

## **A15.4 PARA-TRANSIT TRANSPORT**

### **A15.4.1 Motodop**

As motorcycles drastically increased in the 1990s, the motodop became a popular and convenient transportation mode, because of its high level of service in terms of cheaper fare, frequency and door-to-door trips. Therefore, the main public transport mode in Phnom Penh is para-transit, with mainly motodop in the CBD.

The motodop provides important service to the city and supports the urban activities in Phnom Penh. It may not be the most efficient system for the city, as it contributes to congestion and traffic problems, but it provides a substantial income for thousands of marginal families, including many students who support themselves by working as motodop drivers. The estimated number of motodop drivers is approximately 23,000 based on the traffic survey in 2000 conducted by this Study.

The trip length of motodop in the central 4 districts is relatively short compared to the other modes, as shown in Figure A15.4.1. Based on this trip characteristic, the central area can be divided into 3 zones. Taking into account the above-mentioned conditions and public transport planning concept discussed in section A15.1, the planning directions and measures of motodop transport in the CBD are as follows:

- a. Motodop will play the role of feeder transport means of bus.
- b. Introduction of license system for motodop operation. Motodop drivers should wear the prescribed uniform color based on the 3 designated operational zones mentioned below.
- c. The operational zone system of motodop will be introduced to reduce traffic in the CBD and to pave the way for a smooth city bus service operation. Based on the person trip survey, the CBD is divided into 3 zones: within Preah Sihanouk (Doun Penh and 7 Makkara), northern part (Toul Kouk) and southern part between Preah Sihanouk and Inner Ring Road (Chamkar Mon).
- d. Motodop will be banned along trunk roads, such as Preah Monivong, Preah Sihanouk, Monieth and Russian Blvd. However, motodop can cross main intersections of the trunk roads except for the above-mentioned roads.
- e. A motodop stand/pool will be provided at major bus stops and bus terminals for the smooth transfer between modes.

### **A15.4.2 Cyclo**

In the early 80s, the common form of public transport system in the city was the cyclo. This is a three-wheeled cycle with the driver on a high seat behind the passenger seat.

The number of cyclos has drastically decreased from more than 10,000 to just 1,203 in recent years due to speed concern and their influence on the other transportation modes on roads.

Considering these facts and the public transport planning concept discussed in section 6.1, the planning directions and measures of cyclo transport are as follows:

- a. Cyclo will be preserved as a historically unique transportation mode which can operate only in designated areas, such as tourist zone.
- b. Number of cyclos will be reduced from 1,200 to 500 in the year 2015, and a unique design will be painted on its body (refer to Figure A15.4.3) to attract tourists.
- c. Proposed zone for cyclo operation is the eastern area of Preah Norodom Blvd. between Preah Sihanouk Blvd. and Wat Phnom (so called tourist zone, refer to Figure A15.4.4).
- d. It is proposed that the avenue along the Sap River (a part of Preah Sisovath Blvd.) be developed as a unique road development such as transit mall, which can operate buses and cyclos and accommodate pedestrians.

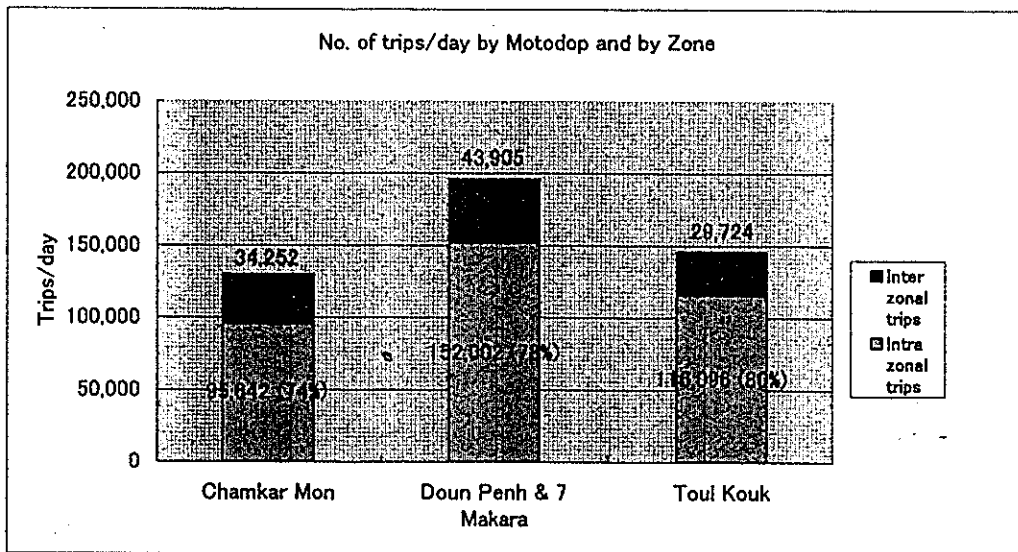
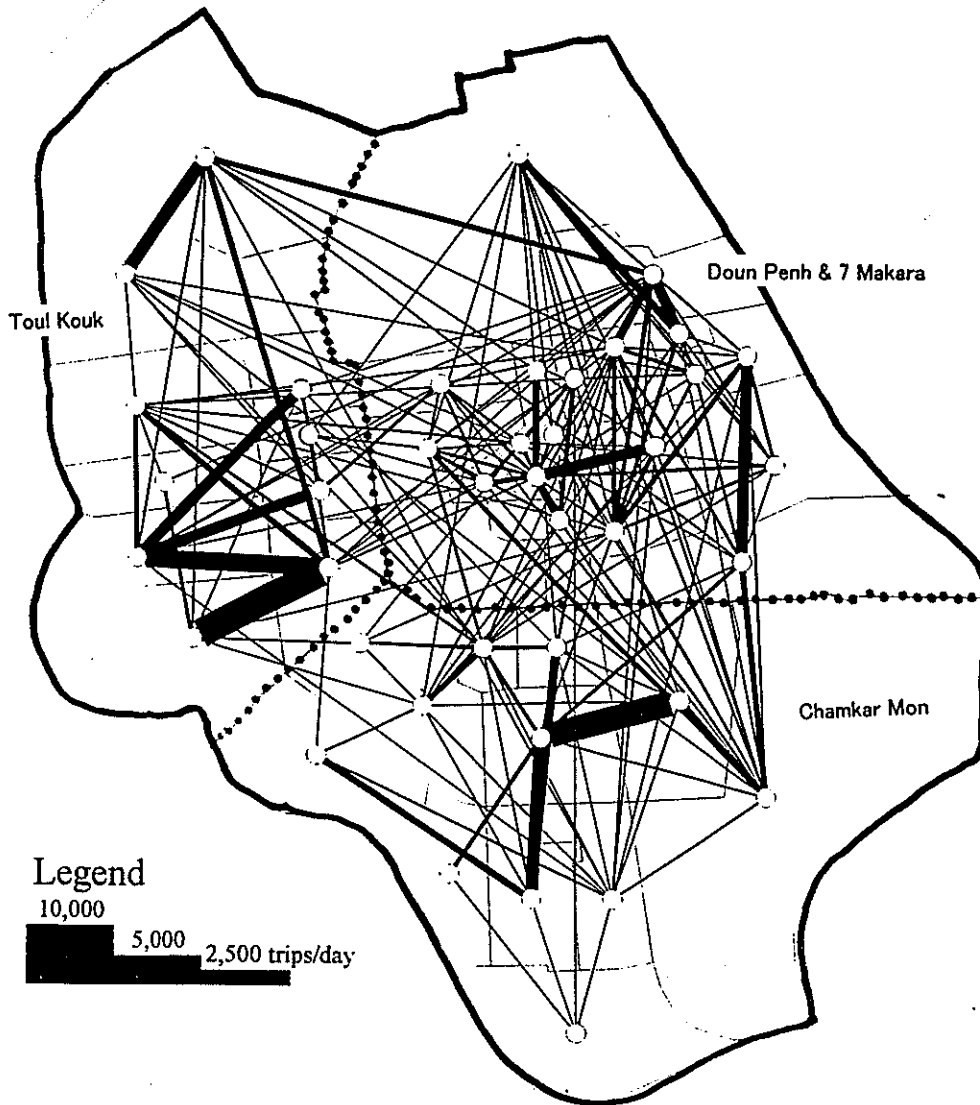


Figure A15.4.1 Desired Line of Motodop in Central 4 Districts and Number of Trips by Designated 3 Zones

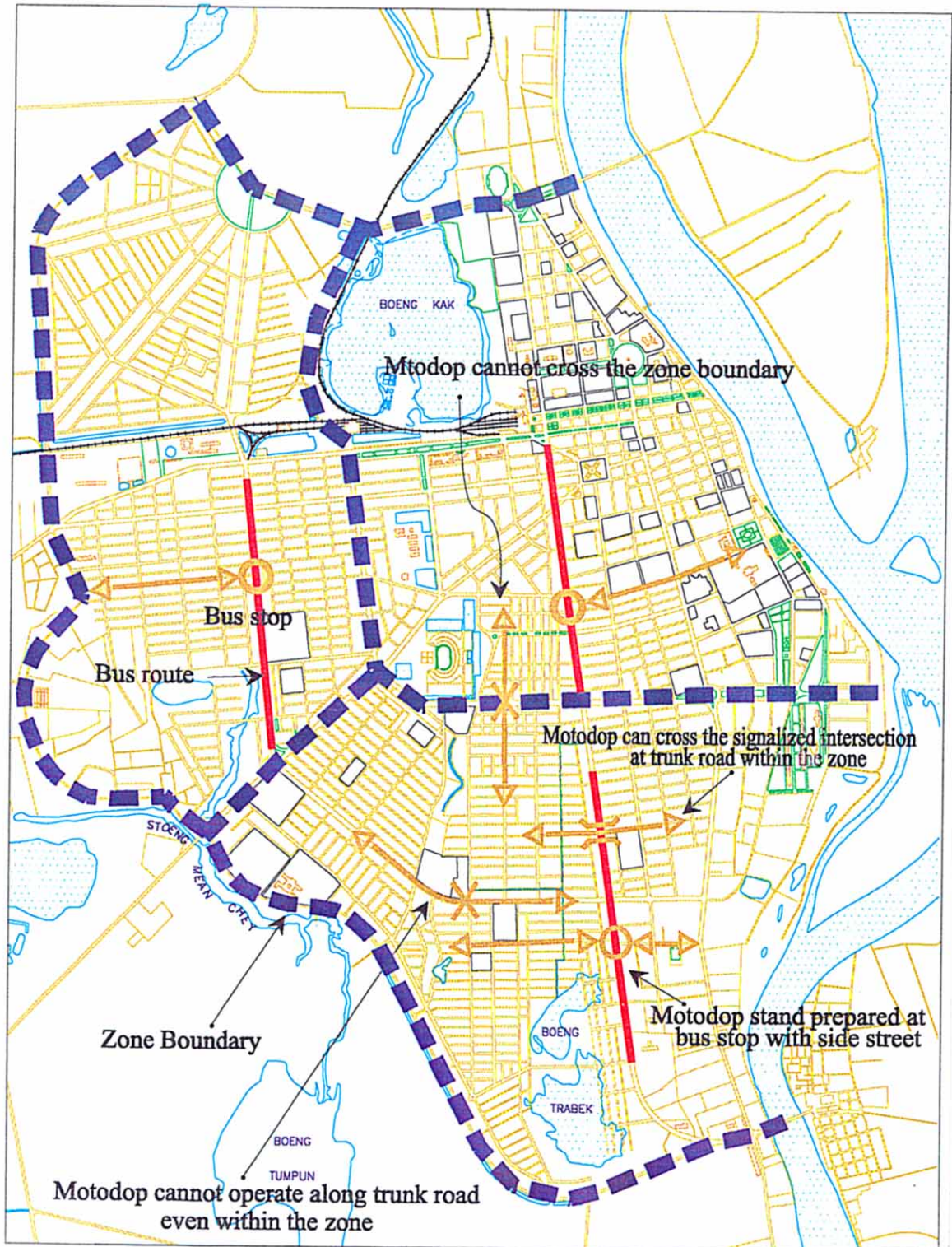


Figure A15.4.2 Concept of Motodop Operational Zone in CBD



Figure A15.4.3 Example of Body Design of Cyclo for Tourists

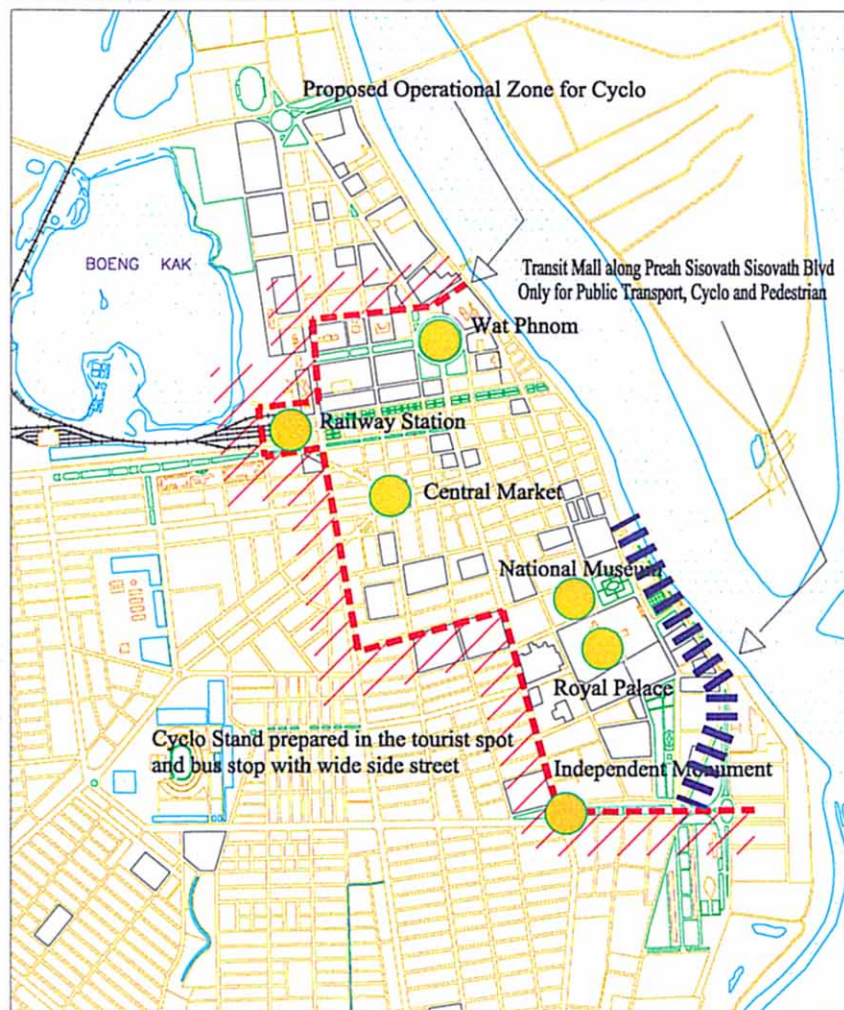


Figure A15.4.4 Cyclo Operational Zone in the Future

### A15.4.3 Motorumok

On the outskirts of the city, trailers are attached to the back of motorcycles to transport people and goods for journeys longer than those taken by motodops and cyclos. These are called motorumok and can transport 12 or 15 persons at a time. This mode is used mainly by factory workers to commute to/from work and by farmers to transport their goods to the market. Based on the person trip survey result, it can be said that the desired line made by motorumok does not extend into the CBD because of the ban of motorumok operation within the CBD (refer to figure A15.4.5).

Based on the above-mentioned conditions and the public transport planning concept discussed in section A15.1, the planning directions and measures of motorumok transport are as follows:

- a. Motorumok will play the role of feeder transport means of bus in the suburban area.
- b. Ban of motorumok operation along suburban trunk roads, such as National roads.
- c. The new feeder system, which is the mode between bus and motorumok in the future, is proposed due to the sparse road network density in the suburban area. This mode can be converted from pickup type of taxi-bus. The public transport system in the suburban area in the future is shown in Figure A15.4.6.
- d. The motorumok stand/pool can be developed at major bus terminals and bus stops for the improvement of convenience of transfer between modes (refer to section A15.8).

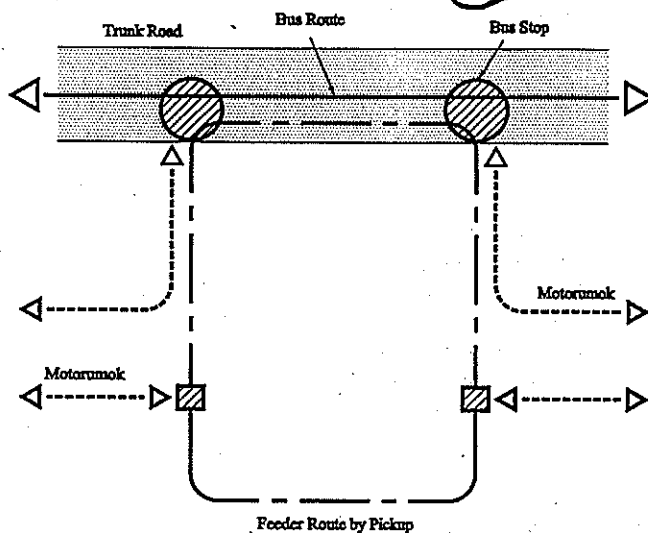
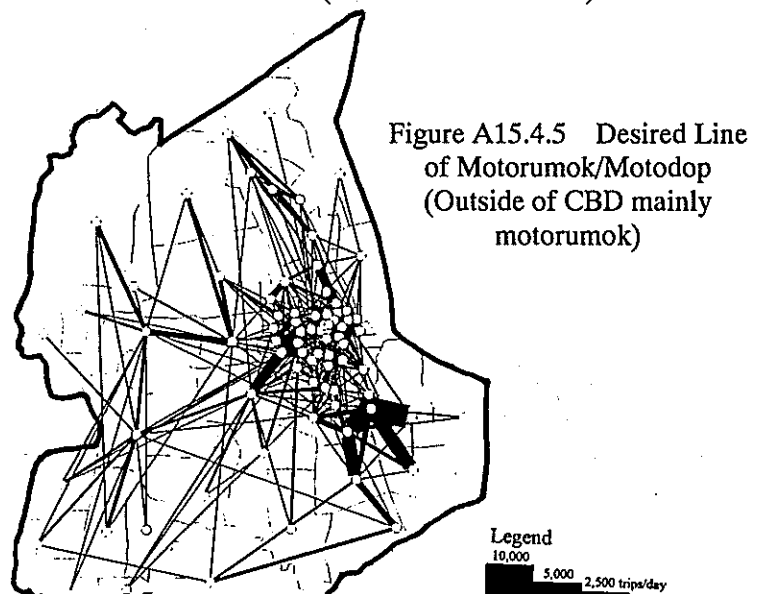


Figure A15.4.6 Public Transport System in the Suburban Area in the Future

## **A15.5 ACCESSIBILITY OF OTHER TRANSPORT MODES**

### **A15.5.1 Rail Transport**

#### (1) Nationwide Network

Royal Railways of Cambodia operates two (2) lines. These are the northern line (from Phnom Penh to Poipet of 385km) and the southern line (from Phnom Penh to Sihanoukville of 263km).

The operational speed of railway is less than 20km/hour due to the deterioration of railway facilities, such as bridges and tracks, by the civil war and natural disasters, such as floods. Therefore, there is not much expectation on the railway system in Cambodia unlike the intercity transport mode, especially passenger transport. However, rehabilitation of the railway system becomes more important among the transport systems in the whole country, because of not only the increase of heavily large freight volume at Sihanoukville port, such as container cargo, but also the following reasons:

- a. Railway makes possible the increase of transport capacity by small rehabilitation cost.
- b. Railway is suitable to the heavy freight transport.
- c. It is necessary to provide a public transport mode for the low income level.
- d. Cambodia has a responsibility to provide railway service as a member of ASEAN.
- e. Railway is efficient for not only container transport but also the transportation mode along Cambodia's growth corridor between Phnom Penh and Sihanoukville.
- f. Railway is an environmentally friendly means of transportation.

Based on the above-mentioned background, Royal Railways of Cambodia has a plan in the short-term up to the year 2003 to rehabilitate the northern line and southern line, including the connection to the Thai railway system (between Sisophon and Poipet, 48km). Estimated total investment cost of this project is approximately US\$93 million but there is no decision yet on the financial source. Considering this rehabilitation plan, the estimated freight transport and passenger transport volume in both lines in the year 2003 will reach 560 thousand tons (2.1 times from 1999 to 2003) and 2 million passengers (3.8 times from 1999 to 2003) respectively.

On the other hand, continuation of the rehabilitation of the northern and southern lines still has a first priority for the long-term plan. And for the long-term and sub-regionally, Royal Railways of Cambodia is envisioned to play the part of Trans Asian Railway (from Singapore to Unman in China via Thailand, Malaysia, Cambodia and Vietnam). However, this railway line has a missing link within Cambodia. Therefore, the connection to Thailand and Vietnam is one of the urgent issues to Royal Railways of Cambodia.

The connection between lines of Thai railway system is to be completed in the short-term plan up to the year 2003 and ASEAN countries are trying to finish their entire lines before the year 2006. However, the completion of this project is dependent upon the financial issue. There is another plan that tourists from Thailand to Siem Reab, which is the largest tourist spot in Cambodia, will be transported directly by a newly connected railway between Siem Reab and Sisophon (refer to Figure A15.5.1).

On the other hand, there is another long-term demand forecast by the Royal Railways of Cambodia as shown in Table A15.5.1. The estimated railway demand forecast of freight and passenger transport over the next 15 years ranges from 338 thousand tons to 1,708 thousand tons (approximately 5.1 times) and from 600 thousand passengers to 2,323 thousand passengers (approximately 3.9 times), respectively. This forecast by the Royal Railways of Cambodia is projected up to the year 2030. The figures for 2015 are interpolated based on the projected figures.

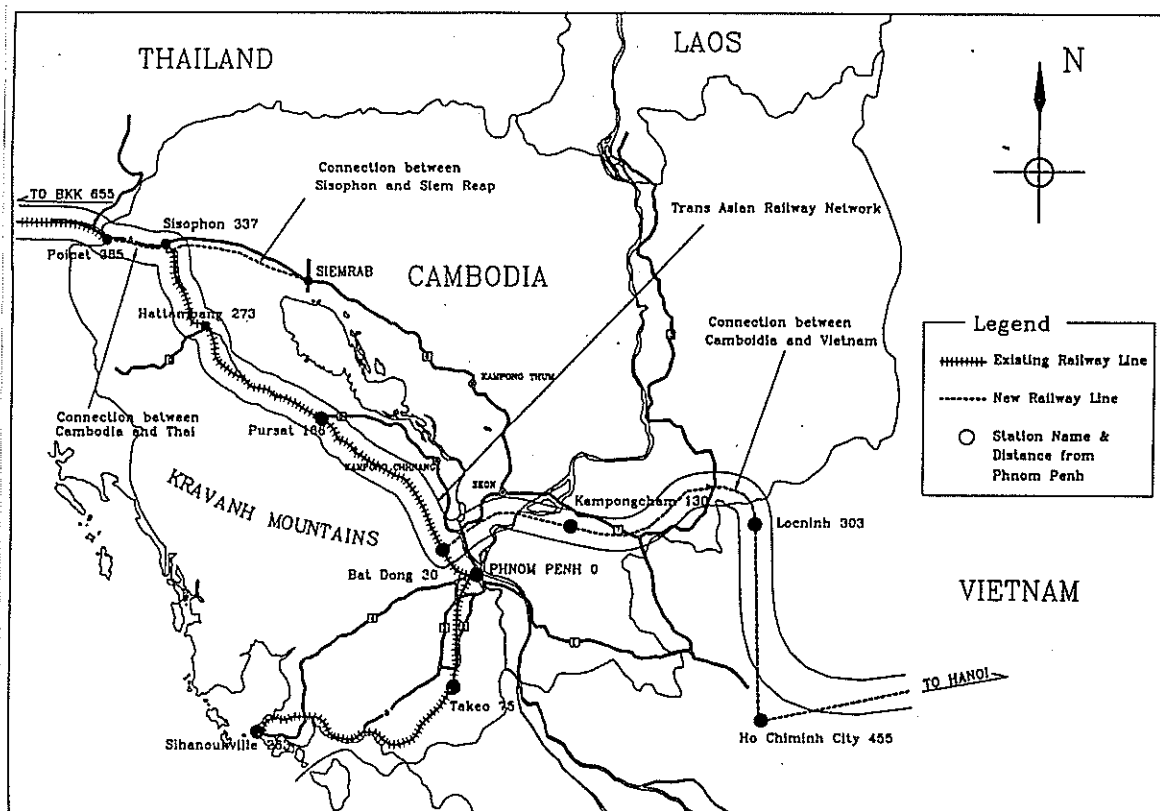


Figure A15.5.1 Various Railway Plans in Cambodia and Surrounding Countries

Table A15.5.1 Demand Forecast of Railway Transport by the Royal Railways of Cambodia  
Source: Royal Railways of Cambodia

Year	Freight (Tonnage)	(Index) Year 2000 = 100	Passenger	(Index) Year 2000 = 100	Remarks
1999	268,390	79	429,111	72	Actual Figure
2000	338,064	100	600,089	100	Projected
2005	750,127	222	1,391,156	232	
2010	1,416,957	419	1,926,938	321	
2015	1,707,858	505	2,322,537	387	

## (2) Phnom Penh Metropolitan Area

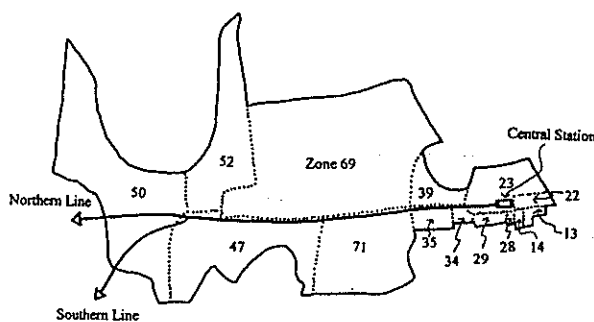
There are 3 railway stations including a central station within the Phnom Penh metropolitan area. But almost all the passengers take the railways for intercity use and not urban use. The central station had only 430 passengers/day in 1999.

However, growth of passenger demand is expected due to the rehabilitation of Northern and Southern lines in the future. Assuming that the increase rate of the rail passengers at the Central Station from 1999 to 2015 is the same as those of whole country, the number of rail passengers at Central Station in year 2015 will reach more than 2,300,000 passengers (refer to Table A15.5.1). And based on the future urban growth of Phnom Penh especially toward the western direction, there will be an urban potential area along the railway line for not only industrial but also residential development (refer to Figure A15.5.2). There is a junction between two lines at 9 km from the central station. This is the strategic point for not only railway system but also comprehensive transport system in Phnom Penh metropolitan area.

To provide an efficient mode interchange area from CBD to these area, improvement of Central Station area is recommended to increase not only railway passengers but also other public mode users by paving the way for a smooth transfer of passengers between modes.

- Rehabilitation of historically important Central Station Building as a new landmark and tourist spot in Phnom Penh
- Improvement of Central Station plaza as one of the major mode interchange areas for smooth transfer between transport modes

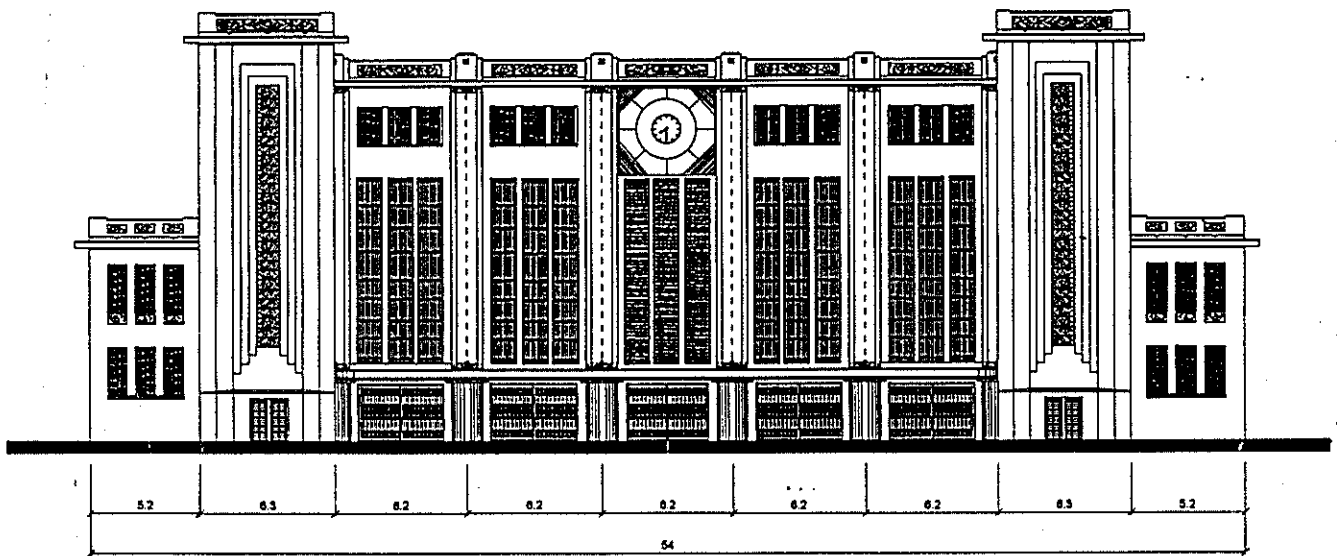
In the case of increase of population along railway line in Phnom Penh, possibility of introduction of urban public transport system using an existing rail track, such as rail bus or dual mode bus.



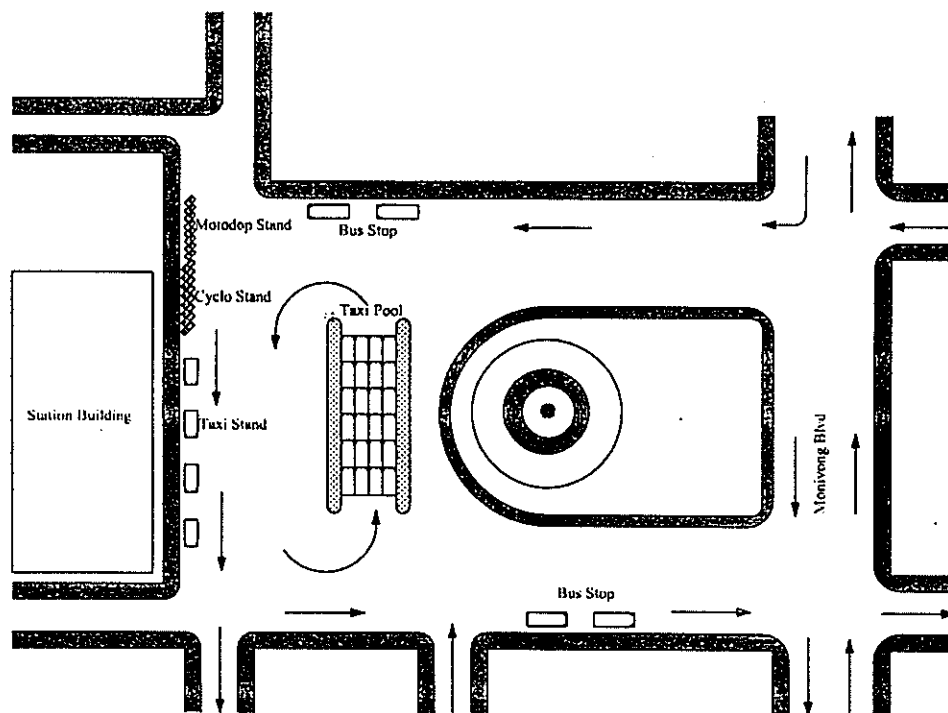
Zone	2000	2005	2010	2015
CBD				
13	7,622	8,060	8,498	8,936
14	7,954	8,411	8,868	9,325
22	34,516	35,520	36,523	37,527
23	8,870	9,128	9,386	9,644
28	13,286	14,050	14,814	15,577
29	12,395	12,577	12,758	12,939
34	10,333	11,071	11,809	12,548
35	13,795	14,781	15,766	16,751
39	27,547	33,471	39,395	45,319
Suburban				
47	19,759	24,959	30,158	35,358
50	4,508	5,251	5,994	6,738
52	3,194	3,720	4,246	4,773
69	21,903	32,333	42,763	53,193
71	40,157	57,701	75,245	92,789
CBD	136,320	147,068	157,817	168,565
Suburban	89,520	123,964	158,407	192,851
Total	225,840	271,032	316,224	361,416
CBD (Index)	100	108	116	124
Suburban	100	138	177	215
Total	100	120	140	160

Figure A15.5.2 Population Distribution along Railway Line





Rehabilitatin of Central Station Building



Improvement of station plaza

Figure A15.5.3 Improvement of the Central Station Area

## A15.5.2 River Transport

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 Phnom Penh and adjoining provinces, the river transport remains the most important public transportation mode, even if the demand is not so much.

Environmental concerns have been raised as regards water transport, such as river transport, not only in the developed countries but also the developing countries, most of which are currently faced with serious environmental problems, especially from the transportation system. River transport, however, is more environmentally kind than other modes of transport. But in the case of Phnom Penh, most of its river transportation facilities, such as ferryboats and jetties, are in very poor condition. Therefore, it is important to improve not only these facilities but also 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 urban environment in Phnom Penh.

Based on the current status of river ferry operation, profile of jetties, future transport demand and planning direction of public transport system in Phnom Penh in the year 2015, required space for jetty is summarized in Table A15.5.2. Considering better transfer between land transport modes, the necessary jetty space in the year 2015 is deemed to be approximately 3.7 times (= 13,000/3,497) that of the year 2000. Planning concept and future image of jetty, which is an environmentally friendly transport mode, are shown in Figure A15.5.4.

Table A15.5.2 Profile of River Ferry Jetty (Year 2000 and 2015)

No.	Ferry Route	Area (sq. m.)	Capacity of Jetty	Ferry Fare (riel)	No. of Ferry Boats	Monthly Passengers in 2000	Daily Passengers		Required No. of Ferries in 2015 *3	Required Area of Jetties in 2015 *4	Remarks
							2000 *1	2015 *2			
1	Kao Sou Kreb - Preak Ta Sek Ferry	720	1	300	1	11,220	449	741	2	1,000	
2	Chrang Chamres - Preak Ta Kov Ferry	300	1	300	1	8,700	348	574	2	1,000	
3	Phnom Penh - Chrouy Chang Va Ferry	1,227	1	300	1	8,160	326	539	2	1,000	
4	Phnom Penh - Akreiy Ksatr Ferry		3	500	3	30,600	1,224	2,020	6	3,000	
5	Khtor - Kaoh Dach Ferry	350	2	300	1	3,240	130	214	1	500	
6	Chrouy Changvar - Svay Chrum Ferry	300	2	500	3	28,200	1,128	1,861	5	2,500	Many vehicles
7	Preach Lieb - Kaoh Okha Tei Ferry	600	3	500	3	46,800	1,872	3,089	8	4,000	Recreational Area
Total		3497	13		13	136,920	5,477	9,037	26	13,000	

Note: \*1 Daily passenger in the year 2000 is calculated based on 25 days per month.

\*2 Increase rate of daily passengers from 2000 to 2015 is 1.65 based on the traffic demand forecast.

\*3 Required number of ferry in the year 2015 is calculated based on 420 passengers/ferry.

\*4 Considering the space for feeder mode stand/pool such as motodop, 500 sq. m. is provided for jetty area/ferry in the year 2015.

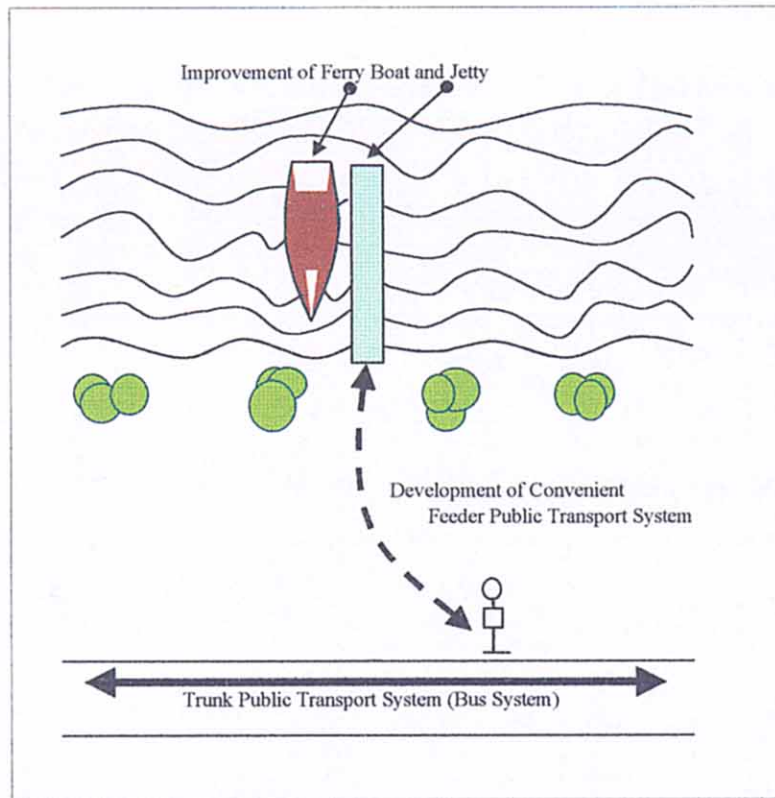


Figure A14.5.4 Planning Concept and Improvement Image of River Ferry Jetty

### A15.5.3 Air Transport

#### (1) Preliminary Air Passenger Demand Forecast

##### a. Whole Country

In 1999, total air passengers were approximately 803 thousand, of which 79% (631 thousand) were international passengers. The break down of international passengers by route was as follows: 50% or 313 thousand from Bangkok, 16% or 103 thousand from Ho Chi Minh, and 12% (73 thousand) from Singapore. On the other hand, domestic air passengers in 1999 were an estimated 171 thousand, of which 76.5% (131 thousand) used Siem Reap route where the Angkor Wat is located, followed by Battambang route.

Based on the air passenger trend, population and per capita GDP in Cambodia, the relation between per capita GDP and air passengers/1,000 population can be found in the following formula, which is graphically presented in Figure A15.5.5. Using this formula, and the population and per capita GDP forecast in the year 2015, air passenger demand in 2015 in Cambodia is estimated to be approximately 3.51 million, as shown below.

$$App = 10.743e^{0.0066x} \quad (R^2 = 0.9163) \quad (\text{Refer to Figure A15.5.5})$$

$$Ap = App \times Pop$$

Where:

App: Air passengers per 1,000 populations in 2015

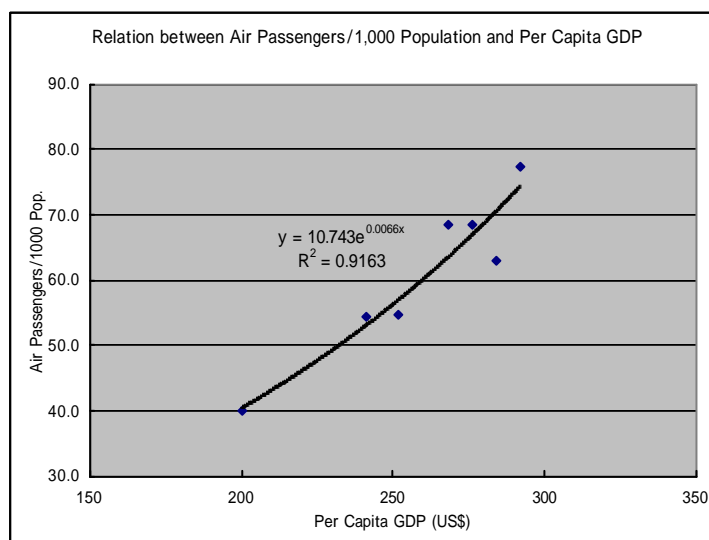
X: Per Capita GDP in 2015 (US\$447 in 1993 constant price)

Pop: Population in Cambodia in 2015 (17.1 million)

Ap: Air Passenger Demand in Cambodia in 2015

##### b. Pochentong International Airport

Assuming that the share of air passengers at Pochentong airport out of total air passengers in Cambodia in 2015 is the same as in 1999, which is 90%, the air passenger demand at Pochentong airport in 2015 is estimated at 3.16 million.



Items		1993	1994	1995	1996	1997	1998	1999
No. of Air Passengers	International	287,407	367,132	451,047	608,228	552,189	480,342	630,823
	Domestic	96,834	171,450	196,627	221,009	201,736	144,846	171,422
	Total	384,241	538,582	647,674	829,237	753,925	625,188	802,245
Population in Cambodia		9.6	9.9	10.3	10.7	11	11.4	11.7
Per Capita GDP (US\$)		200	241	284	292	276	252	268
Air Passengers/1,000 Pop.		40.0	54.4	62.9	77.5	68.5	54.8	68.6

Source: SSCA and CDRI

Figure A15.5.5 Relation between Per Capita GDP and Air Passengers/1,000 Population

## (2) Curbside Facility Requirement at Pochentong International Airport in 2015

Based on the annual air passengers in 2015 and the comparison between various airport data in Japan as shown in Table A15.5.3, the required curbside area is estimated to be approximately 28,400 sq. m. based on the following formula:

$$A = B \times C \times D = 3,160,000 \times 0.3 \times 30 = 28,440 \text{ sq. m.}$$

Where:

A: Required area of curbside (sq. m.)

B: Air passengers at Pochentong Airport in year 2015

C: Number of car park slots/1,000 air passengers

D: Unit car park space (sq. m. /slot)

Table A15.5.3 Comparison between Annual Air Passengers and Car Park Indicators at Various Airports in Japan

Name of Airport		Annual Passengers in 1995 (000)	Total Area (ha)	Runway	Terminal Building (sq. m)	Car Park			
						(sq. m)	(slot)	(slot/1000 pax)	(sq. m/slot)
Hakodate	Existing	2,018	136	2,500x45	11,476	18,006	757	0.38	23.8
	Plan		159	3,000x45		28,200	889		31.7
Sendai	Existing	2,724	222	2,500x45 1,200x45	10,260	15,992	445	0.16	35.9
	Plan		245	3,000x45 1,200x45		38,100	1,300		29.3
Hiroshima	Existing	2,653	167	2,500x60	30,975		1,029	0.39	
	Plan		195	3,000x60					
Kochi	Existing	1,859	120	2,000x45	7,400	14,755	498	0.27	29.6
	Plan		141	2,500x45	21,130	39,235	1,121		35.0
Total						154,288	5,010	0.30	30.8

Source: Airport Handbook 1998

## (3) Improvement of Landside Access to/from Pochentong International Airport

The current access modes to/from Pochentong International Airport are only private cars and airport taxis. Considering the future increase of air passengers of Pochentong International Airport, it is necessary to improve the landside access to/from the airport, especially by introducing a public transport system, such as bus service.

Based on the future air passengers in Pochentong Airport, modal shares of “with bus” and “without bus” and occupancy, the peak hour landside traffic to/from the airport is estimated in Figure A15.5.6. A 12% reduction in traffic volume is estimated to occur with the introduction of a bus service as airport access mode, and air passengers would have more convenience because of the variety of access modes to/from the airport.

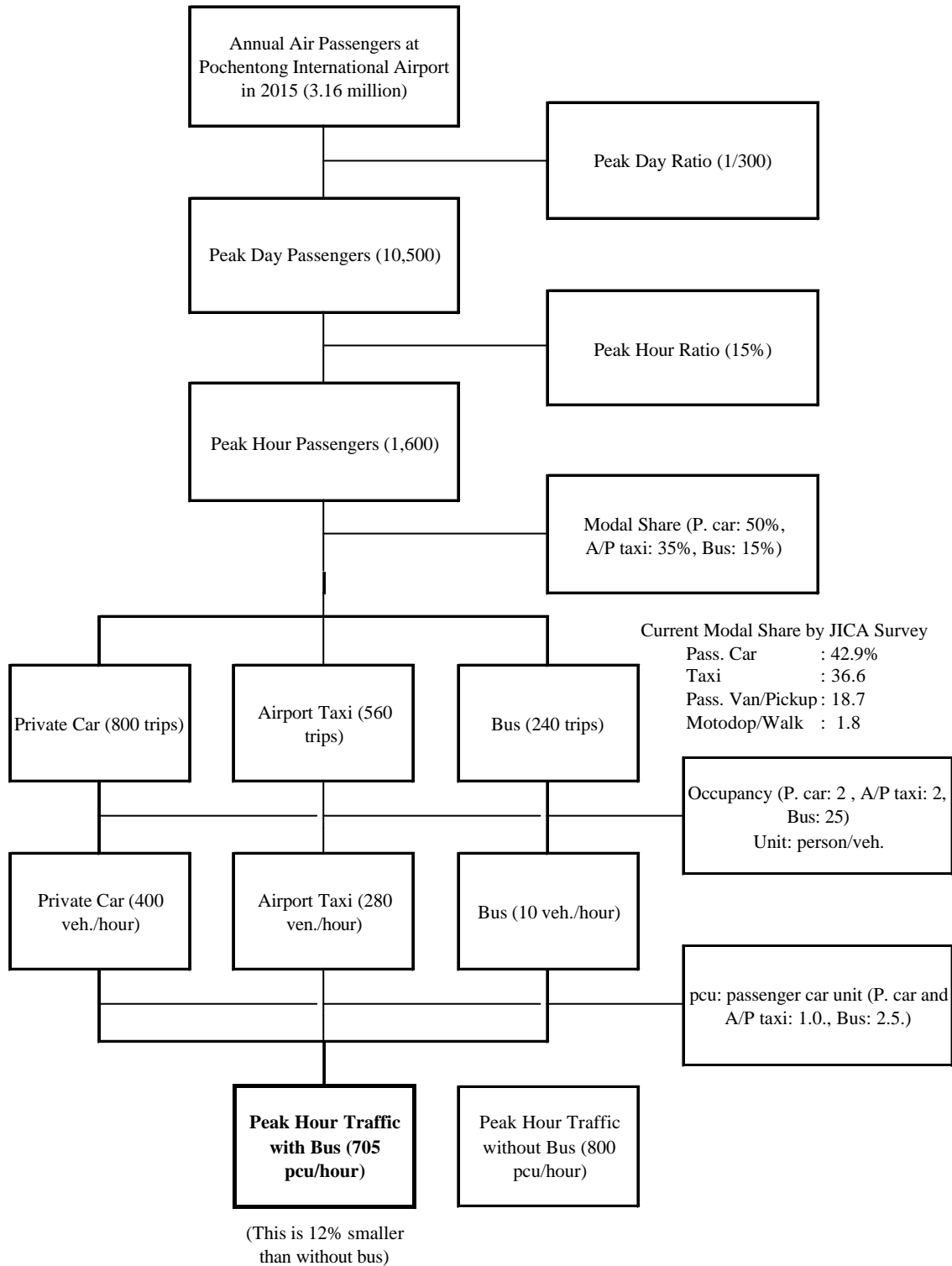


Figure A15.5.6 Curbside Impact of Introduction of Bus at Pochentong Airport in 2015