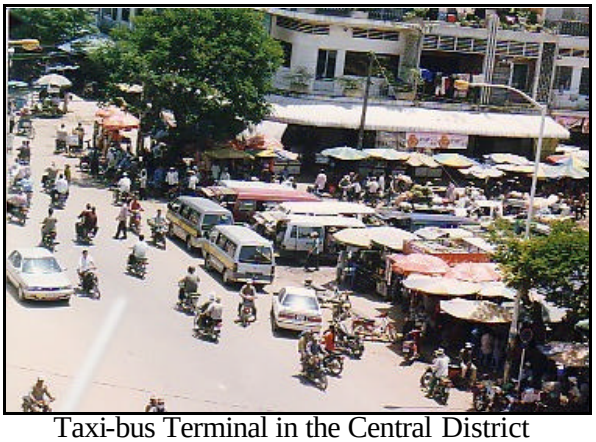
Typical Para-Transit (Motodop)

Typical Para-Transit (Cyclo)

Typical Para-Transit (Motorumok)

Typical Para-Transit (Taxi-bus)

Light Truck carrying Factory Worker



Taxi-bus Terminal in the Central District

Mixed Traffic on NR1 near Chbar Ampau Market

Traffic Congestion on Arterial Street

Inner Ring Road (unpaved and rough)

Outer Ring Road (unpaved)

Narrow Bridge on Suburban Road

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Suburban Road with Poor Pavement Condition

Urban Street under Flood

Traffic Safety Campaign

Poster for Traffic Safety Campaign

Opening Ceremony of Bus Operation

Public Experiment (Bus Operation)

St.105 before Improvement

St.105 after Improvement

Banner for Public Experiment

Material for Traffic Safety Education

Transport Master Plan Work Shop

OUTLINE OF THE STUDY

1. INTRODUCTION

The population and socioeconomic activities of Phnom Penh, the capital of the Kingdom of Cambodia has been growing rapidly in recent years and is expected to continue to grow in the future. In parallel to the growth of population and socioeconomic activities, the number of vehicles and the traffic volume are increasing at substantial rate.

With increase in the number of vehicles and the traffic volume, various problems of transport have become the major social issues. In lieu of this situation, the Government of the Kingdom of Cambodia requested the Government of Japan a technical cooperation to formulate a transport master plan of the metropolitan area. In response to the request of the Government of the Kingdom of Cambodia, the Government of Japan has decided to conduct "the Study on the Transport Master Plan of the Phnom Penh Metropolitan Area" (hereinafter referred to as "the Study") and entrusted the Study to Japan International Cooperation Agency (JICA).

2. SOCIOECONOIC PROFILE

The Study Area consists of the Municipality of Phnom Penh (MPP) and some parts of Kandal Province adjacent to Phnom Penh covering approximately 439 km^2. Population of the Study area is estimated at 1.15 million in year 2000, consisting of 591,000 in the urbanized area and 561,000 in the suburban area. The population is expected to increase to 1.82 million in year 2015.

MPP is planning to control the population growth in the urbanized area by regulating the building heights. On the other hand, MPP is planning to develop the western suburban area. The developments planed in this area include Export Processing Zone (EPZ), industrial areas and residential areas. With this regulation, population in the urbanized area is expected to increase to only 750,000 in 2015 while that in the suburban area is expected to increase to 1,070,000.

3. PRESENT TRANSPORT ISSUES

Present transport issues are as follows.

Public Transport

Motodop (motorcycle taxi) is the predominant mode of public transport helped by its relatively low fare and convenience. However the motodop is dangerous and uncomfortable for the passengers. In addition, the motodop is inefficient as a public transport, in particular compared with bus. There are only inter-city bus services in the Study Area. Intra-city bus were once operated by a Malaysian bus company but halted shortly after the commencement due to several reasons, including insufficient demand and unfavorable operation environment caused by large volume of motorcycle traffic hindering smooth operation of bus.

Traffic Control

Issues in the field of traffic control ranges wide variety as summarized below.

(i) Undisciplined behavior of both motorists and pedestrians
(ii) Uncontrolled parking on streets and on sidewalk
(iii) Out-dated and inefficient function and insufficient number of the existing traffic signals
(iv) Mixed traffic composed of high-speed vehicles, such as passenger cars, and slow-speed vehicles such as cyclos (three-wheeled bicycle taxi).
(v) Disorderly traffic flow at intersections

Road Network

The road network in the Study Area is divided into two according to the deference of the characteristics; urban road network and suburban road network. The issues of the two road networks are as follows.

Urban Road Network

(i) The network itself is well developed, however the pavement conditions are very poor, in particular with regard to collector and local streets.
(ii) Because of poor pavement conditions of collector and local streets, vehicles tend to detour to arterial streets, causing traffic congestion.
(iii) Some sections are frequently inundated and become impassable to vehicles during rainy season.

Suburban Road Network

(i) Majority Municipal roads and Districts/Commune roads are in very poor conditions with insufficient width, unpaved rough surface, and disconnected at many locations.
(ii) Bridges on these roads are severely deteriorated and impassable even for passenger cars and small trucks.
(iii) There are some missing links even on the arterial roads such as Outer Ring Road.
(iv) Due to the facts described above, the suburban road network is not properly functioning causing traffic congestion on arterial roads and lack of proper transport services to many remote villages.

Because of the problems listed above, both the urban and suburban road network is not only imposing the inconvenience to the citizens in their daily activities but also expected to be unable to support sound development of the metropolitan area.

Legislation, Financing and Institution

Legislation
Transport legislation system has problems, in particular, in the practice. These practical problems include inefficient and ineffective vehicle registration system and driver license system. Present vehicle registration system cannot provide reliable basic data, such as number of registered vehicles, needed for formulation of transport policies/measures. Present driver license system has no record of traffic violations. It does not require renewal. Due to these problems, the present driver license system cannot provide basic data for traffic safety planning.

Financing
Present financial source of the Royal Government of Cambodia substantially rely on the foreign assistance from multilateral and bilateral donors. Insufficiency in fund is one of the main causes for the needed projects not being implemented.

Foreign investment is expected to play important role in the improvement of transport facilities including bus services and roads. However, the present climate for foreign investment is very vulnerable. To promote foreign investment, laws and regulations need to be established.

Institution

The Department of Public Works and Transport (DPWT) of MPP is the main institution responsible for

planning, administration and implementation of transport policy and measures in Phnom Penh. DPWT has several problems including unclear job description, or goal, for divisions and sections, insufficiency in professional skills of the staff and budget allocation insufficient for fulfilling the duties.

4. TRAFFIC DEMAND

Based on the data obtained through various traffic surveys, traffic demand was estimated for the present and for the target years. The traffic surveys conducted in the Study include person trip survey, cordon line survey, screen line survey, roadside traffic count and interviews to passengers, owners and drivers of para-transits.

JICA STRADA, a computer program specifically developed by JICA for traffic assignment was used in the traffic demand analysis. OD data were expanded using the data on growth in economy and population. Demand for public transport, used in estimating modal share, was determined based on the data obtained through opinion survey conducted in the person trip survey and verified by using the data obtained through the Public Experiment.

The results of the analysis show that there will be severe traffic congestion mainly on the sections of National Roads immediately outside of the urbanized area in the target year of 2015, if no measures will be implemented (Do Nothing Case). In Do Nothing Case, there will be also severe traffic congestion in some sections on the urban streets.

Contrarily, with implementation of the Master Plan projects (With Master Plan Case), traffic congestion is expected to remain within acceptable level both in the urbanized area and suburban area in year 2015.

5. MASTER PLAN FORMULATION

Strategies

In view of the present transport issues described above and the future problems anticipated based no the result of the traffic demand forecast described above, the strategies of the Transport Mater Plan was established as follows.

Strategy 1: Establishment of Transport Network in Accordance with the Land Use Development Plan
Strategy 2: Provision of Efficient, Comfortable and Safe Transport System
Strategy 3: Improvement of Urban Traffic Environment
Strategy 4: Introduction of Modern Public Transport System
Strategy 5: Establishment of Traffic Operation

Alternatives
Four alternatives were established as follows.

Alternative 1: Present Pattern (Continuation of present pattern)

In this alternative, traffic pattern in the future is assumed to be same to that of the present, except the change due to the growth in income level and/or variation in the choice by the individuals.

Alternative 2: Vehicle Priority Policy (Encourage 4-wheel vehicles)

This alternative assumes encouraging usage of 4-wheel vehicles (passenger cars) through such measures as acceleration of road improvement and introduction of vehicle tax system in favor of cars.

Alternative 3: Bus Priority Policy (Suppress 2-wheel vehicles)

This alternative assumes introduction of bus services on all the urban arterial streets. Operation of motodop is totally prohibited.

Alternative 4: Bus Favored: Para-transit Co-existing Policy (Encourage bus operation with coexistence of bus and motodop)

This alternative assumes introduction of bus services only along the high-demand routes. Operation of motodops are allowed but controlled. Operation of motorcycles on bus routes is regulated.

Optimum Alternatives of Master Plan

The above four alternatives were comparatively evaluated in terms of such factors as traffic condition, traffic cost and social acceptance. Traffic assignment was made for each of the alternatives and the results were evaluated in terms of such traffic parameters as gross travel length, gross travel time, average volume/capacity ratio and average travel speed over the entire network.

The result of evaluation showed that Alternatives 1 and 2 are unfavorable with in all of the three factors, while Alternative 3 indicated the best traffic condition and traffic cost, followed by Alternative 4 with a slight margin. However Alternative 3 were judged to be socially not acceptable because it assumes total prohibition of motodop. Consequently, Alternative 3 that assumes encouragement of bus usage with coexistence of motodop was selected as the optimum alternative.

The selected optimum alternative was further evaluated to verify that it meets the requirement of the five strategies described above and it was found that the selected alternative satisfy the requirements.

Master Plan Components

The Master Plan is composed of (i) public transport plan, (ii) traffic control plan, and (iii) road development plan as well as (iv) legislation and financing plan and (v) institutional and capacity development plan.

Planning Period

The target year of the Master Plan was set at year 2015. The implementation schedule of the Master Plan projects were divided into three terms; Short Term of 2001 to 2005, Medium Term of 2006 to 2010 and Long Term of 2011 to 2015.

6. ROAD DEVELOPMENT PLAN

In view of the previously stated problems, the strategies and basic direction of road development are set as described below.

Urbanized Area

Strategy: Full utilization of the existing facilities and minimum new construction

Since the road network in the urbanized area is well developed, large-scale new construction/improvement is not necessary, except construction of two missing links. Improvement of pavement of local and collector streets is proposed to properly distribute the traffic which is currently concentrated on the arterial streets.

Suburban Area

Strategy: Implementation of hierarchy road network which support planned development

The present road network in the suburban area is not properly functioning due to extremely poor conditions of collector and local roads with poor surface conditions, insufficient road widths, deteriorated or damaged ridges and large number of disconnected section and missing links. This road far insufficient not only to support the future development but also not providing required transport services to the people living in the suburban area. The incomplete road network is also causing congestion on arterial roads (National Roads) with excess traffic concentration due to the collector and local roads that are impassable for vehicles. Thus, implementation of functional hierarchy road network is in urgent need.

Road Projects

A total of 38 projects for the suburban road, 4 projects for the urban road and 23 bridge projects for the urban and suburban roads combined are proposed. The total const of the road and bridge projects are estimated at US$ 301 million.

7. PUBLIC TRANSPORT PLAN

Introduction of bus services are proposed. Bus is considered to be most appropriate as the new public transport mode in the Study Area. The reasons for selecting bus are as follows.

(i) Bus can be introduced relatively easily because it does not require substantial modification on the existing transport facilities such as road system.
(ii) Manner of bus operation such as route and operation interval can be flexibly adjusted to the change in demand. Thus it can easily respond to future growth in demand which is expected as a result of growth in population and socioeconomic activities in the Study Area.
(iii) Bus is suitable to the Study Area considering the physical and population size of Phnom Penh and also considering the experience of other cities in Asian countries.

Bus Services

The following four stages of implementation is proposed for bus services. Small-size bus with a capacity of approximately 30 passengers is recommended not disturb the favorable urban scenery consisting of relatively low-rise building. Bus fare of 800 riels is proposed based on the result of the analysis of the data obtained through the interview conducted as a part of the person trip survey. Interval of operation is set at 5 minutes and 10 minutes in the urbanized area and suburban area, respectively.

Short Term Plan (2005)

The total number of buses is increased to 448 in, including reserve, and bus routes are extended 9 routes with a total length of 84 km. The bus routes are set along all the major urban arterial streets to connect major public facilities including markets, schools and government offices.

Medium Term Plan (2006 – 2010)

The total number of buses is increased to 844, including reserve,, and bus routes are extended to the suburban area adjacent to the urbanized area in response to the increase in demand in that area. The total length of the bus routes is 102 km.

Long Term Plan (2011 – 2015)

The total number of buses is increased to 1,306, including reserve. The total length of the bus

routes is extended to 148 km covering substantial part of the suburban area in response to the progress of development.

Para-Transit

Motodop

Motodops are allowed to operate within the designated zones and play the role of feeder transport to supplement bus services.

Cyclo

Cyclos are preserved as a unique historic transport mode and allowed to operate in designated areas such as tourist zone.

Motorumok

Motorumoks are banned from operating on the National roads and function as the feeder transport to supplement the bus services in the suburban area.

8. TRAFFIC MANAGEMENT PLAN

In view of the problems described before, and based on the "3 E" concept (engineering, education and enforcement), the following measures are proposed.

Traffic Engineering Measures

Following measures are proposed.

Improvement of existing traffic signals and installation of signals at intersections with large traffic volume

The exiting traffic signals are out-dated and inefficient. These signals need to be replaced by up-to-date type of signals. In addition, there are many unsignalized intersections where the traffic volume is exceeding, or expected to exceed, the capacity. Traffic signals should be installed at these intersections. Implementation schedule of the improvement of signal system is as follows.

Stage 0 (2001 – 2002): The existing signals at 20 intersections are replaced by signals with fixed parameters.

Stage 1 (2003 – 2007): The exiting signals at 20 intersections are up-graded to enable isolated control with "time of the day" parameters. In addition, signals with same function are installed 13 unsignalized intersections.

Stage 2 (2006 – 2010): Additional 23 intersections are signalized and coordinated control system is introduced to the these 23 intersections and 33 previously signalized intersections. In addition signals with isolated control are installed at 7 intersections.

Stage 3 (2011 – 2015): Additional 54 intersections are signalized making the total number of signalized inter section 117. The area control is introduced.

Other traffic engineering measures

(i) Provision of left-turn lane and left-turn signal phase: This measure is expected to improve the flow at intersections and reduce congestion.

(ii) Installation of raised median: This measure will prevent driving on the opposed lane and reduce the chance of accident and also will make the traffic flow smooth.

(iii) Improvement of intersections: Intersections with irregular configuration and round-about intersections should be improved to improve the traffic flow and reduce congestion.
(iv) Establishment of computerized traffic accident data base: To identify the hazardous locations and effective countermeasures detailed data of traffic accidents are indispensable.
(v) Provision of parking facility: Provision of on-street and off-street parking facilities is proposed to rectify the present uncontrolled parking on street and on sidewalk.

Traffic Education and Enforcement

Traffic Campaign
Based on the result of traffic campaign implemented in the Study, it is proposed that traffic campaign be carried out regularly.

Traffic Education
Traffic education is proposed to be incorporated in curricula of regular schools and driving schools. It is also proposed that school teachers and driving school instructors are given training of traffic education. In addition, a police unit specializing traffic education be established and visit schools to educate school children and students.

Traffic Enforcement
It is proposed to strengthen traffic enforcement in order to rectify the current undisciplined driving behavior. Selective enforcement on focused theme is preferable. The problems to be focused include driving on opposite lane, drunken driving, parking near intersections. Enforcement equipment, such as radar speedometer, with good quantity and sufficient quality should be available at traffic police headquarters and district police offices.

9. LEGISLATION AND FINANCING PLAN

Legislation

Following projects are proposed to improve the transport legislation system.

Computerized Vehicle Registration System

Reliable data of vehicle registration is basic information for formulating transport policy. Computerized vehicle registration system needs to be introduced for compiling accurate data of vehicles. A study for introducing such system is proposed to be implemented.

Computerized Drivers' License System

Computerized drivers' license system should be introduced to properly mage drivers. The system should include record of traffic violations and accident to identify hazardous drivers. The system can also provide some basic data for analysis of traffic accidents. A study for introducing such system is proposed to be implemented.

Private Investment Law

To promote private participation in the area of transport, better-structured legislation for private investment needs to be established. A study for establishing such legislation system is proposed to be implemented.

Financial Plan

The Government if encouraged to consider raising fund from such sources as fuel tax, on-street parking fee, vehicle ownership tax and fines of traffic violations.

In reality, however, the Government has to continue to rely on ODA to great extent. The Government is planning to adopt "Reform Plan" which enhance "good governance" and allow the Government to obtain increased ODA in the future. Private participation is also expected to increase in the Reform Plan.

10. INSTITUTIONAL AND CAPACITY BUILDING PLAN

To improve the institutional capacity for implementing the proposed projects in road, public transport and traffic management, 5 units/offices are proposed to be established in DPWT, MPP. These new units/ offices are (i) Budget Formulation Unit, (ii) Public Transport Management Unit, (iii) Laboratory for material testing, (iv) Data Base Formulation Unit, and (v) Urban Transport Research Center (in cooperation with the Ministry of Public Works and Transport).

Two-years program of training for DPWT staff of various levels is proposed to develop human resource capacity.

11. OVERALL IMPLEMENTATION SCHEDULE

Overall implementation schedule was formulated combining the described above and considering the available amount of fund. The estimated amounts of fund required for Short, Medium and Long Term Periods are US$106 million, US$129 million and US$ 141 million, respectively. The estimated amounts of funds available for these periods are US$85 million, US$120 million and US$155 million, respectively. The amounts of required and available fund are considered to match with acceptable difference.

12. TRAFFIC CAMPAIGN AND PUBLIC EXPERIMENT

Traffic Campaign

Traffic campaign was implemented for one week from late January to early February 2001. Traffic police officers and school children participated in the Campaign and advised/encouraged proper driving. The effect was prominent. Improvement of driving manner, such as stopping before the stop line at intersection, is observed not only at the intersection where the campaign activities were held but at many intersection over the whole city.

Bus Operation Experiment

A total of 23 units of buses were leased from a private bus company and were operated on two routes; along Monivong Blvd. and along a circular route consisting of Norodom, Sihanouk, Nerhu and Campuchea Krom Blvds. The experimental bus operation was implemented for one month in June 2001. The total number of the passengers exceeded 100,000 persons and the total revenue of bus fare was more than US$15,000. The Experiment and survey data are considered to show that bus services are well accepted by the general public in the Study Area.

After the experimental operation was completed at the end of June 2001, MPP continued bus operation supported by strong request of the citizens, and stopped at the end of July 2001 due to shortage in fund.

Pavement of a collector street and a local street was improved prior to the start of the Bus Operation Experiment to provide detour route for motorcycles which were prohibited to enter a section of Monivong Blvd. between Sihanouk Blvd and Charles de Gaulle Blvd. This Prohibition of motorcycles was intended to improve the environment for bus operation. Diversion of traffic to the improved streets were substantial and proved the effectiveness of pavement improvement for proper distribution of traffic and alleviation of congestion on the arterial streets due to excess concentration of traffic on them.

13. ENVIRONMENTAL EXAMINATION

Impact of proposed projects of Master Plan was assessed based on the measurement/survey of the present conditions and estimation of expected impacts. The result of assessment showed that the Master Plan, with due consideration on the negative impacts improve the environment in the Study Area.

14. FEASIBILITY STUDY

Feasibility study was conducted on the priority projects.

Bus Services

Operation of 75 units of buses on 4 routes with a total length of 36 km is proposed as Immediate Action Plan, followed by extension to 9 routes with a total length of 84km on which 175 units of buses are operated. The economic analysis showed the following indicators and the project is justified.

NPV = US$4.1 million B/C Ratio = 1.38 FIRR = 20.4%

The operating entity is proposed to be Phnom Penh Transport Authority, with provision bus fleet and facilities by the Government. The results of economic analysis are as follows. With this scheme, the financial analysis showed the cost ratio of 98% indicating this scheme is feasible with very limited margin.

Traffic Control System

Improvement of intersections is proposed. The components of improvement are improvement of the existing signals at 20 intersections, installation of signals at 13 unsignalized intersections and improvement of configuration/ channelization of intersections.

The economic analysis showed high economic return as shown below and the project is justified.

NPV US$ 14.5 million NPV = 6.5 EIRR = 98.4%

Urban Road Improvement

Pavement improvement of urban streets with a total length of 31.8 km is proposed to be improved. The economic analysis showed that the project is justified.

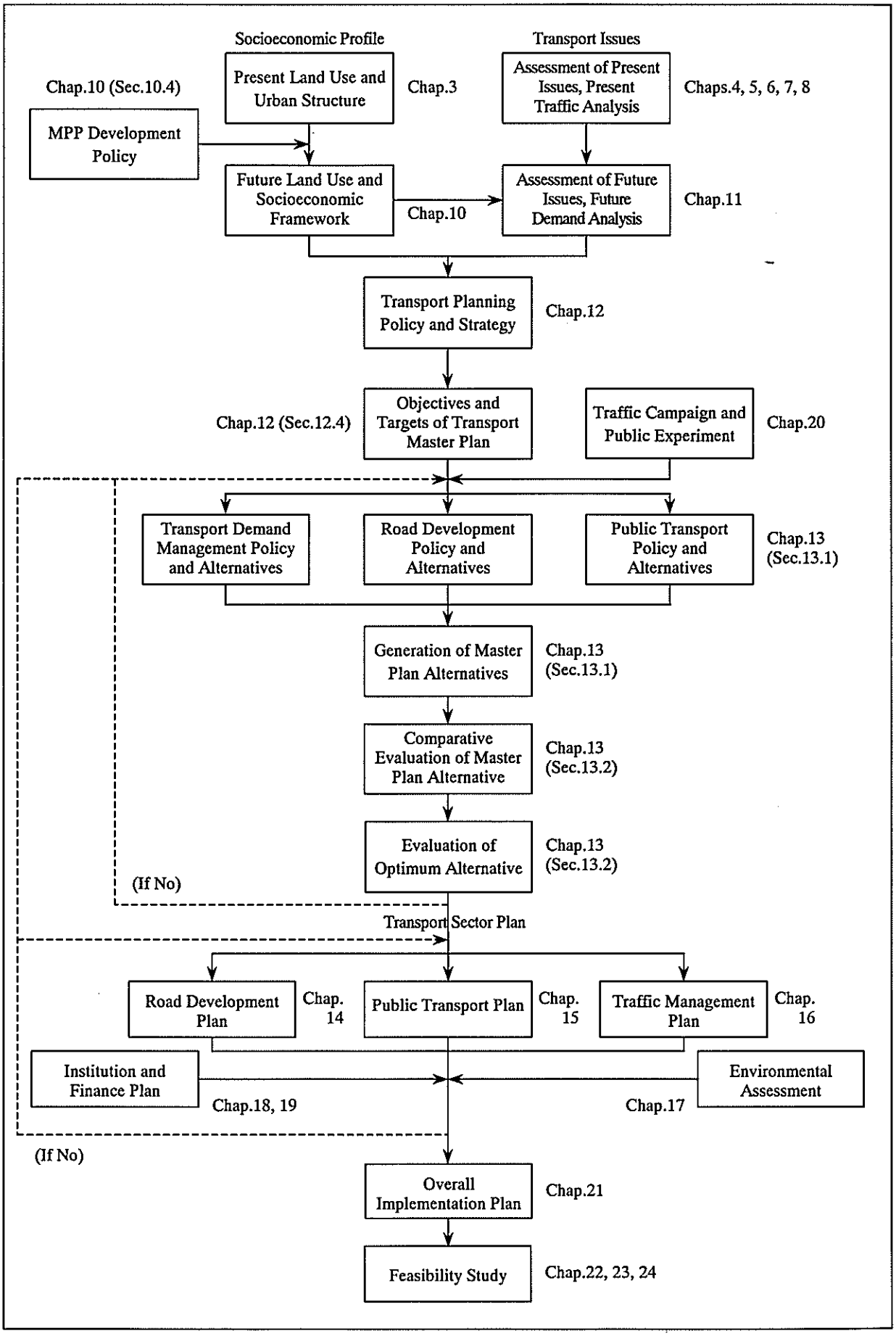
	NPV (US$1,000/km)	B/C Ratio	EIRR (%)
Major Arterial Street	329	1.38	18.0
Minor arterial Street	38	1.07	12.9
Collector Street	-3	0.99	11.9
Local Street	-19	0.94	11.3

15. CONCLUSION AND RECOMMENDATION

It is concluded that The Master Plan is feasible and meet the requirement. It is recommended that the Government authorize the Master Plan and implement it with high priority.

STUDY FLOW

The procedure of the Study followed the flow shown below.



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Abbreviations

3E	Engineering, Education, and Enforcement
A/P	Air Port
AASHTO	American Association of State Highway and Transport Officials
AC	Asphalt Concrete
AC	Advisory Committee, JICA
ADB	Asian Development Bank
ADT	Average Daily Traffic
AADT	Annual Average Daily Traffic
AM	Ante Meridien (Before Noon)
AP	Air Passenger
APP	Air Passenger per Population
ASEAN	Association of South-East Asia Nations
ASTM	American Society for Testing and Materials
ATA	Air Transport
Aus AID	Australian Agency for International Development
AWWA	American Water Works Association
B/C	Benefit Cost Ratio
BAU	Bureau of Urban Affairs
Blvd.	Boulevard
BMTA	Bangkok Metropolitan Transport Authority
BOD	Biological Oxygen Demand
BOT	Build, Operate and Transfer
BS	Bus
BSC	Bus Stop CBD
BSNS	Business
BSS	Bus Stop Suburban
BT	Build and Transfer
CAD	Computer Aid Design
CAP	Cleaning Authority of Phnom Penh
CBD	Central Business Districts
CBT	City Bus Terminal
CDC	Council for the Development of Cambodia
CDRI	Cambodia Development Resources Institute
CFRC	Cheminus de Fer Royaux du Cambodge
CHV	Commercial Heavy Vehicles (Large Bus, Heavy Truck, Tractor & Trailer)

CL	Cordon Line
CLV	Commercial Light Vehicles (Minibus, Pickup, Light Van)
CMAC	Cambodian Mine Action Center
CMC	Commercial Motorcycles (Motodop, Motorumok)
CNATUC	Country Planning, Urbanization and Construction
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
CPU	Central Processing Unit(s)
CRA	Cambodian Railway Authority
CTA	Chief Technical Advisor(s)
CYC	Cycles (Bicycle, Cyclo)
dB	Decibel(s)
DF/R	Draft Final Report
D-factor	Directional Distribution Factor
DIN	Deutchen Industrien Normen
DLUPC	Department of Land Management, Urban Plan and Construction, MPP
DPWT	Department of Public Works and Transport, MPP
DSD	Drainage and Sewerage Division, DPWT, MPP
DSS	Drainage and Sewerage Section, DPWT, MPP
EDC	Electricite Du Cambodge
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EPZ	Export Process Zone
F/R	Final Report
FDI	Foreign Direct Investment
FILP	Fiscal Investment and Loan Program
FPD	Flood Protection Division, DPWT, MPP
FS	Feasibility Study
FY	Fiscal Year, Financial Year
GDP	Gross Domestic Product
GNP	Gross National Product
GRP	Gross Regional Product
ha	Hectare
HCM	Highway Capacity Manual
hr	Hour(s)
HT	Heavy Truck
HV	Heavy Vehicles

IBT	Inter-city Bus Terminal
IC/R	Inception Report
ID	Identification
IEE	Initial Environmental Examination
IRR	Inner Ring Road
IT/R	Interim Report
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
JIS	Japan Industrial Standards
JT	Japan Tobacco Incorporated
km	Kilometer(s)
kip	kilo pound (1,000 pounds)
l	Little(s)
LOS	Level of Service
LRT	Light Rail Transit
LV	Light Vehicles
M/M	Man Month
MC	Motorcycles
MEF	Ministry of Economics and Finance
mg	Milli Gramme
MHz	Mega Hertz
MIS	Management Information System
MLUPC	Ministry of Land Management, Urban Plan and Construction
MM	Minutes of Meeting
MOP	Ministry of Planning
MP	Master Plan
MPN	Most Probable Number
MPP	Municipality of Phnom Penh
MPT	Ministry of Post and Telecommunications
MPWT	Ministry of Public Works and Transport
MW	Mega Watt(s)
n.a.	Not Available
NC	New Construction
NGO	Non Governmental Organization(s)
NO_2	Nitrogen Dioxide
NPV	Net Present Value
NR	National Road / National Route

NTT	Nippon Telegraph and Telephone Corporation
O&M	Operation and Maintenance
OCR	Optical Character Reader
OD	Origin and Destination
ODA	Official Development Assistance
ORR	Outer Ring Road
OTHR	Others (Horse/Cow/Bicycle Trailers)
P	Pavement
P.T.	Public Transport
P/R	Progress Report
PC	Passenger Car
PC	Prestressed Concrete
PC	Personal Computer
PCU	Passenger Car Unit
pH	Potential of Hydrogen
PHN	Phnom Penh
PIP	Public Investment Program
PITFP	Phnom Penh International Trust Fund Program
PLV	Private Light Vehicles (Passenger Car, Pickup)
PM	Post Meridiem (After Noon)
PMC	Private Motorcycles
PMU	Project Management Unit, DPWT, MPP
Pop.	Population
PPCS	Phnom Penh City Shuttles
PPWSA	Phnom Penh Water Supply Authority
PRVT	Private
psi	pound per square inch
PT	Person Trip
QV	Quantity and Velocity (Volume and Speed)
RAI	Round-About Intersection
RC	Reinforced Concrete
Rd.	Road
RGC	Royal Government of Cambodia
RN	Route National
ROW	Right-of-Way
RS	Road Side
RSP	Railway Station Plaza

RTJ	River Transport Jetty
SC	Steering Committee, MPP
SCHL	School
SDP	Socioeconomic Development Plan
SL	Screen Line
SO_2	Sulfur Dioxide
SOCL	Social
sq.	Square
SSCA	State Secretariat of Civil Aviation
St.	Street
STRADA	System for Traffic Demand Analysis, JICA
SW	Scope of Work
TA	Technical Assistance
TDM	Traffic Demand Management
TM	Traffic Movement
TS	Travel Speed
TSP	Total Suspended Particulate
TTC	Travel Time Cost
TV	Television
TVK	National Television of Cambodia
UNDP	United Nations Development Program
USD	United States Dollar
VCR	Volume Capacity Ratio
VOC	Vehicle Operating Cost
W	Widening
WB	World Bank
WFP	World Food Program
WLK	Walk