CHAPTER 6

PUBLIC TRANSPORT

CHAPTER 6

PUBLIC TRANSPORT

6.1 EXISTING PUBLIC TRANSPORT SYSTEM

6.1.1 Public Transport in Phnom Penh

(1) Public Transport Conditions

There are mainly eight (8) public transport modes currently in operation in the Study Area, as shown in Table 6.1-1. The typical feature of public transport in Phnom Penh is the absence of a city bus system and ordinary taxi service.

Buses and taxi-buses mainly provide inter-city services. Bus terminals can be found at the Central Market. Private companies operate buses. A city bus system used to operate in Phnom Penh in the past, however the service was suspended due to the deterioration of road conditions caused by the large number of motorcycles. On the other hand, taxi-buses are one of the most convenient public transport modes from/to the provinces. Included under the taxi-bus category are vans, pickups and sedan type vehicles; these are called 'Location' as painted in Khmer language on one side of the vehicles. Taxi-buses have specific routes, similar to ordinary buses, but when passengers are brought to their desired destinations, they assume a taxi-like function. There are four (4) terminals for taxi-buses in the urbanized area, mostly located near markets.

There are 82 taxis in Phnom Penh, painted yellow and white. These taxis usually wait for passengers at the airport, serving as airport taxis. There is no ordinary taxi in the city.

Motodop, motorumok and cyclo are the para-transit modes in the Study Area. They are the most common public transport modes in the city, especially the motodop. Because of its high level of service, in terms of frequency and door-to-door trips, the motodop is regarded as the trunk public transport mode in the Study Area. The cyclo, which is a traditional 3-wheel bicycle taxi, also serves as a public transport mode in the urbanized area. However, the number of cyclos has drastically decreased from more than 10,000 in 1980's to just 1,200 in recent years due to speed-concerns and their friction with other transport modes on roads. Motorumok usually caters to the suburban areas in Phnom Penh. This mode is used mainly by factory workers to commute to/from work and by farmers to transport their goods to the market. Cyclerumok also operates in the southern outskirts of the Study Area. The number of cyclerumok and their service area are limited.

Royal Railways of Cambodia operates a 650-km railway network in the country. There is no urban railway service within the Study Area.

River transport in the country, including navigable sections of main rivers, operates over a total length of about 1,400 km in the rainy season and less than 650 km at other times. There are seven (7) ferry jetties in Phnom Penh for public transport use: three (3) for intra-city use and four (4) for inter-city.

The air transport network comprises nine (9) international routes and seven (7) domestic routes, centered at Pochentong International Airport. The total annual volume of air passengers was approximately 800,000 in 1999.

The estimated number of persons who are directly involved in public transport services in the Study Area, excluding rail, river and air transport is 27,400. This figure comprises 6.5% of the 423,747 economically active persons in the Study Area.

The various types of public transport modes in the Study Area, as described above, are shown in Figure 6.1-1.

Table 6.1-1 Public Transport Modes in Phnom Penh

No.	Mode	Operation	Control	Type of Service	No. of Terminals	No. of Fleet	Passengers in (pax/day)	Remarks
1	Air transport	Royal Air Cambodge President Airline Phnom Penh Airways	State Secretariat of Civil Aviation	Inter national/ Inter-city	Pochentong Airport	AN26: 1 (Cargo) AN12: 2 AN24: 2 B737 : 2	760	No. of passengers is for the whole country:2,670/day
2	Railway transport	Royal Railways of Cambodia	Royal Railways of Cambodia	Inter-city	3 stations in P.P.	29 Locomo tives 239 Wagons	360	No. of passengers is for the whole country:1,430/day
3	River transport	Private Sector	Department of Inland Waterway Transport/Depart ment of Water Transport (MPWT)	Inter-city /Intra-city	6 jetties for 7 ferry routes (3 for intra-city and 4 for inter-city)	7 Boats	2,800	2 international freight ports, 2 domestic freight ports and 7 speed boat jetties
	Bus	Ho Wah Genting Transport Co. G.S.T. Express Bus D.H. Cambodia Group	Ministry of Public Works and Transport/Depart ment of Public Works and Transport	Inter-city	1 terminal + 2 on-street Central Market	50	12,820	14-hour Traffic
4	Taxi-bus (Van, Pick-up and Sedan)	Private Sector			6 terminals	2,660	101,760	14-hour Traffic at 4 terminals in CBD
5	Taxi			Intra-city	No Terminal	82		
6	Motodop					6,098		
7	Cyclo					1,203		
8	Motorumok/ Cyclerumok					227		

Source 1: Royal Railway of Cambodia
2: Ministry of Public Works and Transport, Department of Inland Waterway Transport
3: State Secretariat of Civil Aviation
4～8: Department of Public Works and Transport

(2) Public Transport Network

The basic public transport network in the Study Area is composed of inter-city bus/taxi-bus routes radiating from the inter-city terminals in the urbanized area, with river transport partly playing a role. However, the major public transport mode in the city is the motodop. This is a motorcycle taxi, which serves any road and street in the city, except for Norodom Blvd. The public transport mode serving the suburban area is the motorumok.

Public transport modes, which provide inter-city service, include air transport, river transport, railway and bus (ordinary and taxi-bus). As mentioned earlier, Royal Railways of Cambodia operates a 650-km railway network in the country. There are mainly two lines originating from the Phnom Penh central terminal: the Northern line to Battambang, and the Southern line to Sihanoukville. The weekly frequency of train operation is four trips for each line and there is no urban rail service in the Study Area. As regards river transport, its role has greatly diminished over the past years. Nowadays, mainly ferry services are available to the public, but there are two (2) international inland freight ports, which are supported by Japanese Grant Aid and ADB. Meanwhile, the country's air transport network consists of nine (9) international routes and seven (7) domestic routes, centered at the Pochentong International Airport.

A schematic public transport network is shown in Figure 6.1-2.

Bus (Intercity service only)

Taxi-bus (Major intercity public transport mode)

Taxi (Only airport service)

Motodop (Most popular public transport mode in the city)

Cyclo (Historically unique non-motorized public transport mode in the city)

Motorumok (Major public transport mode in suburban area)

Cyclerumok (Partially operates in southern suburban area)

3-wheel rumok (Recently operates in the city)

Figure 6.1-1 Varieties of Public Transport Modes in Phnom Penh

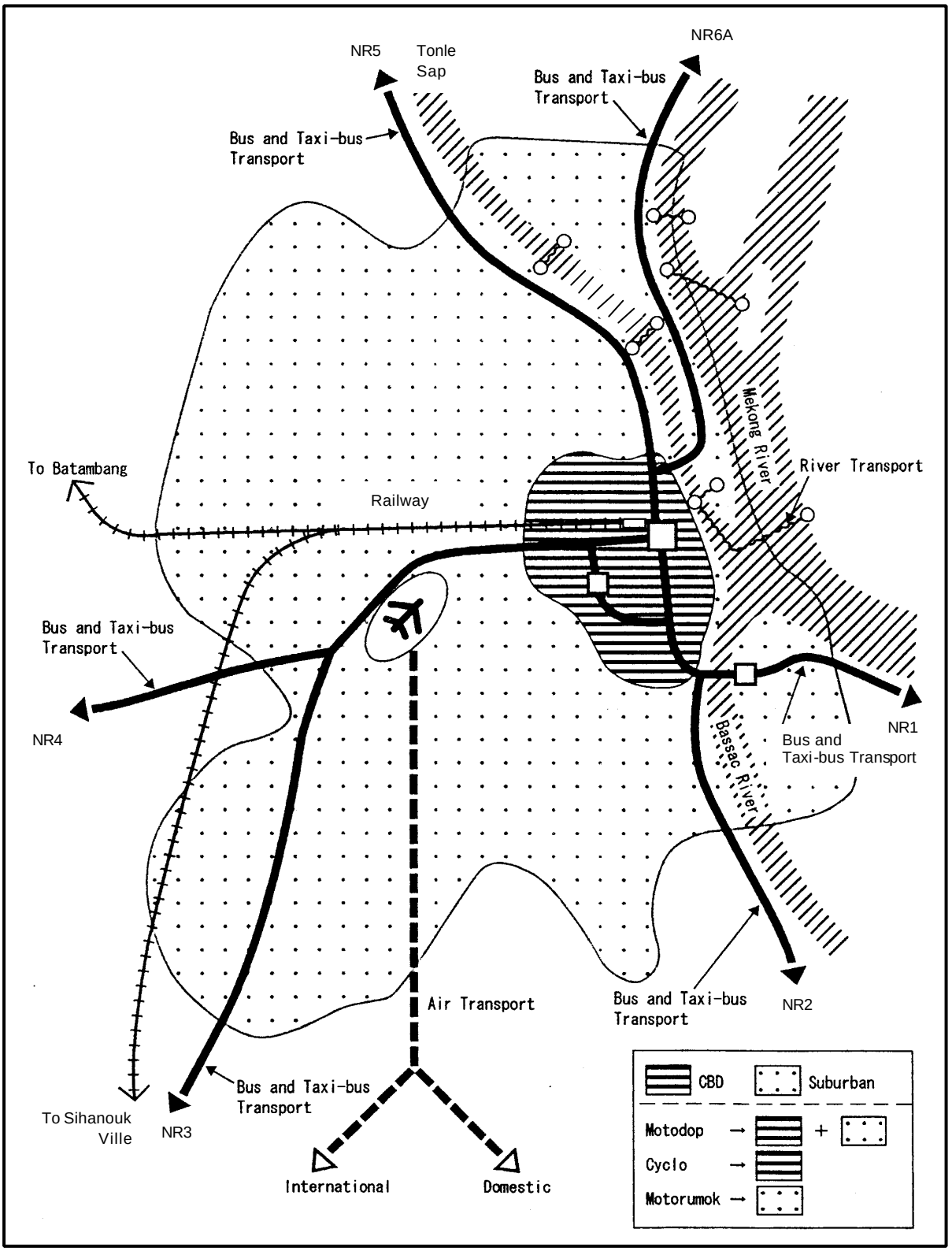

Figure 6.1-2 Schematic Public Transport Network

6.1.2 Public Transport Systems in Selected Asian Cities

Figure 6.1-3 shows the relation among population, per capita GNP and public transport system of 17 major cities in Asia.

A 13-year trend (1985 – 1998) of the abovementioned items is provided for some cities, such as Bangkok, Manila and Shanghai. It is interesting to note that statistics vary widely among the cities, from a population of 0.5 million in Vientiane, Lao PDR, to over 11 million in the city of Calcutta in India; from a per capita GNP of US$260 in Phnom Penh, Cambodia to US$3,500 in Kuala Lumpur, Malaysia.

Figure 6.1-3, also shows the public transport system in each city by type as described below. A summary is also prepared in Table 6.1-2.

The 17 cities can be roughly categorized into four (4) types of public transport system. They are as follows:

Type A: Rail + bus/rail + bus + para-transit

It is can be said that the cities belonging to this type provide a comprehensive public transport system. The trend of public transport of this type indicates a shift from a bus-oriented system to a comprehensive public transport system, typically over a period of approximately 15 years, due to the very rapid increase of per capita GNP and/or population. However, most of the public transport demand is still carried by the bus system because the urban rail transit system has a short history as yet.

Type B: Bus oriented

This is the most common public transport system not only in Asian cities but also in developing countries worldwide. Notwithstanding its popularity, the existing bus system in many Asian cities are faced not only with financial problems due to the low level of fare system but also with operational problems due to the drastic increase of private cars. However, it is only the bus system that can serve a large number of public transport passengers without the need for large-scale investment. The introduction of bus priority measures can be seen in some Asian cities on a trial basis.

Type C: Para-transit oriented

This type of public transport system is seen in the cities that experienced delay in urbanization due to a troubled historical past such as civil war, low level of per capita income and/or small scale urban area compared with its population and urban activities. For most of the cities in this category, the bus system was introduced within a 15-year period. Therefore, motorcycle-taxis and cycle-taxis are still the trunk public transport system in these cities.

Type D: Limited to Para-transit

This category is found only in Phnom Penh and other small urban cities. Similar to Type C above, this kind of city is characterized by delayed urbanization, low level of per capita income and small scale urban area compared to its population and urban activities. However, it is necessary to change the current public transport system in these cities owing to their increasing rates of urban population growth and number of private cars. The bus system is probably going to be one of the most suitable public transport systems in these cities in the future.

Table 6.1-2 Population, Per capita GNP and Public Transport System in Asian 17 Cities

Region (ADB Classification)	Country Name	Population YR1998 *1	Area (km2) *1	GNP per Capita *2 *3	Capital/Major city Name	Population *4	Year	Area (km2) *4	Pop. Density (Person/ha)	Public transport modes *5: P.T. System Type *6	Rail: Urban rail transit	Rail: Railway	Rail: Light rail transit	Road: Trolley bus	Road: Bus	Road: Minibus	Road: Taxi	Para-transit: Motorized	Para-transit: Non-motorized	Water transport
People Republic of China & Mongolia	People Republic of China	1,236,914,658	9,596,960	750	Beijing	7,362,428	1990	16,808	4.38	A	○	○		○	○		○			
				(310)		5,958,808	1985	16,808	3.58											
				750	Shanghai	8,208,598	1990	6,108	13.49	A	○	○		○	○		○			
				(310)		7,008,808	1985	6,108	11.79											
	Mongolia	2,578,530	1,565,000	378	Ulaanbaatar	515,108	1987	4,704	1.10	C				○	○		○			
Southeast Asia excluding Singapore	Cambodia	11,329,562	181,040	260	Phnom Penh	998,804	1990	290	34.48	D							○	○	○	○
	Indonesia	232,941,830	1,919,440	640	Jakarta	9,108,308	1995	668	136.38	A	○				○	○	○	○	○	
				(530)		8,808,808	1985	668	121.21											
	Lao PDR	5,260,842	236,800	328	Vientiane	466,808	1987	188	25.78	C					○			○	○	
	Malaysia	20,932,981	329,750	3,670	Kuala Lumpur	1,226,708	1990	244	50.28	A	○	○	○		○	○	○			
				(1,210)		1,103,808	1985	244	45.28											
	Myanmar	47,985,319	678,500	708	Yangon	2,513,823	1985			C					○		○		○	
	Philippines	73,725,862	300,000	1,050	Manila	8,454,348	1995	636	141.65	A	○		○		○	○	○	○	○	○
				(800)		6,322,808	1985	636	107.28											
	Thailand	60,037,586	514,000	2,160	Bangkok	5,647,398	1990	1,568	58.08	A	○		○		○	○	○	○		○
				(830)		5,208,478	1985	1,568	33.46											
	Viet Nam	76,236,259	329,560	350	Hanoi	2,466,808	1997	927	26.57	C					○		○		○	○
				350	Ho Chi Minh	4,808,808	1997	2,095	23.08	B					○		○			
South Asia excluding India, Maldives and Nepal	Bangladesh	127,567,082	144,000	350	Dhaka	6,618,808	1991			B					○	○		○	○	
	India	984,003,683	3,287,590	440	Delhi	8,419,804	1991	3,483	56.77	B					○	○	○	○	○	
				440	Calcutta	11,021,918	1991	1,388	79.87	A	○	○	○		○	○	○	○	○	
	Pakistan	135,135,195	803,940	470	Karachi	7,008,808	1981	1,978	39.58	B					○	○	○	○	○	
				(300)		6,208,808	1985	1,978	51.47											
	Sri Lanka	18,932,158	65,610	810	Colombo	808,808	1997	608	13.30	C					○			○		

Data source:
*1 Population and Area in countries: CIA (Internet home page)
*2 GDP per capita in countries excluding Myanmar: World Bank (Internet home page). Figure in Parenthesis is 1985 data.
*3 GDP per capita in Myanmar: Data comparison sheet of Southeast Asian countries (Internet home page)
*4 Population and Area in cities: Various internet home page
*5 Public transport mode: JICA studies and various internet home pages
*6 Public Transportation System:
A: Rail+Bus or Rail+Bus+Para-transit B: Bus Oriented C: Para-transit Oriented D: Limited to Para-transit

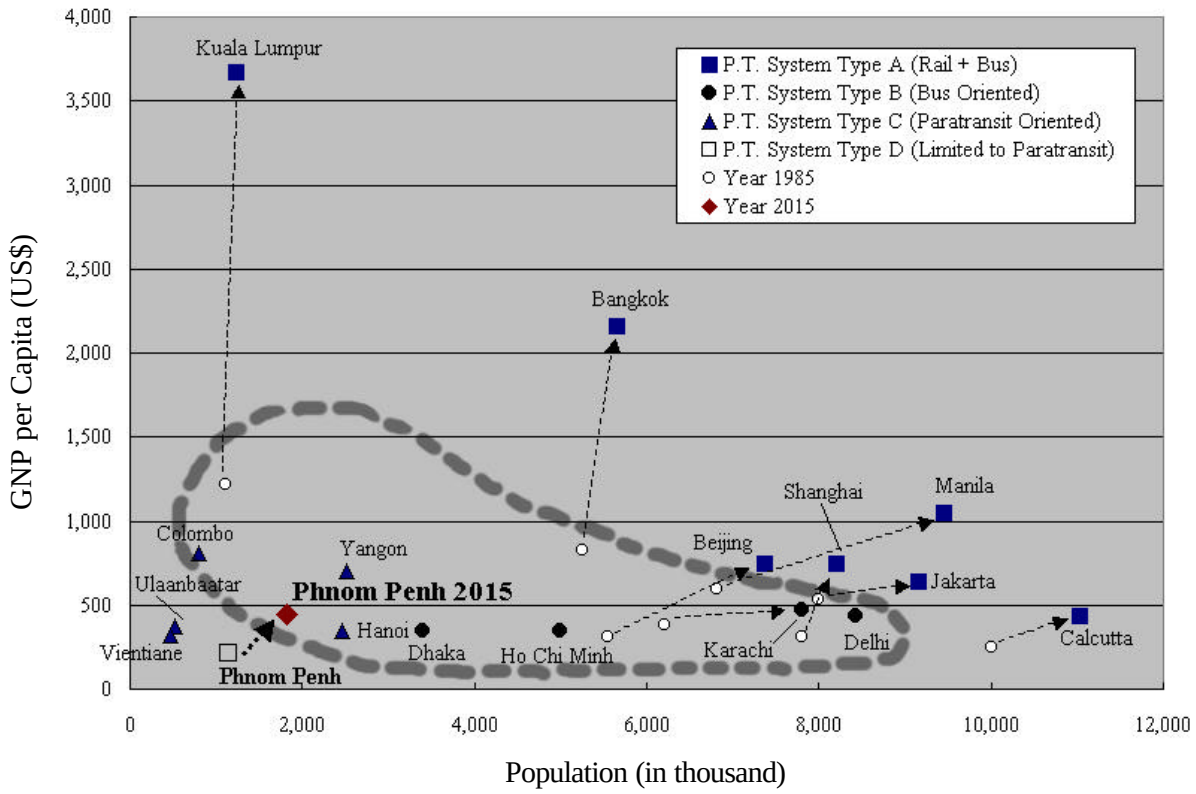

Figure 6.1-3 Population, Per capita GNP and Public Transport System in Asian 17 Cities

6.2 PUBLIC TRANSPORT MODES

6.2.1 Bus and Taxi-bus

(1) Bus and Taxi-bus Traffic

The main inter-city public transport modes are bus and taxi-bus. Taxi-bus is a shared taxi with the word 'Location' in Khmer painted on its side and is comprised of vans, pickups and sedans. Bus and taxi-bus terminals are scattered throughout the urbanized area, mainly located near markets. However, bus and taxi-bus traffic concentrate at three (3) entrances/exits of the urbanized area (north, south and west) because of the arterial road network configuration. The heaviest volume of bus and taxi-bus traffic, some 635 vehicles/day, can be found at the north entrance of the urbanized area (in front of the French Embassy near the Japanese-Cambodian Friendship Bridge), given that this point connects to Road No. 6A which has no alternative transport mode, such as railroad.

(2) Bus and taxi-bus terminals

Most of the bus and taxi-bus terminals are located at strategic points for urban transport, such as near markets. These terminals and also the adjoining thoroughfares are almost always congested given the large volume of bus and taxi-bus traffic converging on the limited terminal spaces.

(3) Vehicular composition of taxi-bus

The taxi-bus fleet is comprised of a variety of vehicle types, such as vans, pickups and sedans. With the wide selection of taxi-buses, passengers can choose whichever type they prefer depending upon their travel circumstance, i.e., trip purpose, amount of luggage and road conditions. On the other hand, it is necessary to control the entry of vehicles as taxi-buses, considering the aggravation of traffic congestion caused by complicated vehicular composition and the lack of an ordinary city taxi service.

6.2.2 Para-transit

(1) Motodop

There is a very high number of entrants into para-transit operation primarily because of the following two reasons; (1) there is no need to get a license, and (2) it is the easiest way to earn money to support families of low-income level. The increase of motodop units in operation is one of the most serious factors leading to the traffic congestion in Phnom Penh. Therefore, it is necessary to control entry into motodop operation by adopting some measures, such as requiring registration of motodops and wearing of uniform, which is being proposed by the Department of Public Works and Transport, the Municipality of Phnom Penh.

(2) Cyclo

Nowadays, use of the cyclo as an urban public transport mode is definitely unsuitable because of speed concerns and its influence on the other transport modes on thoroughfares. However, the historical importance and uniqueness of the cyclo should be taken into account. It is therefore recommended that cyclos be allowed to ply designated areas, such as tourist zones, in Phnom Penh in the future.

(3) Motorumok

The main public transport mode in the suburban area in Phnom Penh is the motorumok. Usually, the motorumok serves rural roads, especially trunk roads such as the two-way, two-lane National Roads (NRs) in the suburban area. The operation of motorumok vehicles

along NRs is considered dangerous due to friction with the faster and much heavier truck traffic. This observation has been borne out by the motorumok drivers as indicated by the result of the interview survey. In the survey, one of the serious problems of motorumok operation pointed out by respondents is the accidents along trunk roads. Therefore, it is necessary to introduce mass public transport modes, such as bus, along trunk roads in the suburban area. The motorumok can serve as the feeder transport mode to the bus in the future.

6.2.3 Operational Characteristics of Para-transit Drivers

The operational characteristics of para-transit drivers, obtained from the interview survey, is tabulated in Table 6.2-1 and summarized below:

- 60 to 75% of total interviewed para-transit drivers, excluding those who answered 'no idea,' wanted to quit their jobs, if they could find other jobs, especially the motodop drivers.
- Primary jobs of most of the interviewees (approximately 80% of total interviewees) are para-transit drivers. Only 20% have primary jobs other than para-transit drivers.
- Average monthly income (fare income minus expenditure) of motodop, cyclo and motorumok drivers are US$39, US$30 and US$47, respectively.
- Average trip length is 4.1 km for motodop, 1.8 km for cyclo and 21.1 km for motorumok.
- Most serious problems faced by the para-transit drivers are as follows:
  Motodop: too many drivers (scramble for passengers among motodop drivers)
  Cyclo: not enough passengers
  Motorumok: accidents because trunk roads in the suburban area have only 2 lanes both ways

Table 6.2-1 Operational Characteristics of Para-transit Drivers

Items		Unit	Motodop	Cyclo	Motorumok
Continue or quit of this business					
	Continue		23.6%	28.0%	28.0%
	Quit		64.9%	56.0%	60.0%
	No idea		11.5%	16.0%	12.0%
Average Age of Driver		Years Old	35.6	37.5	33.3
Primary or Secondary Business					
	Primary		80.9%	82.0%	80.0%
	Secondary		19.1%	18.0%	20.0%
Average Monthly Income		Riels 000	296	213	390
Average Monthly Expenditure		Riels 000	146	96	208
Income - Expenditure		US$	39	30	47
Average Working Hours per Day		Hours	9.0	9.2	8.3
Average No. of Trips per Day		Trips	9.5	8.7	5.2
Average No. of Pax per Trip		Person	1.4	1.6	7.0
Average Fare per Pax per Trip		Riels	808	755	945
Average Trip Length		Km	4.1	1.8	20.1
Encounterd Problems					
	Accident		12.2%	17.0%	24.4%
	Robbery		18.9%	8.5%	0.0%
	Poor Pavement Condition		10.2%	1.7%	4.9%
	Traffic Congestion		15.3%	8.5%	17.1%
	Too Many Regulations		2.9%	6.8%	12.2%
	Too Many Drivers		22.4%	5.1%	12.2%
	Not Enough Passengers		3.8%	33.9%	7.3%
	Too Expensive Cost		6.7%	10.2%	14.6%
	Health problems		5.8%	8.5%	7.3%

Source: Public Transport Owner/Driver Interview Survey, JICA2000

6.3 BUS OPINION INTERVIEW

The opinion survey on the introduction of a city bus system, which had been introduced before, was conducted with the existing public transport users as interviewees. The survey focused not only on the introduction of a proper public transport system but also on the influence of the system on the urban environment of Phnom Penh, which has a population of approximately one million.

In this survey, approximately 83% of the total interviewees took a positive attitude toward the introduction of a city bus system and had high expectations of safety for this mode; the acceptable level of fare is 770 riels. Current public transport users pay approximately 800 and 750 riels for motodop and cyclo fare, respectively. In terms of waiting time for a city bus, most of the interviewees replied that they are not willing to wait for more than 5 minutes.

A preliminary conclusion from this survey result is that a city bus system is regarded as highly safe and a fare of approximately 800 riels is acceptable, but an operation requiring a wait of more than 5-minutes appears to warrant careful consideration.

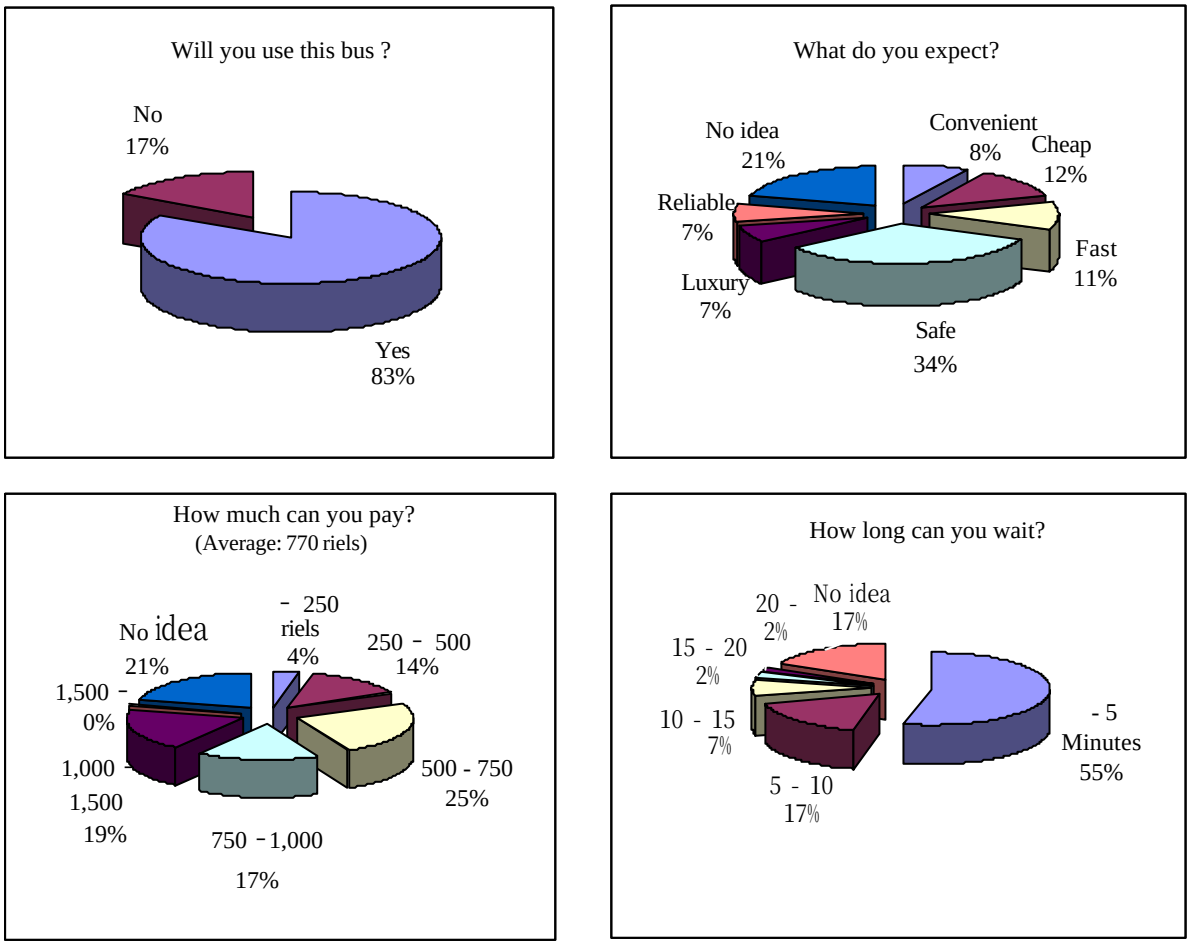

Figure 6.3-1 Summary of Opinion Survey on Introduction of City Bus Service
Number of samples: 2,019 = 600 (Bus) + 900 (Para-transit) + 519 (Intercity)

6.4 INTER-CITY PUBLIC TRANSPORT

(1) Railway

Considering the operation of its 648-km railway network, the 430,000 annual passengers and 270,000 tons of annual freight it carries, and comparing these figures with those of other countries, it may be said that the railway system in Cambodia has a low utilization rate. The large inter-city public transport demand, in particular, has been diverted from the south line to the long distance bus system along National Road No.4, which is faster and more comfortable. There are discussions for effective utilization of the railway system in the future, such as limited freight railway system and urban rail system, with the urban extension towards the western suburbs of the Study Area.

(2) River Ferry

In recent years, there has been a continuing shift from river transport to vehicular transport as the main mode of travel. However, for the people living along the river in the Study Area and adjoining provinces, the river transport mode has remained as the most important public transport mode, even if the demand is limited.

Environmental concerns have been raised regarding the adverse impact of the transport system, not only in the developed countries but also in the developing countries. Water transport systems, including river transport, are more environmentally friendly than other modes of transport and therefore consideration should be given to strengthening their contribution to the transport system where they are in operation. In the case of the Study Area however, most of the river transport facilities, such as ferryboats and jetties, are in very poor condition and require significant improvement. In addition, it is important to also improve the feeder transport system between the ferry and trunk public transport for the convenient access to/from the riverside area and for the improvement of the urban environment in the Study Area.

(3) Air Transport

Current access mode to/ from the Pochentong International Airport is limited to private cars and airport taxis only. It is necessary to prepare adequate access modes considering future air traffic demand and convenience to airport users. The airport facilities are under expansion and the target year for completion is 2005. The annual demand in the year 2005 is estimated at 1.7 million passengers. There are a number of alternatives concerning the long-term airport plan, such as further expansion of the existing airport and/or construction of a new international airport located 30 km from the urbanized area of Phnom Penh, in order to meet the future air traffic demand beyond the year 2005.

6.5 PROBLEM IDENTIFICATION

Identified problems based on the existing public transport situation in the Study Area, can be summarized as below.

(1) Overall Existing Public Transport Features

- Public transport services are inefficient due to the lack of a mass public transport system, and cannot respond to the future increase in the traffic demand. Predominant mode of public transport is the motodop which is unsafe, uncomfortable and inefficient.
- When the population and economic conditions in the Study Area are changed, the public transport system will also shift from para-transit-oriented system to a comprehensive public transport system, based on the analysis of other Asian cities.

(2) Bus Transport

- Only one intercity bus company has an off-road terminal; bus terminals operated by other small bus companies are on-road
- Problems are found in and around the taxi-bus terminal because of taxi-bus traffic congestion

(3) Taxi Transport

- There are no city taxis. This imposes inconvenience to those with heavy baggage and with urgent business as well as tourists and new-comers who are not familiar with the geography of the city.

(4) Para-transit

- Motodop is the major public transport system in the city, because of its high level of service in terms of cheaper fare, frequency and door-to-door trips. It is also the most important financial source for low-income people. Despite its popularity, the motodop service is inefficient and poses a danger to drivers and passengers alike. The motodop is also a primary contributor to the traffic problems in the city.
- Cyclo is a unique historical mode of transport in Phnom Penh. However, this mode is not effective in an urban transport setting because of its low speed.
- Allowing the motorumok to continue plying along the narrow and heavily-trafficked trunk road in the suburban area is dangerous.

(5) Railway Transport

- Utilization of the existing railway is extremely low despite the approximately 640 km railway network in the whole country.

(6) River Transport

- While river transport, which is an environment-friendly mode of transport, is the most important mode of transport in areas not served by land transport, its facilities, such as ferryboats and jetties, are deteriorated.

(7) Air Transport

- Access to/from Pochentong International Airport is only by airport taxi and private modes and it is necessary to assess the future air passenger demand.

CHAPTER 7

TRAFFIC MANAGEMENT AND CONTROL

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TRAFFIC MANAGEMENT AND CONTROL

The traffic situation in Phnom Penh during morning and evening peak hours is beginning to show signs of congestion at most locations and in particular, at major intersections. Statistics on accidents and injuries also showed a rapid rise of traffic incidents, and considering the steady increase in traffic demand in the coming years, this situation is expected to deteriorate further. As the traffic situation worsens, problems such as wastage of energy, air pollution and other adverse effects as faced by many large cities will also gradually develop.

This chapter describes the present traffic management and control conditions as well as various traffic congestion problems, causes of road traffic capacity reduction and traffic accidents, as viewed from the perspectives of traffic engineering, traffic safety education and enforcement. *

7.1 TRAFFIC MANAGEMENT ADMINISTRATION

Traffic management in the Study Area is basically administrated by three (3) major government agencies;

- Road Transport Department, Ministry of Public Works and Transport (MPWT)
- Department of Public Works and Transport (DPWT), Municipality of Phnom Penh (MPP)
- Municipal Traffic Police of Phnom Penh

Table 7.1-1 presents a list of the involved agencies with their respective responsibilities in the traffic management system of the city.

Table 7.1-1 Agencies Related to Traffic Management in Phnom Penh

Category	Responsibility	Agency
Traffic Operation and Control	Road / Intersection Design Standard	Public Works General Directorate, MPWT
	Road / Intersection Improvement	DPWT, MPP
	Traffic Regulation and Control	
	Traffic Signals	
	Pavement Marking and Traffic Signs	
Traffic Safety Facilities	Pedestrian Overhead Bridges	
	Pedestrian Protective Barriers	
	Street Lighting	
Plantation	Street Plantation and Maintenance	
Drivers / Vehicles Management	Motor Vehicle Registration System - Motor Vehicles (Except M/C) - Motorcycles	MPWT DPWT, MPP
	Driving Licensing System – All Motor Vehicle Drivers	MPWT
	Motor-vehicle Technical Inspection System – All Motor Vehicles	
Traffic Control / Enforcement and Accident Investigation / Treatment	Traffic Rule Violations	Municipal Traffic Police
	Traffic Control on Site	
	Accident Investigation	

* Additional information of this Chapter is included in the attached report: "Approach to Traffic Management in Phnom Penh"

7.2 TRAFFIC CONDITIONS

7.2.1 Traffic Management Condition

(1) Traffic Congestion Situation

The result of analyses based on traffic survey data obtained in this Study has revealed that the major roundabouts and signalized intersections in Phnom Penh are now operating close to their design capacities. If countermeasures are not taken soon, it is only a matter of time before chronic daily traffic congestion will occur.

(2) Traffic Disorderliness caused by Mixed Traffic

Traffic in the Study Area is highly mixed comprising of passenger cars, trucks, buses, motorcycles, cyclos, motorumoks, bicycles and pedestrians. These different modes of transport differ significantly in their operational behavior on the same roads due to their differences in travel speed, vehicle size and energy mode (motorized versus non-motorized). Such highly mixed traffic is one of the causes of the rapid deterioration in traffic capacity of the road network. It also poses many critical dangers to the road users. Although sidewalks are provided at most locations, pedestrians are often found to walk on the road pavement and cross the streets at random.

Along road sections, lane markings have recently being introduced in an attempt to physically segregate the 4-wheelers from the other vehicles. At intersections, however, regulations on turning movement by types of vehicles become ambiguous and many drivers are unsure of any proper traffic behavior. This gives rise to confusion and disorderliness resulting in very chaotic traffic operation at the intersections.

At the moment, heavy trucks and large buses are prohibited from entering the city center during the daytime hours. This measure has helped in maintaining a manageable level of traffic operation during the daytime hours at the present moment. Without such a measure, traffic in the city center would undoubtedly have to face a higher level of congestion.

(3) Complexity in Traffic Control at Irregular Intersections and Roundabout

In the Study Area, traffic congestion is becoming rather common at irregular intersections and roundabouts.

Irregular intersections (multiple legged intersection or crank intersection) or roundabouts normally have little difficulty in processing traffic demand if the volume is small. In fact, for low volume traffic flow, the roundabout is a very convenient facility for road users. However, as traffic demand increases, it also brings about an increase in the complexity of traffic flows, difficulty in processing the large traffic volume, given the small capacity, difficulty for pedestrians crossing the road and a concentration of traffic at such intersections. Under these circumstances, such types of intersections become prone to congestion and traffic accidents.

(4) Inadequacy and Insufficiency of Traffic Control Signals

a. Inadequacy in Number of Signalized Intersections
Presently there are only 21 intersections in the Study Area that have been signalized. There are twelve (12) more intersections where the current traffic volumes are close to or exceeding the capacity of un-signalized intersections. These intersections need to be signalized urgently to increase the capacities and manage current traffic satisfactory. As traffic demand increases in the near future, many more intersections in the city will have to be signalized in order to meet the increased demand. Figure 7.2-1 presents the locations of

signalized intersections, roundabouts and intersections where left turn movements are prohibited.

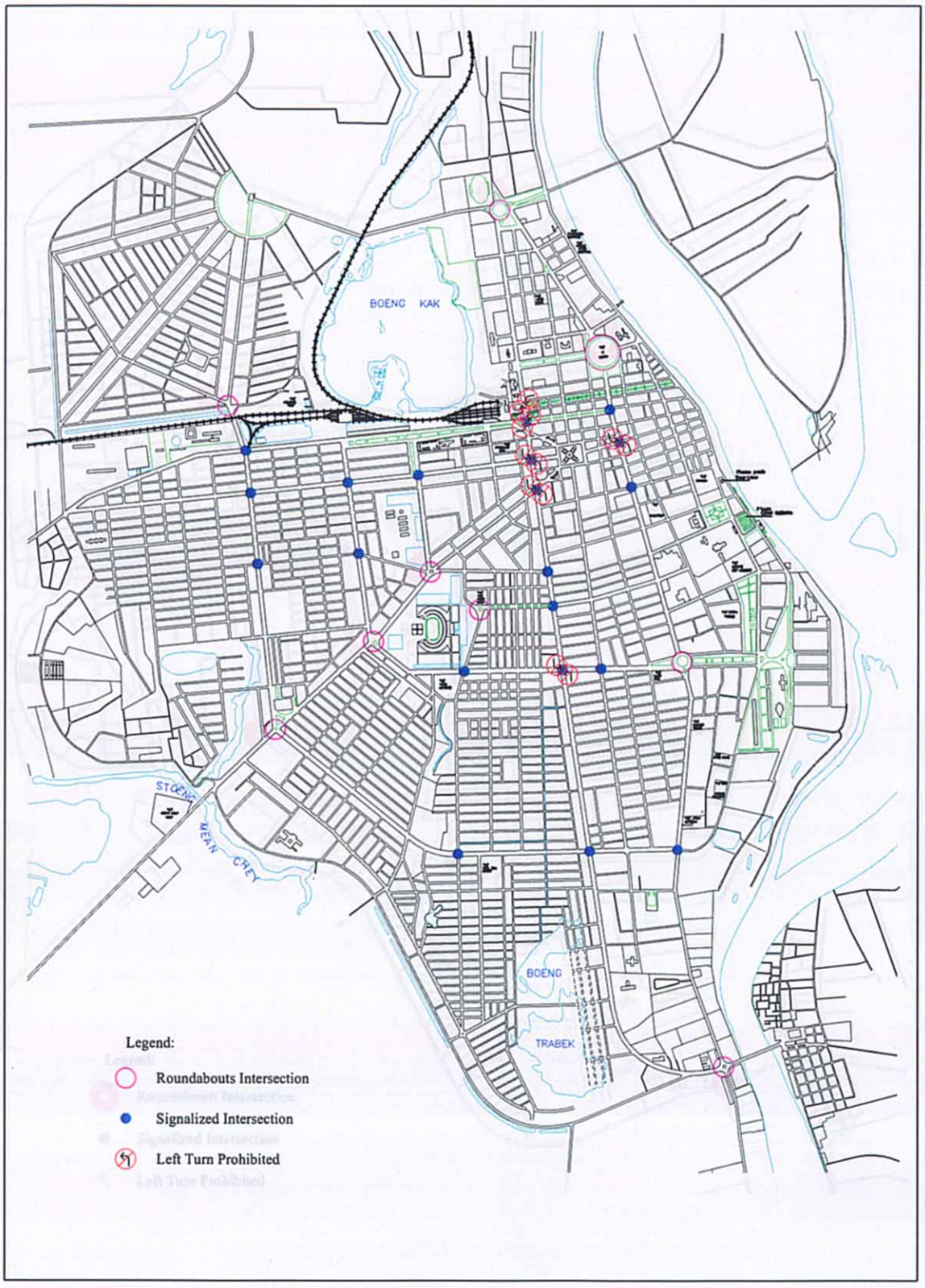

Figure 7.2-1 Locations of Roundabouts, Signalized Intersections and Left-turn Prohibition

b. Inadequacy in Method of Signal Control
- Signal parameters do not correspond to the traffic demand situation at many of the existing signalized intersections,
- Signal control for adjacent signalized intersections is either not effective or appropriate,
- Since the signal cycle lacks an 'all red' phase, there is a tendency for through traffic to conflict with left-turning traffic as the signal light changes. This can cause severe traffic congestion.
- Pedestrian signal timings are found to be too short at some locations for all pedestrians crossing the road to clear the distance within the allocated time. This poses great danger to the pedestrians using such signals. At such locations, when the pedestrian signal changes from green to red, the vehicular signal for the intersecting road changes to green within 5 seconds. With such a short time interval between green phases, even fast walkers cannot safely cross the road if the signal changes shortly after they start to cross.
- During late night hours, some of the signals are shut down. Blinking function at these signals is however not used to indicate priority of main roads over secondary roads.
- At some signalized intersections where left-turning traffic volume is high, an exclusive left-turn signal phase is necessary, but it is not provided.
- At intersections where congestion is common, the present traffic signal control method is deemed inadequate to meet the traffic demand.

c. Shut down of Signal Functions
- Power failure is presently the main cause of traffic signal shut downs. Power failure in the city is quite common and if the duration of such failure becomes significantly long, traffic confusion will occur at intersections.

d. The Minimum Requirements for New Signal Control Function
- Splits need to be incorporated into the signal control function in order to respond to changing traffic demand. (e.g. time-of-day control)
- Signal controls of adjacent intersections must be linked to enable a coordinated system wide control,
- Uninterrupted power supply to ensure no signal shut down.

(5) Traffic Control Measures

Traffic control measures currently implemented in the city, either throughout the day or for specific time periods, are substantially acceptable. Such measures include one-way traffic regulation, left-turn prohibition, no entry for bicycles and others. However, considering the traffic situation, the coverage area of these measures needs to be extended and the following deficiencies need to be addressed.
- In the absence of basic traffic data, effective traffic control measures are difficult to be formulated and planned,
- Sufficient signs or pavement markings on the traffic control measures are not provided to the road users, thus, they may not be aware or clearly understand such measures.
- Traffic control measures that cannot be enforced by the present set up should not be left as they are. Such measure should preferably be removed.
- There is inadequate information given to the public regarding the various traffic control measures enforced by the city. There are no city maps or information boards indicating such measures in public places.

(6) Roadside Parking Problems

a. Parking Prohibition Area
- Despite the fact that parking is prohibited for certain designated areas, drivers often ignore such regulation and park illegally.
- There is insufficient enforcement to prevent such illegal parking.

- At some parking prohibition areas, no-parking signs are not clearly displayed.
- Designated parking areas are indicated by pavement markings and parking fees are collected. However, such parking charges are not actually collected by the MPP Office.

b. Obstruction to Vehicular Traffic
- Curbside parking is uncontrolled and widespread in the city. Double-row parking is also common along some road sections.
- Parking generally occurs on the motorcycle lane as well as vehicular lane.

(7) Parking or Garages on Pedestrian Sidewalks
- Parking of vehicles on pedestrian sidewalks has become so widespread that these vehicles create serious obstructions to safe pedestrian movements.
- Pedestrian sidewalks or curbsides have become private vehicle garages.

7.2.2 Traffic Safety Condition

(1) Traffic Accidents

The number of traffic accidents (475 cases in 1999) and fatalities (133 cases in 1999) are showing signs of rapid increase. The present fatality rate stands at 11-persons/100,000 population. Fatality rates in Japanese cities with a similar population size of about one million, such as Kawasaki City and Hiroshima City, are only 3.9 and 6.3 respectively. Compared to these cities, the city of Phnom Penh has a fatality rate 2 to 3 times larger. Anticipating that traffic accidents and fatalities in Phnom Penh will continue to increase in the near future, traffic safety planning and countermeasures must be carried out soon and implemented as quickly as possible. Figures 7.2-2 to 7.2-4 show statistical data for accident characteristics in Phnom Penh, while Figure 7.2-5 presents a road map showing the major locations of serious accidents.

(2) Traffic Accident along Road Sections

In most advanced countries, traffic congestion and accidents occurred predominantly at the intersections rather than along road sections. This is obviously due to the fact that at an intersection, the same road space has to handle two crossing traffic streams and thus its capacity is lowered. Similarly, due to the conflicting travel directions of traffic at an intersection, the probability of collision is much higher.

However, in the city of Phnom Penh, traffic congestion and accidents are common on both the road sections as well as at intersections. Despite the lack of available data it is apparent that traffic accidents occur more frequently along the road sections. There are many factors that have led to a reduction in traffic capacity along the road sections and a higher frequency in traffic accidents.

The main causes are the poor and waterlogged road surface conditions, illegally parked vehicles (particularly double row parking), parking maneuvers affecting flow of other vehicles, traveling against the designated traffic flow, random crossing by pedestrians, vendors, road maintenance works, building construction works, illegal storage of building materials, machinery on road pavements and many more. In addition, the characteristics of the mixed traffic have contributed further to the confusion and disorderliness of the traffic behavior, leading to more congestion and a higher degree of danger on the roads.

To improve the situation, large scale and costly measures such as road widening and expansion are in fact not necessary. Small scale and relatively low cost countermeasures are sufficient to significantly improve the present situation. Such measures however, need to be planned out carefully and implemented immediately and diligently. It should be noted here that such measures often require time and patience to yield the desired results.

(3) Traffic Accident at Intersections

Given the present poor state of traffic signal control at intersections in the Study Area, traffic congestion is anticipated in view of the increasing traffic demand in the near future, which may further lead to increases in traffic accidents. Factors that contribute to traffic accidents at intersections in the Study Area are listed below:

a. At intersections, there is no specific rule on traffic movement by types of vehicles. All vehicle types behave and move in the same manner, whether they are traveling forward, making a turn to the left or right. The highly mixed traffic composition makes the movement at intersection highly confused and chaotic, thus giving rise to higher chances in collision.
b. Channelization by movements at an intersection is not well implemented.
   - Traffic lanes by directions are often not clear, contributing to confusion among drivers.
   - Lane markings and directional arrows markings are not adequate.
   - Channelization facilities including islands within large intersections are inadequate.
c. Lack of traffic safety facilities to promote observation of traffic rules (pavement markings, traffic signs).
   - Stop lines or signs at an intersection approaches are often unclear or non- existent (in particular, stop lines are often not provided at non-signalized intersections).
   - At an intersection, markings do not clearly indicate the priority from the low priority roadways.
   - Although left-turn prohibition signs are installed, their corresponding pavement markings are not provided.
   - Due to the high number of violators, physical barriers are needed to enforce the rules, such as installing central dividers, railings to prevent vehicles entering the traffic lane from the opposite stream as well as pedestrians from walking on the road pavement.
d. Exclusive left-turning lanes are not provided.
   - Left turn vehicles waiting at an intersection often obstruct the flow of through traffic.
   - Many left turning vehicles have the habit of waiting for the signal on opposing traffic lanes beyond the centerline.
   - Even at intersections with high left-turning vehicle volumes, exclusive left-turning lanes are not provided.
e. Pedestrian crossing facilities are inadequate. Pedestrians would randomly cross the road at intersections.
   - Pedestrian crossing facilities at an intersection are either not provided for or not clearly marked,
   - At intersections where crossing facilities are in fact provided, some of them are poorly deployed if evaluated from the perspective of the users (the use of shortest distance and refuge islands for enhancing their safety).

(4) Driving Behavior

The majority of drivers in the city do not seem to be aware of the danger and seriousness of traffic accidents and the need to observe traffic safety rules. Most of these drivers can be seen to drive with the notion that if they act more aggressively, other road users will surely give way to them.

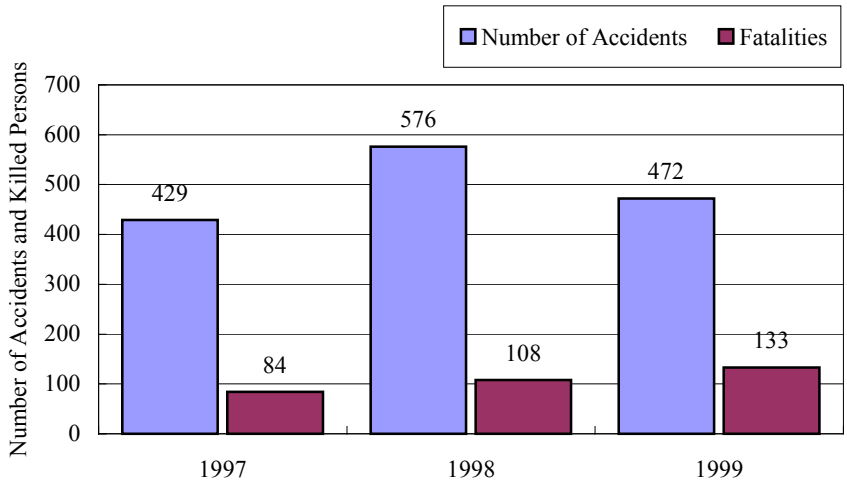

Figure 7.2-2 Total Numbers of Accidents and Fatalities, 1997-1999

Source: Municipality Traffic Police Department

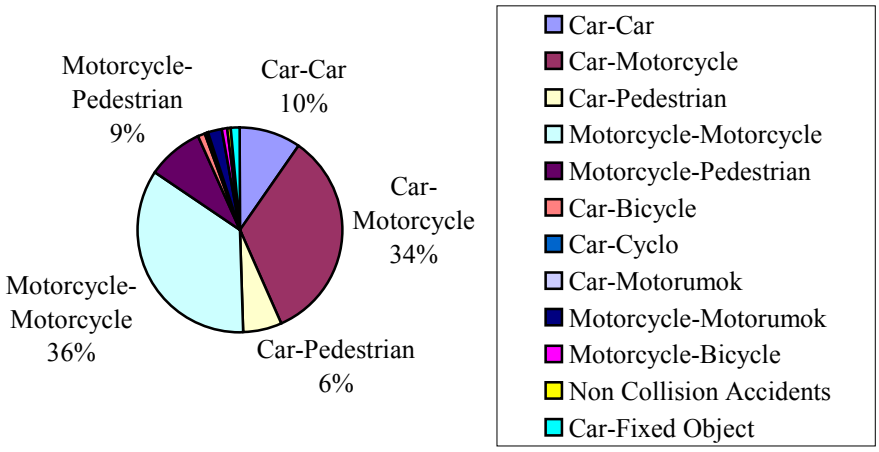

Figure 7.2-3 Percentage Shares of Accidents By Types of Vehicles

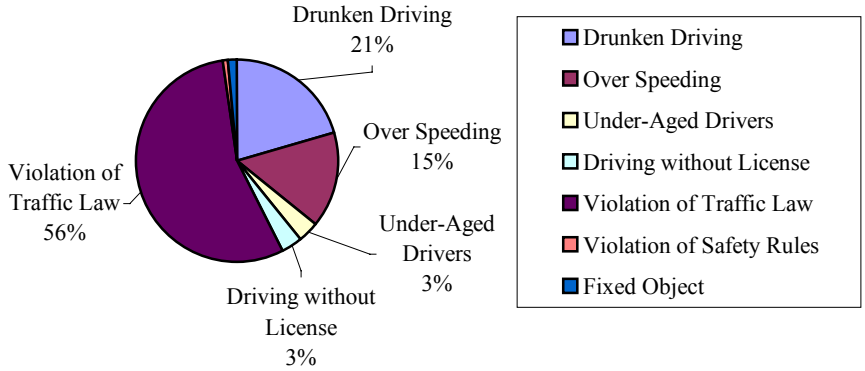

Figure 7.2-4 Percentage Shares of Accidents By Causes

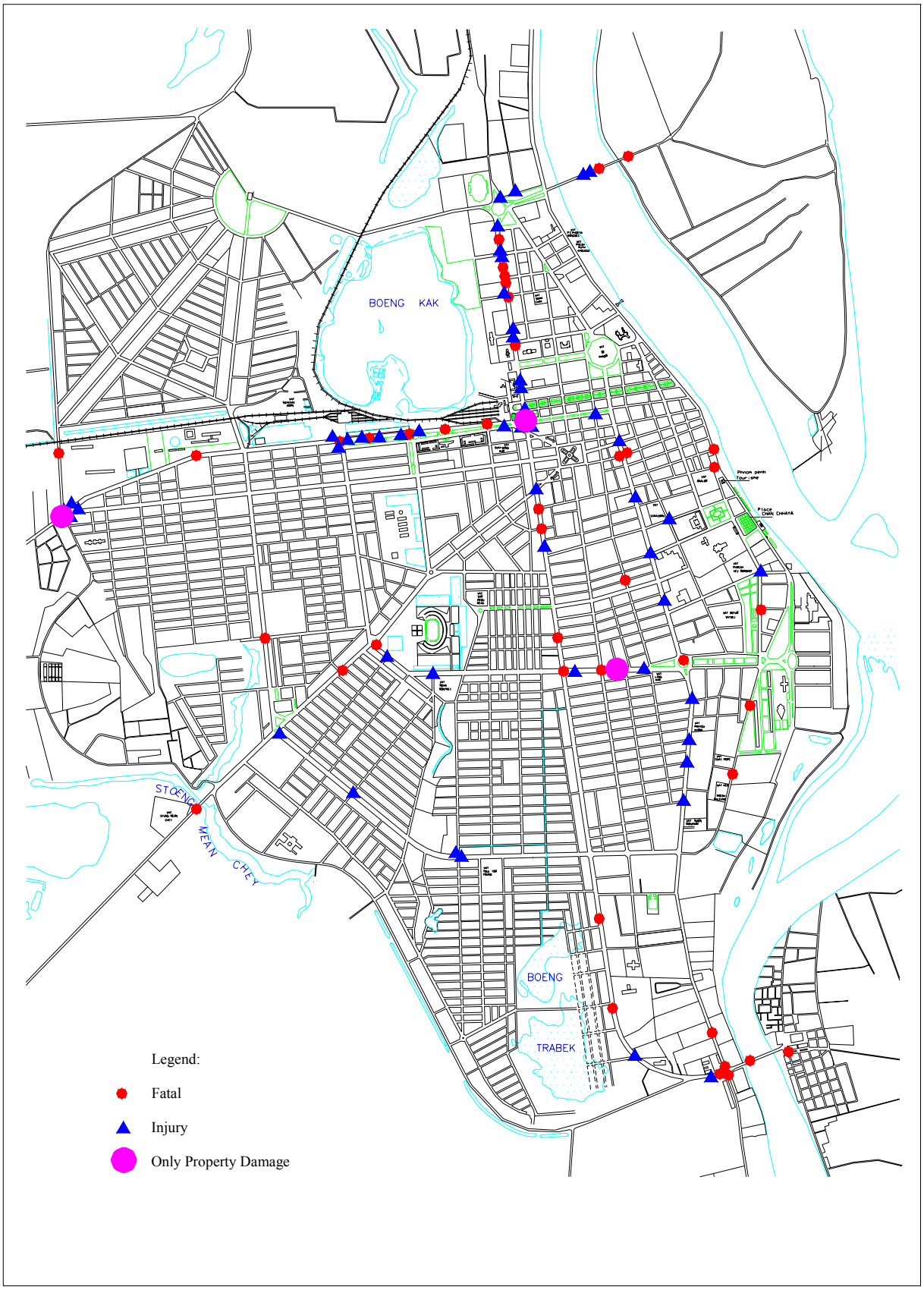

Figure 7.2-5 Major Locations of Serious Accidents (1997～1999)

Source: Municipality Traffic Police Department

Most drivers in the city, including the motorcycle drivers, are observed to behave with the following manners:

- There is almost no concept of 'give way' to pedestrians on sidewalks, pedestrian crossings or at/near to bus stops or other public vehicle stations.
- There is a lack of respect for the right-of-way of vehicles already traveling within the designated traffic lanes.
- There is also no awareness of priority traffic stream at non-signalized intersections.
- Some drivers travel against the designated traffic direction just so they can get ahead and cut into the opposite side of the road. This shows a total disregard of the safety of other road users and should be strictly prohibited. This behavior is illustrated in Figure 7.2-6.

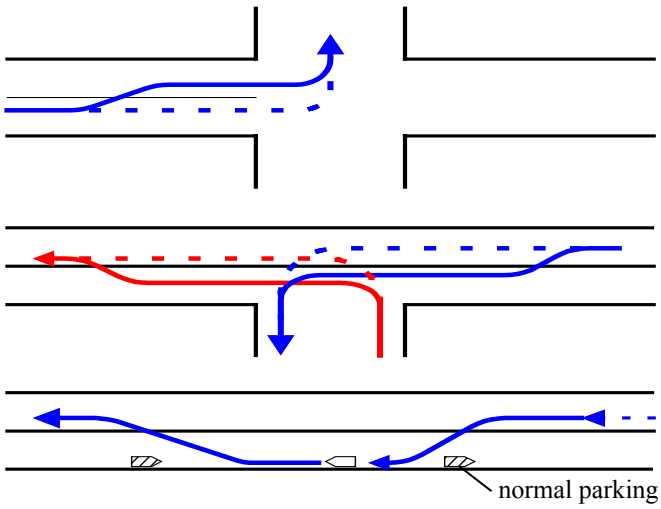

Figure 7.2-6 Dangerous Driving Behaviors

- Drivers are also found to ignore the left turning prohibition measure. This is another serous traffic offence.
- Ignoring traffic signals (another serious traffic offence).
- Parking within or near intersections (another traffic offence)
- Entering the intersections even though the downstream exit is already congested, thus creating gridlock situation when the signal light changes.
- Frequent and sudden changing of lanes and maintaining an unsafe (insufficient) headway to the vehicle in front.

Motorcyclists also have the following undesirable behavior:

- Too many passengers are riding on one motorcycle.
- The requirement to wear safety helmets is ignored. Many of them are also seen to wear high-heel sandals without realizing the danger they pose.
- Many young motorcyclists are driving without licenses. Stricter enforcement on underage motorcyclists should be carried out. (3% of the total reported traffic accidents involved drivers who are below 15 years of age).

(5) Low-speed Vehicular Traffic

- Cyclos, motorumoks and bicycles are traveling at speeds far too slow compared to those of 4-wheelers and motorcycles. There is a need to segregate these two groups of vehicles on the roads.
- These low speed vehicles typically travel on the motorcycle lane nearest to the curbside along road sections with clear pavement markings. However, when negotiating an intersection and making a left turn, these vehicles shift to other lanes and turn from any lane.

- Drivers of these low speed vehicles are quick to seek any shortcuts even to the extent of infringing on the opposing traffic lanes when making a left turn.

(6) Pedestrians

a. Unpaved pedestrian sidewalks
There are many areas where pedestrian sidewalks are not paved, forcing pedestrians to walk on the carriageway to avoid the unmade dirt surface or grassed-over areas.

b. Discontinuous pedestrian sidewalks
Where pedestrian sidewalks suddenly come to an abrupt end, pedestrians are forced to divert to the carriageway, inviting danger to themselves and obstructing the traffic flow. The discontinuity of pedestrian walkways may be due to any of the following causes:
- Presence of parked vehicles
- Storage of goods and materials
- Extensions from buildings or illegal structures
- Commercial activities (especially near markets)
- Presence of building materials/machinery used for construction on adjoining lots

c. Pedestrian mall
- There is no designated pedestrian mall in the city where a street with low traffic volume is closed for the exclusive use of pedestrians, ensuring their safety and comfort during weekends or public holidays.

d. Pedestrian crossing facilities
- At the city outskirts where the distance between two adjacent intersections is great, there are very few pedestrian crossings where pedestrians can cross the road safely.
- There is little provision of various comprehensive pedestrian crossing facilities, namely zebra markings, warning signs, pavement markings, pedestrian signals, safety islands and special lighting for pedestrians.
- Inadequate pedestrian crossing facilities both within the city center and the outskirts. Pedestrian crossing markings at intersections are particularly lacking.
- Pedestrian signal timings at the existing signalized intersections to allow pedestrians to clear the distance are too short, inappropriate and dangerous to the users.
- The crossing distances for pedestrians at large scale intersections are too long. No thoughts are given to shorten such distances or providing refuge islands.

e. Pedestrian behavior
- Pedestrians tend to cross the streets or intersections wherever they like.
- There are no physical barriers erected to prevent such widespread and uncontrolled jaywalking.
- Such behavior is extremely dangerous along road sections where traffic is traveling at high speeds or in the future, where more roads are improved thus allowing higher travel speeds.
- The presence of pedestrians on roadways and the uncontrolled and sudden crossing by pedestrians are among the main causes resulting in low travel speeds of vehicles in the city.

7.3 TRAFFIC SAFETY EDUCATION

Traffic safety education must be given to all residents in the city. All drivers are also pedestrians at certain times of the day and such education would therefore benefit all persons throughout their entire lives.

At present, many residents would not pause to think twice when crossing the street at random. Except for those unfortunate few who have personally experienced the horrors and loss of life due to traffic accidents, most citizens in Phnom Penh have yet to realize the dangers of such actions. From general observations of the citizens' behavior on the roads, the level of awareness on traffic safety can be said to be rather low. Information and statistics on traffic accidents are not widely publicized to the general public. They should be made aware of the rapid increase in traffic accidents and

fatalities and how such incidents can become a major social problem in the future.

(1) School Children, Students and General Public

- Traffic safety education program or campaign targeted at all the citizens by means of mass media such as newspaper, radio, television, and public notice boards are rare.
- News reports on traffic accidents and related issues are occasionally given in these media, but their frequency is not high.
- Traffic safety education has just started in schools this year for all primary and secondary school children and students. From now on, such education should be regularly given to all school children, not just once a year, and following a properly structured curriculum.
- Currently there are no suitable teaching materials containing statistics and data on accidents and actual cases for presentation to the general public.
- Similarly, suitable teaching materials for the school children and students are still lacking.
- MPP is the only public institution actively involved in traffic safety education. Traffic safety is something that cannot be handled by just one public institution. For better results, it requires the cooperation and participation of other public agencies and schools as well as other resident organizations and NGOs.

(2) Motorcyclists

- Currently, motorcyclists obtain their licenses without undertaking proper lessons. As a result, they lack even basic knowledge of traffic rules and raiding skills.
- Presently, there is very little opportunity or avenue for imparting traffic safety education to motorcyclists,
- To some motorcyclists, the only avenue available now is through regular schools. And this is insufficient.

(3) Drivers

When obtaining driving licenses, all the 4-wheel vehicle drivers have to attend lessons of driving skill and traffic regulation as well as undertake both the written and driving tests. However, judging from the actual driving behavior on the roads, many drivers display poor driving manners and skills.

The following are some of the obvious poor driving behaviors:

- No concept of 'give-way' to pedestrians along sidewalks, pedestrian crossings, bus stops or other public transport terminals.
- Lack of respect for the right-of-way of other vehicles already traveling within the traffic lanes.
- No notion of the difference in priority of right-of-way between major road and side street at non-signalized intersections.
- When congestion occurs, drivers have no hesitation to use opposing lanes.
- Ignoring left-turn prohibition measures at intersections,
- Parking at or near intersections,
- Entering the intersection even though the downstream exit is already congested. Such undisciplined behavior often creates traffic gridlock situations.
- Erratic driving behavior with frequent lane changing and maintaining a dangerously short headway to the vehicle in front.

(4) Cyclo and Motorumok Drivers

Drivers of these modes of transport have no formal compulsory education on traffic safety.

(5) Education Materials

No simpler education material is produced and made readily available to the public.

7.4 PROBLEM IDENTIFICATION

Based on the findings of the proceeding sections, this section summarizes the major problems in the Study Area of traffic congestion, traffic capacity and traffic accidents, as viewed from the perspective of traffic engineering, traffic safety and enforcement.

(1) In proportion to the rapid growth of car ownership, road traffic volume is increasing sharply, and this will cause serious traffic problems in the city. At present, deterioration of the traffic environment is expanding to most of the Study Area. These traffic problems include frequent traffic congestion, delay in travel and increase in travel time, increase in traffic accident and frequent occurrence of serious accidents, lack of safety facilities, education and enforcement due to sub-standard engineering applications.

(2) Traffic in the city is highly mixed comprising of passenger cars, trucks, buses, motorcycles, cyclos, motorumoks, bicycles and pedestrians. These different modes of transport differ with each other significantly in their operational behavior on the same roads due to their differences in travel speed, vehicle size and energy mode (motorized versus non-motorized).

(3) Lack of an effective traffic signal system as well as on-street parking practice, due to few off-street parking facilities, contributes greatly to traffic congestion and traffic accidents, which should be remedied immediately.

(4) With the absence of proper enforcement, the existing traffic facilities are not used efficiently. If traffic management and operation, as well as enforcement, are improved, traffic capacity and safety will increase greatly.