 between St. 105 and Preah Monivong Blvd was paved. The scope of the works were similar to those of St. 63, except that the pavement was newly constructed.

The road markings on Preah Monivong Blvd were also renewed to enable smooth flow of the traffic.

(2) Effect of Improvement

Change in Traffic Volume

Traffic surveys were carried out on several occasions on Preah Monivong Blvd. and the detour routes; prior to the start of the pavement work (January 2000), after completion of pavement work (March 2001), before the start of the Public Experiment (29 May 2001), mid-point of the Public Experiment (June 2001-1) and near the end of the Experiment (June 2001-2). (With regard to Monivong Blvd, traffic volume data surveyed in Jun. 2000 was also available.) These data are compared in Tables 20.2-4 – 20.2.6 and Figure 20.2-8.

From the tables, the following can be identified:

- Immediately after the pavement works had been completed, traffic volume on St. 105 increased drastically, from less than 2,400 vehicles/day to 15,000 vehicles/day. The number of motorcycles on Monivong Blvd decreased by more than 20,000 immediately after the completion of the improvement of the detour routes.
- This indicates that traffic on the arterial roads will divert to local streets if the pavement conditions of the local streets are improved. Thus, improvement of local (minor) streets is effective in diverting traffic from arterial street and reducing traffic congestion the arterial streets.
- The number of motorcycles on Monivong Blvd decreased during the Experiment to about half of that before the start of the Experiment and continued to decrease. In the plan of the Experiment, 2-wheel vehicle and cyclos were to be completely prohibited on Monivong Blvd, but in reality, about half of the regulated vehicles entered the prohibited section. This indicates that implementation of regulations requires some time before they become fully effective.
- The traffic volume on St. 63 did not increase significantly after the improvement, but drastically increased during the Experiment.

Table 20.2-4 Change of Traffic Volume (a) Monivong Blvd

	Traffic Volume (Veh/day)					
	Jun. 2000	Jan. 2001	Mar. 2001	May 2001	Jun. 2001 (1)	Jun. 2001 (2)
Light Vehicle	15,017	14,993	13,961	9,334	10,088	10,124
Heavy Vehicle	258	175	191	147	360	359
Motorcycle	93,390	100,334	79,933	60,819	26,138	20,839
Bicycle & Others	3,834	6,420	4,591	4,368	2,063	2,109
Total	112,500	121,922	98,676	74,668	38,649	33,431

Table 20.2-5 Change of Traffic Volume (b) St. 63 (Trasak Paem)

	Traffic Volume (Veh/day)				
	Jan. 2001	Mar. 2001	May 2001	Jun. 2001 (1)	Jun. 2001 (2)
Light Vehicle	3,664	3,932	4,608	4,178	3,808
Heavy Vehicle	273	90	166	113	82
Motorcycle	24,077	24,396	19,267	42,278	44,272
Bicycle & Others	1,429	2,213	2,629	3,800	3,444
Total	29,443	30,631	26,670	50,369	51,606

Table 20.2-6 Change of Traffic Volume (c) St. 105

	Traffic Volume (Veh/day)				
	Jan. 2001	Mar. 2001	May 2001	Jun. 2001 (1)	Jun. 2001 (2)
Light Vehicle	262	2,270	2,634	2,136	2,053
Heavy Vehicle	27	3	146	133	153
Motorcycle	1,676	11,597	17,609	31,856	31,775
Bicycle & Others	391	1,198	2,509	3,153	3,112
Total	2,346	15,098	22,898	37,278	37,093

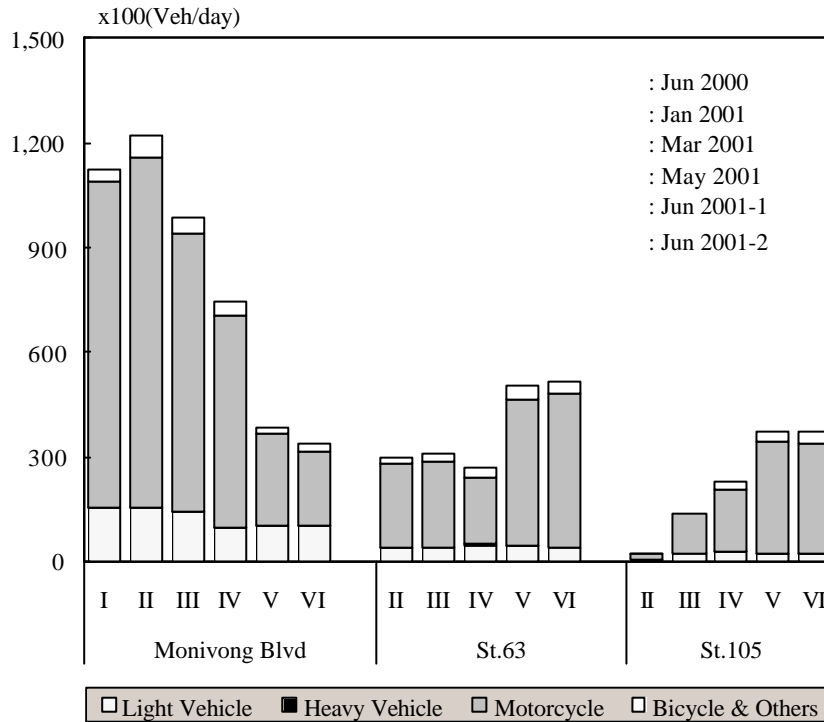


Figure 20.2-8 Change of Traffic Volume Before and During the Public Experiment

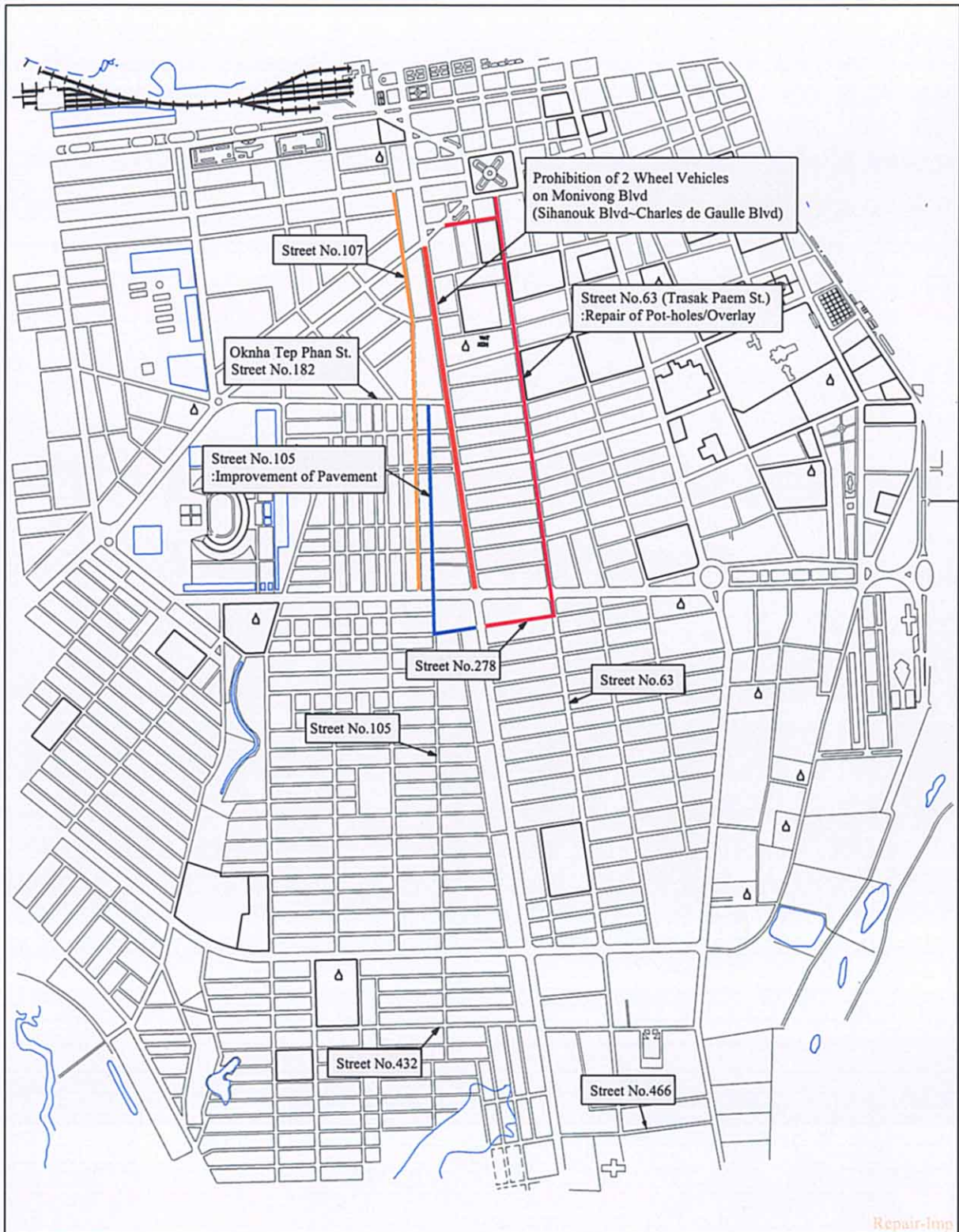


Figure 20.2-9 Location of Repair/Improvement of Pavement of Detour Route

Travel Speed

The average travel speed on Monivong Blvd. and the detour routes are as shown in Table 20.2-7. Travel speed on Monivong Blvd increased during the Experiment while those on the detour routes decreased. This is due to the diversion of traffic from Monivong Blvd to the detour routes.

Table 20.2-7 Travel Speed on Monivong Blvd and Detour Routes (Average of day; km/hr)

	Direction	Jan. 2001	Mar. 2001	Jun. 2001 (1)	Jun. 2001 (2)
Monivong Blvd	S – N	16.7	22.9	21.2	21.5
	N – S	17.4	22.3	21.6	22.2
Trasak Paem Street	S – N	19.0	19.4	16.1	16.3
	N – S	*	18.2	16.7	17.1
Street No. 107/105	S – N	16.6	14.9	14.7	15.2
	N – S	16.6	15.6	15.2	15.2

*One-way regulation was implemented and traffic was allowed only in S – N direction

Attitude of Roadside Residents/Shop Owners on the Regulation

Roadside residents and shop owners were interviewed for their opinion on the regulation on one occasion before the Experiment and on two occasions during the Experiment. Before the Experiment, about 70 % of the interviewees along Monivong Blvd were against the regulation. At the mid-point of the Experiment, the opposition to the regulation reduced to 29 %, and reduced further to 28 % by the end of the Experiment. This decrease in opposition to the regulation is considered to be attributed to the fact that the regulation was not fully enforced and many motorcycles actually could travel on Monivong Blvd.

Effort to Improve the Street by MPP and Roadside Residents

To further enhance the effect of the improvement of the detour routes, MPP newly installed street lights along the improved section of St. 105. Many of the roadside residents also rehabilitated the sidewalk pavement (masonry) at their own expense. In addition, approximately 100m of St. 242, between St. 105 and Monivong Blvd., was newly paved by the roadside residents also at their own expense. All these efforts were inspired by the improvement of the pavement of St. 105. It is expected that further improvements of pavement on local streets can induce a similar response from roadside residents.

20.2.3 Achievement of Objectives of Public Experiment

The objectives of the Public Experiment were fully achieved as described below.

Bus Experiment

- Potential of bus services in Phnom Penh was proved by smooth operation and large number of passengers.
- Sufficient data were collected to estimate passenger demand.
- Several problems on operation were identified and solved.
- Bus services were well known and supported by the citizens.

Prohibition of 2-Wheel Vehicles

- Although motorcycles could not completely prohibited on Monivong Blvd, it is well envisaged that the regulation can be enforced if longer time is allowed for implementation.
- Although large number of motorcycles diverted to the detour routes, severe traffic jam did not occur.
- During and after the Experiment, majority of the roadside residents and shop owners accepted the regulation.
- Considering the above facts, the regulation is judged to be implementable.

CHAPTER 21

OVERALL IMPLEMENTATION PLAN

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21.1 IMPLEMENTATION FRAMEWORK

To establish the overall implementation program of the Transport Master Plan, the framework was set up involving time schedule, project implementation capacity and budgetary considerations.

(1) Time Framework

The planning period, 2001~2015, is divided into the following three (3) stages;

- Short Term 2001~2005
- Medium Term 2006~2010
- Long Term 2011~2015

(2) Project Implementation Capacity

The administrative and technical capacities of the Government for the implementation of projects and measures proposed under the Master Plan are expected to be developed through the execution of institutional and capacity building plans. The Governmental capacities are recommended to be reinforced with professional staff to render the professional services required for the implementation of projects in accordance with the proposed implementation schedule.

(3) Estimated Fund

(i) Estimation by Ministry

The Ministry of Economy and Finance projected the national GDP and capital expenditures until the year 2003 as shown in Table 21.1-1.

Table 21.1-1 National GDP and Fund (Riel billion)

	1997	1998	1999	Plan 2000	Plan 2001	Plan 2002	Plan 2003
National GDP	9,100.0	10,900.0	11,960.0	13,034.0	14,430.0	15,973.0	18,300.0
Domestic Revenue	881.0	942.7	1,330.0	1,505.0	1,803.0	2,193.0	2,540.4
Total Expenditure	1,267.9	1,563.8	1,319.5	2,335.0	2,750.0	3,430.0	4,135.0
Capital Expenditures	451.9	630.0	223.6	1,020.0	1,260.0	1,780.0	2,305.0
Locally Financed	110.3	120.4	223.6	320.0	550.0	580.0	745.0
Externally Financed	341.6	509.5	-	700.0	910.0	1,200.0	1,560.0

Source: Current Revenue and Expenditures 1994-2003, Ministry of Economy and Finance

According to the projection, the total capital expenditure in 2000 is Riel 1,020.0 billion (about US\$ 255 million) with breakdown of local finance of Riel 320.0 million (about US\$ 80 million) and external finance of Riel 700.0 billion (about US\$ 175 million).

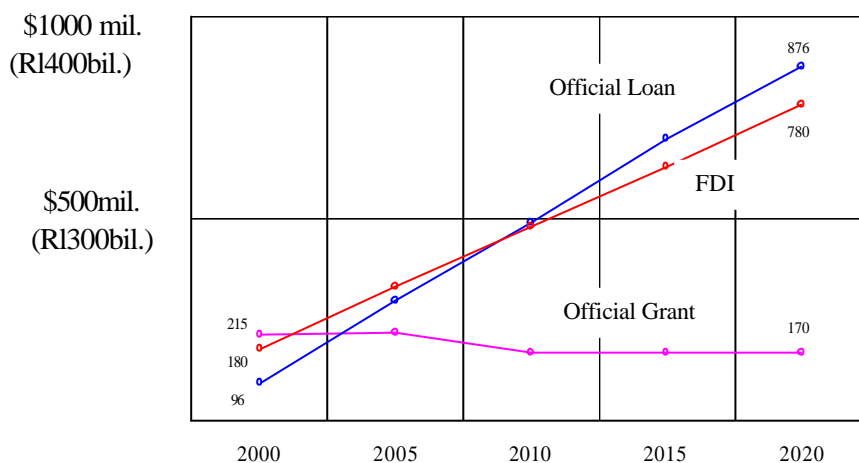
(ii) Estimation by Effects of Reform Plan

The Cambodia Development Resource Institute (CDRI) prepared the national reform plan covering public finance reform, public administration reform, forestry reform, official development assistance and foreign private investment. Table 21.1-2 and Figure 21.1-1 show the estimation of official development assistance (official grant and loan) and foreign direct investment (FDI) of foreign private investment. Table 21.1-2 indicates the official grant of US\$215 million and official loan of US\$96 million in 2000, increasing to US\$170 million and US\$ 700 million in 2015, respectively.

Table 21.1-2 Fund estimated based on Effects of Reform (US\$ million)

Year		2000	2005	2010	2015	2020
1) Cambodia (Total)	Official Grant	215	220	170	170	170
	Official Loan	96	296	490	700	876
	FDI	180	330	480	630	780
2) Phnom Penh (Total)	Official Grant	43	44	34	34	34
	Official Loan	19	59	98	140	175
	FDI	54	99	144	189	234
3) Phnom Penh (Transport Sector)	Official Grant	9	9	7	7	7
	Official Loan	4	12	20	28	35
	FDI	3	5	7	9	12

Note: 1) Enhancing Governance for Sustainable Development, Cambodia Development Resource Institute, May 2000
 2) Estimated by the Study Team. 20% of Cambodia (Total) for official Grant and Loan
 30% of Cambodia (Total) of FDI (Foreign Direct Investment)
 3) Estimated by the Study Team 20% of Phnom Penh (Total) for Official Grant and Loan
 5% of Phnom Penh (Total) for FDI



Source: Enhancing Governance for Sustainable Development Cambodia Development Resources Institutes, May 2000.

Figure 21.1-1 Reform Plan

(iii) Available Fund estimated for the Transport Master Plan

Based on the estimation by the effect of Reform Plan, the Study Team assumed the amount of official grant, official loan and foreign direct investment to be allocated for the Municipality of Phnom Penh and a total for the transport sector. The assumptions used in calculating the allocation are as follows.

- Budget Allocation to MPP: National past trend; 20%
- FDI allocation to MPP: The foreign direct investment may favor to MPP; 30%
- Transport Sector Share: Equal distribution to five (5) sectors; 20% of MPP
- FDI Allocation to Transport Sector: The foreign direct investment may be smaller than other sectors; 5%

(iv) Available Fund estimated for each planning period

The available funds are presented in Table 21.1-3 for each planning period of the Transport Master Plan, estimated on the basis of the assumptions mentioned above.

Table 21.1-3 Estimates of Available Fund for Transport Master Plan
(in US\$ million per Year)

	2001~2005	2006~2010	2011~2015
ODA (Grant, Loan)	9 + 8 = 17	8 + 16 = 24	7 + 24 = 31
FDI	4	6	8

21.2 IMPLEMENTATION SCHEDULE

Taking into consideration the project suitability with the fund characteristics, proposed projects can be categorized as shown in Table 21.2-1. This project categorization is only for the reference for the preparation of fund required for the Master Plan.

- Category A; Local Finance Type
- Category B; Official Development Aid (ODA) Type
- Category C; Private Finance Type

The overall implementation schedule of the Transport Master Plan is proposed under the condition of the established implementation framework, as shown in Table 21.2-2.

21.3 SELECTION OF HIGH PRIORITY PROJECTS

High priority projects were selected for the feasibility study (FS projects), to be conducted in the Third (III) Stage of the Study, in accordance with the priority criteria established in each sectorial plan and the requirements mentioned below.

(1) Requirements for Feasibility Study (F/S)

1) High Priority and Urgency

FS projects shall be in urgently required with high priority. These projects shall be included in the short-term plan and be intended to directly solve the existing traffic problems. The scale and degree of such traffic problems are likely to be great with large effects and impact.

2) Project Maturity

One of the important requirements of FS project shall be readiness for implementation. Projects included in the city plan must be given high priority, while those involving the acquisition of road right of way and relocation of residents are given low priority because of the difficulty in project preparation.

3) Study Example

A feasibility study is expected to show an example of solving traffic problems involving a new technology. Projects that will involve the introduction of new technology are given a high priority.

4) Project Impact

Projects are preferred to have a large-scale effect and impact so that the actualization of the Master Plan will be accelerated.

(2) Recommendation for Feasibility Study

Table 21.3-1 shows the comparative evaluation of FS candidate projects. Among the candidate projects, the following three projects are selected for feasibility study:

Table 21.2-1 Candidate Projects by Fund Type

Fund Type	Project Characteristics	Candidate Projects
Category A (Local Finance)	<ul style="list-style-type: none"> •Package of small size projects •Require a lengthy implementation period •Require an intensive administrative management 	<ul style="list-style-type: none"> 1) Traffic safety education and enforcement 2) Traffic Regulation and Organization 3) Pavement improvement of small-size local streets in the urbanized area and suburban area
Category B (ODA)	<ul style="list-style-type: none"> •Related to basic human needs and poverty •Require urgent improvement in view of disaster as well as traffic •Related to protection of social and natural environment •Expected to involve a large number of beneficiaries 	<ul style="list-style-type: none"> 1) Traffic signal system 2) Pavement improvement of arterial / major collector and local streets in the urbanized area 3) Urgent improvement of important arterial / collector roads in suburban area. 4) Bridge reconstruction along existing roads
Category B-2 (Official Loan Type)	<ul style="list-style-type: none"> •Related to socio-economic development with reasonable rate of return •Large-scale projects requiring large investment and higher technology. •Favorable in protection of environment 	<ul style="list-style-type: none"> 1) Improvement of arterial and collector roads 2) Construction of large-scaled bridges 3) Widening of Large-scale existing bridges
Category C-1 (Government/Private Partner Type)	<ul style="list-style-type: none"> •Expected to be reasonably profitable •Road improvement integrated with land development •Government control may be required in social viewpoint. 	<ul style="list-style-type: none"> 1) Improvement of arterial , collector and local roads with land development potentiality 2) Bus services
Category C (Private Finance)	<ul style="list-style-type: none"> •Expected to be profitable •Road development with high traffic demand or integrated with land development •Government control may not be necessary or be easy in social viewpoint. 	<ul style="list-style-type: none"> 1) Bus services 2) Off-street parking

Table 21.2-2 Overall Implementation Schedule (1/2)

Sector	Project Code	Project Name	Length (Unit)	Cost (M\$)	Short Term				Medium Term				Long Term					
					2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Road Development	Urbanized Area																	
	U1	Pavement Improvement of Arterial & Collector	57.9	23.4														
	U2	Pavement Improvement of Local Street	227.2	50.0														
	U3	Construction of Missing Link	3.4	1.7														
	U4	Improvement of Intersection (2 loc)		0.2														
		Sub Total		285.1	75.3			27.5			47.8					0.0		
	Suburban Area																	
		Arterial Road																
	A1	Inner Ring Rd	13.9	10.6														
	A2	Outer Ring Rd Sec 1	8.6	8.6														
	A3	Outer Ring Rd Sec 2	13.4	10.2														
	A4	Outer Ring Rd Sec 3	3.7	2.8														
	A5	Outer Ring Rd Sec 4	2.0	2.0														
	A6	Outer Ring Rd Sec 5	8.8	6.7														
	A7	Outer Ring Rd Sec 6	11.2	11.2														
	A8	Northern New Trunk Rd	11.0	8.4														
	A9	Southern New Trunk Rd	7.4	7.4														
	A10	Phnom Penh Thmei Rd-1	3.0	2.3														
	A11	Phnom Penh Thmei Rd-2	4.3	3.3														
	A12	Tumpum Dike Rd	4.2	3.2														
	A13	Cheung Aek Bypass	10.3	7.8														
		Sub Total		101.8	84.5			40.1			24.6					19.8		
		Collector Road																
	C1	Russei Kaev Bypass	6.6	3.1														
	C2	Khmuonh Rd	7.0	3.3														
	C3	Tang Krasang Rd	8.4	4.0														
	C4	Krang Thnong-Dei Thmei Rd	9.0	4.2														
	C5	Northbridge Rd	6.9	5.5														
	C6	Trapeang Rumchek Rd	4.5	2.1														
	C7	Prev Sa Rd	7.3	3.4														
	C8	Tuol Sambo Rd	1.8	0.9														
	C9	PNH-KDL Bypass	4.8	3.8														
	C10	Preaek Pra Rd	6.7	3.2														
	C11	Veal Sbov Bypass	7.1	5.7														
		Sub Total		70.1	39.2			7.3			16.0					15.9		
		Local Road																
	L1	Russei Kaev Rd-2	2.2	1.1														
	L2	Tuol Sankae Rd	7.1	3.6														
	L3	Samraong Rd	4.3	2.2														
	L4	Poung Peav Rd	3.6	1.8														
	L5	Dei Thmei Rd	2.1	0.7														
	L6	Kouk Chambak Rd	3.5	1.4														
	L7	Trapeang Chrev Rd	6.0	3.0														
	L8	Prev Tea Rd	3.6	1.8														
	L9	Ou Baek Kaam Rd	3.0	1.2														
L10	Boeng Krop Rd	1.6	1.1															
L11	Chaom Chau Rd	1.5	0.8															
L12	Krang Pongro-Sak Sampov-Baku Rd	13.9	7.0															
L13	Tuol Kei Rd	4.1	2.1															
L14	Preah Ponlea Rd	2.6	0.9															
	Sub Total		59.1	28.7			0.0			4.1					24.6			
	Total of Suburban Road			231.1	152.4			47.4		44.7					60.3			
	Bridge																	
1B	Reconstruction of Existing Bridges	14Br	3.6															
2B	Reconstruction of Existing Bridges	2Br	3.5															
3B	Widening of Bottleneck Bridges	3Br	33.8															
4B	Conststruction of New Bridges along	2Br	32.4															
	Sub Total		21Br	73.3			4.7			16.1					52.5			
	Total			301.0			79.6			108.6					112.8			

Table 21.2-2 Overall Implementation Schedule (2/2)

Sector	Project Code	Project Name	Length (Unit)	Cost (M\$)	Short Term					Medium Term					Long Term				
					2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Public Transport	B-1	Bus Fleet	1,306	52.2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	B-2	Bus Terminal		2.5	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	B-3	Bus Stop	740	0.2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	B-4	Bus Shelter	148	0.4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	B-5	Bus Depot		1.9	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
		Sub Total		57.2	20.0					12.0					20.3				
	M-1	Development of Mode Interchange Area (Station Plaza Improvement)		0.1	■	■	■	■	■										
		Sub Total		0.1	0.1					0.0					0.0				
	P1	Policy / Legislation (Zone System for Motodop and Cyclo, Ban the Motorumok Operation along Trunk Road)		0.1	■	■	■	■	■										
		Sub Total		0.1	0.1					0.0					0.0				
	Total		57.4	19.5					17.6					20.3					
Traffic Management	TM-1	Traffic Signal System		12.9	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	TM-2	Accident Analysis System		0.5	■	■	■	■	■										
	TM-3	On Street Parking		0.2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	TM-4	Enforcement Equipment		0.5	■	■	■	■	■										
	TM-5	Public Education		1.2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
		Total		15.3	4.5					3.0					7.8				
Traffic Regulation	R-1	Institution and Organization Development		0.4		■	■	■	■										
	R-2	Human Resource Capacity		0.5	■	■	■	■	■										
	R-3	Vehicle Registration System		0.4	■	■	■	■	■										
	R-4	Driver License System		0.5	■	■	■	■	■										
	R-5	Private Investment Law		0.1		■	■	■	■										
		Total		2.1	2.1														
Total				74.8	26.1					20.6					28.1				
Gross Total				375.8M\$	105.7M\$					129.2M\$					140.9M\$				
Estimated ODA Fund				360M\$	85M\$					120M\$					155M\$				

Note: Items in shadowed boxes are the projects for which feasibility studies are conducted as described in Part IV.

Table 21.3-1 Evaluation of FS Candidate Projects

Sector	Projects	High Priority and Urgency	Project Maturity	Study Example	Project Impact	Remarks	
Road Improvement	1) Pavement Improvement of Arterial/ Collector Roads and Local Streets in Urbanized Area	<ul style="list-style-type: none"> Very urgent because of present traffic volume condition and accidents 	<ul style="list-style-type: none"> Simultaneous implementation with Drainage Project is necessary. 	<ul style="list-style-type: none"> Pavement Standard Design Technology Establishment of implementation method / procedure of project includes many sub-projects. 	<ul style="list-style-type: none"> Grouping of small project 	<ul style="list-style-type: none"> Ready for implementation 	
	2) Road A9 Southern New Trunk Road L=7.4km	<ul style="list-style-type: none"> Very urgent to relieve the existing traffic congestion on NR4 and Toll Road. 	<ul style="list-style-type: none"> Acquisition of road right of way is necessary 	<ul style="list-style-type: none"> Technology on road improvement integrated with land development is introduced. 	<ul style="list-style-type: none"> Large impact on traffic congestion relief and land development. 	<ul style="list-style-type: none"> At present, impact of relocation is moderate, but the area is rapidly being developed and the impact will be larger 	
	3) Road A12 Phnom Penh - Thmei Road (Intermediate Ring Road) Section 2, L=4.3km	<ul style="list-style-type: none"> Very urgent because of on-going land development with completion of Road A11 and some section of Road A9 	<ul style="list-style-type: none"> Northern half is ready for 2-lane improvement. Southern half needs acquisition of road right of way 	<ul style="list-style-type: none"> Same as above 	<ul style="list-style-type: none"> Same as above 	<ul style="list-style-type: none"> Same as above 	<ul style="list-style-type: none"> Many houses are affected by 4-lane widening of the northern half of the road
	4) Road C4 Krang Thnong - Dei Thmei Road. L=9.0km	<ul style="list-style-type: none"> Very urgent to relieve the existing traffic congestion on NR4 (Airport Road) 	<ul style="list-style-type: none"> Road improvement of 2-lanes for one-fourth section on the east end is ready. Construction of remaining section and 4-lanes widening requires acquisition of road right of way. 	<ul style="list-style-type: none"> Technology on road improvement integrated with land development is involved 	<ul style="list-style-type: none"> Relatively large effect because of facilitation of land development 	<ul style="list-style-type: none"> Moderate number of houses are affected by 4-lane widening. 	
Public Transport	1) Implementation Plan for City Bus Operation	<ul style="list-style-type: none"> Very urgent because this is one of the most important transport issues 	<ul style="list-style-type: none"> The Municipality is very positive to implement this project. 	<ul style="list-style-type: none"> Technology on the planning procedure 	<ul style="list-style-type: none"> Significant effect on city-image and urban environment 	<ul style="list-style-type: none"> The Municipality is very positive for introduction of bus services 	
	2) Study of Zone System for Para-transit	<ul style="list-style-type: none"> Urgent because this is one of the relevant studies of Implementation Plan for City Bus Operation 	<ul style="list-style-type: none"> Needs more survey/investigation for this study, such as additional para- transit drivers interview survey. 	<ul style="list-style-type: none"> DPWT is trying to work about this type of study 	<ul style="list-style-type: none"> Relatively large effect, especially together with the City Bus Operation 		
	3) Study on the Development of Mode Interchange Area.	<ul style="list-style-type: none"> Urgent; same as 1) because efficient mode interchange area encourages the increase in bus users. 	<ul style="list-style-type: none"> Needs related survey for this study, such as traffic counts on vehicular and passenger traffic 	<ul style="list-style-type: none"> Technology on the planning procedure 	<ul style="list-style-type: none"> Relatively large effect on transport aspects and urban development potential. 		
Traffic Management	1) Traffic Control and Signal System	<ul style="list-style-type: none"> Very Urgent to relieve the existing traffic congestion in CBD (Central Business District) 	<ul style="list-style-type: none"> Ready for installation of traffic signal 	<ul style="list-style-type: none"> Technology on the planning procedure 	<ul style="list-style-type: none"> Significant effect on the immediate measures to relief traffic congestion 	<ul style="list-style-type: none"> Installation of traffic signals is on-going at major intersections. Installation shall be expanded to other intersections. 	
	2) Provision of Accident Analysis System	<ul style="list-style-type: none"> Urgent to reduce the traffic congestion in CBD 	<ul style="list-style-type: none"> Organization for study is required 	<ul style="list-style-type: none"> Technology on the planning procedure 	<ul style="list-style-type: none"> Relatively large effect because of the reduction in traffic accidents 		
	3) Provision of Enforcement Equipment	<ul style="list-style-type: none"> Urgent to reduce the traffic congestion in CBD 	<ul style="list-style-type: none"> Organization for study is required 	<ul style="list-style-type: none"> Technology on the planning procedure 	<ul style="list-style-type: none"> Relatively large effect because of the reduction in traffic accidents 		

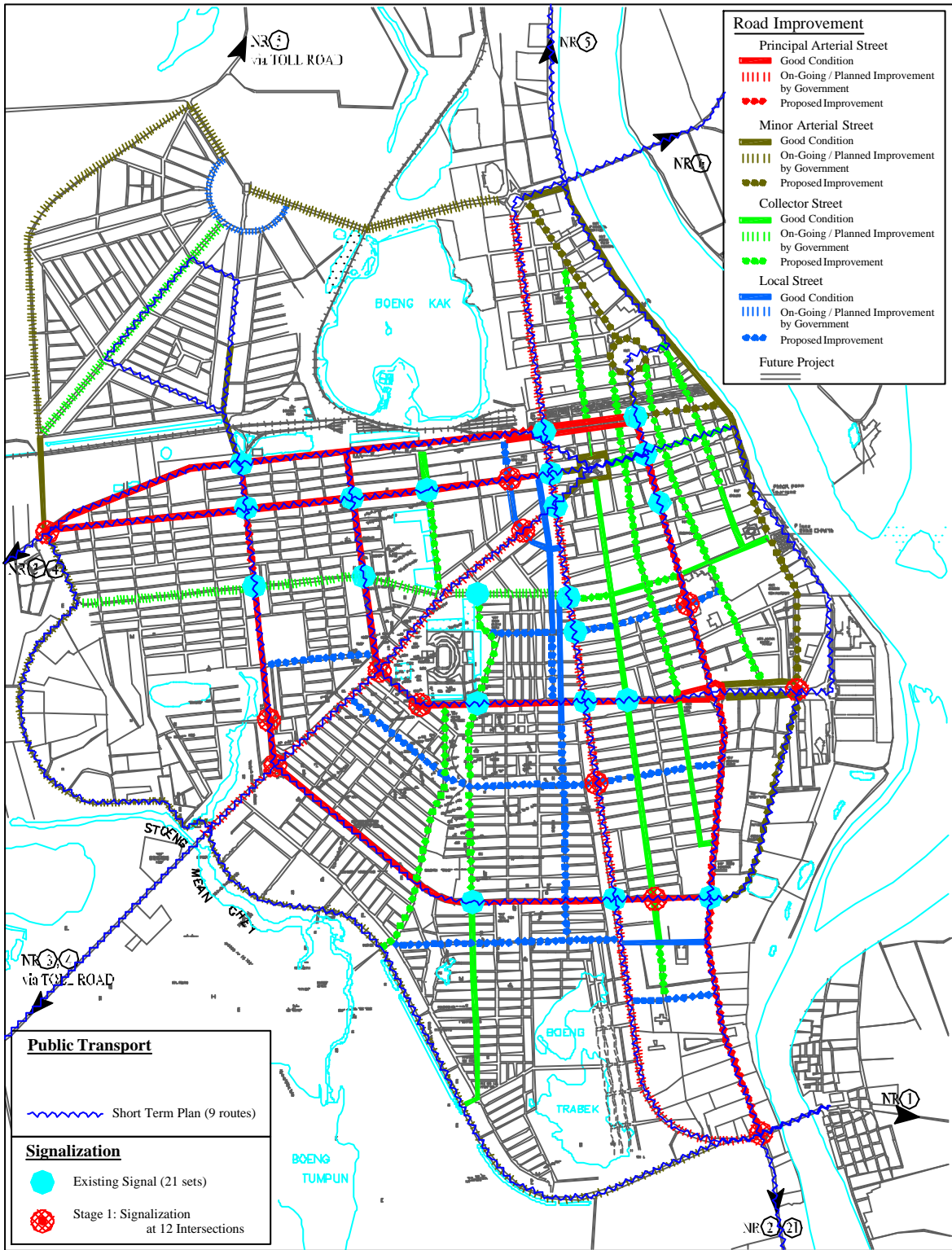


Figure 21.3-1 Location Map of F/S Candidate Projects

(1) Implementation of city bus operation

Bus operation is one of the main measures to solve the traffic problems in the Study Area. In addition, MPP is very positive towards the introduction of bus services.

(2) Traffic control and signal system

The fact that MPP is installing new signals at a few intersections, although the pace is very slow due to budget constraints, shows the MPP's eagerness to improve traffic control. In addition, this measure can be implemented with relatively small cost and short implementation period.

(3) Pavement improvement of urban streets

Improvement of pavement condition, especially in the urbanized area is not only one of the main measures to mitigate the problems of transport but also prerequisite for bus operation and improvement of traffic signals.

All these projects should be implemented so that they bring about full combined effect.

Improvement of the pavement of collector and local street will promote the diversion of motorcycles from arterial streets to the collector and local streets and help smooth operation of buses on the arterial streets. Good pavement is also a precondition for better traffic control. Pavement markings such as lane mark cannot be installed on deteriorated and rough pavement surface. Improvement of the traffic control system will bring about a smoother traffic condition with higher travel speed of vehicles. With higher travel speed, buses can attract increased number of passengers.

Figure 21.3-1 graphically shows the location of FS projects.