2) Outer Ring Road

As for the Outer Ring Road, the analysis is done from the result of traffic assignment whose road network is fully developed.

Traffic demand on the Outer Ring Road in 2015 is shown in Table 6.9 and Fig. 6.26. There are more than 10,000 pcu/day of traffic on the sections between Budhanilkantha Road and Lubhu (a~f), on the sections between Kirtipur and Tribhuvan Highway (l~m), and on the section between Bhimdhunga Road and Trisuli road (o). Since road construction is difficult in western part of Kathmandu Valley, the proposed Outer Ring Road is restricted to be the sections between Budhanilkantha Road and Bungamati (a~i). The sections between Budhanilkantha Road and Lubhu (a~f) should have high priority of all, because traffic demand based on present traffic pattern are larger and further traffic impact from this road development are greatly anticipated.

TABLE 6.9 TRAFFIC DEMAND ON EACH SECTION OF OUTER RING ROAD (2015)

No	Section	Traffic Demand (1,000 pcu/day)	Further Development Effect
a	Budhanilkantha Road – Jorpati	12	
b	Jorpati – Gothatar	14	o
c	Gothatar – Thimi	11	o
d	Thimi – Arniko Highway	13	
e	Arniko Highway – Arniko Bypass	13	o
f	Arniko Bypass – Lubhu	11	o
g	Lubhu – Godawari Road	9	
h	Godawari Road – Chapagaon Road	7	
i	Chapagaon Road – Bungamati	7	
j	Bungamati – Dakshinkali Road	7	
k	Dakshinkali Road – Kirtipur	4	
l	Kirtipur – 2nd Tribhuvan Highway	14	
m	2nd Tribhuvan Highway – Tribhuvan Highway	11	
n	Tribhuvan Highway – Bhimidhunga Road	7	
o	Bhimdhunga Road – Trisuli Road	10	
p	Trisuli Road – Phutung	3	
q	Phutung – Tokha	6	
r	Tokha – Budhanilkantha Road	7	

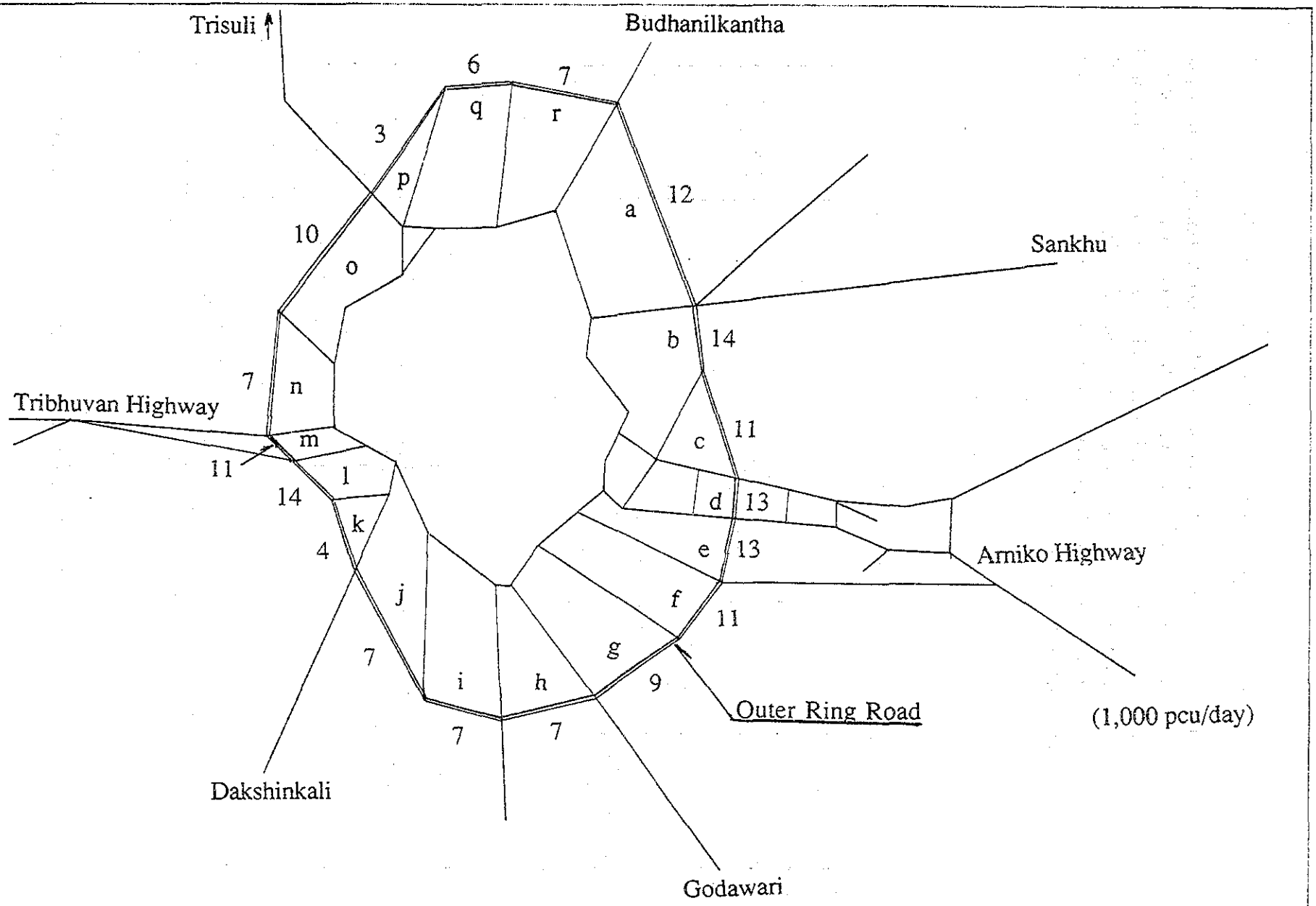


FIG 6.26 TRAFFIC DEMAND ON THE OUTER RING ROAD (2015)

(3) Road development for the integration of three (3) existing city centers

Although existing traffic demand along the Kathmandu-Bhaktapur corridor is about 10 thousand pcu/day, it will reach about 40 thousand in 2015 as shown in Fig. 6.27. Under these conditions, widening of Koteswor - Thimi - Bhaktapur Feeder Road and construction of Baneswor - Thimi shortcut as well as construction of Arniko Bypass are inevitable for the reduction of traffic load on Arniko Highway.

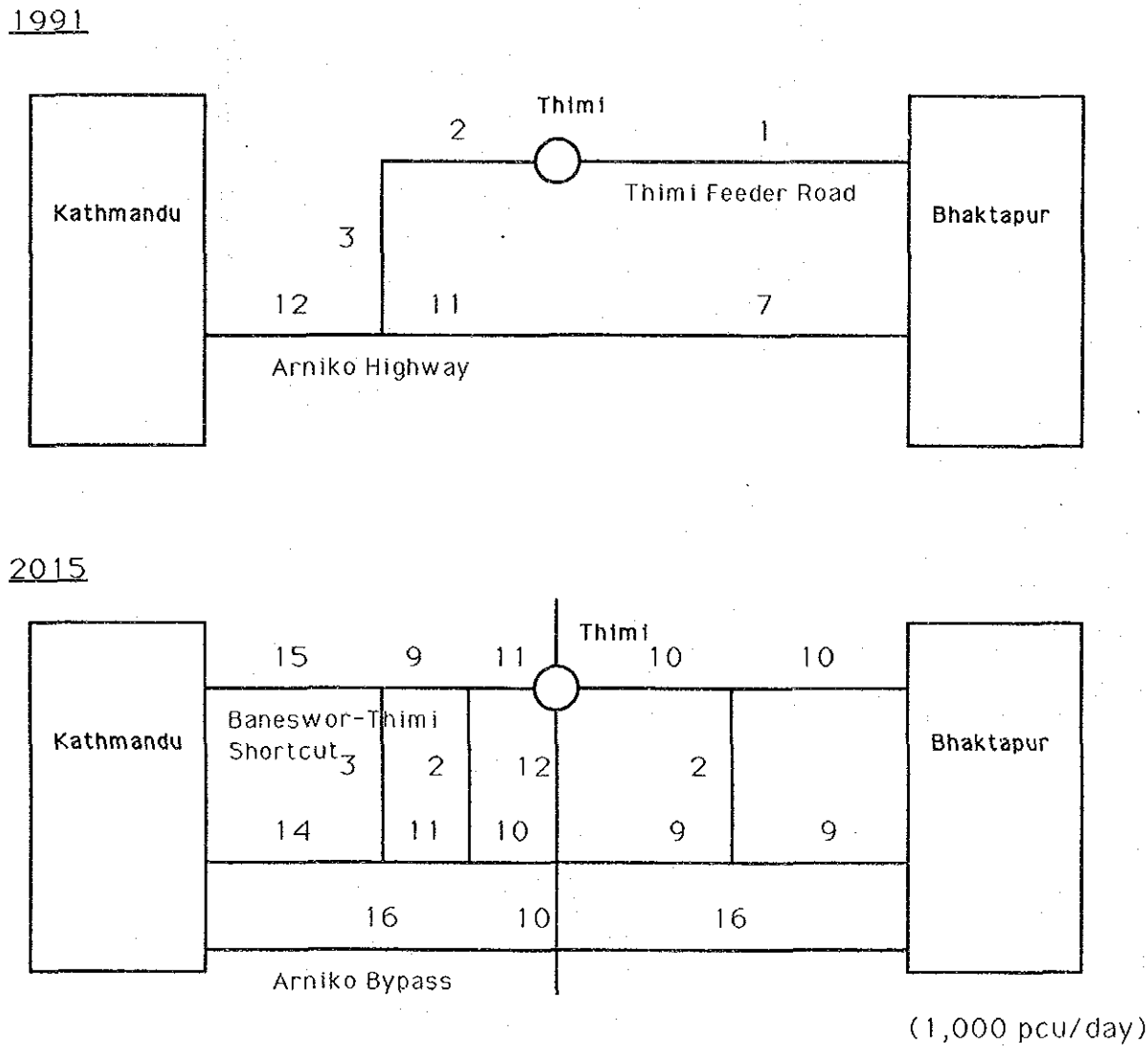


FIG. 6.27 TRAFFIC DEMAND BETWEEN KATHMANDU AND BHAKTAPUR

(4) Road development to streamline traffic flow inside the City Area

Development of the Inner Ring Road is the most important subject inside the urban area.

Traffic demand on the Inner Ring Road and its connection roads with the Ring Road in 2015 are shown in Table 6.10 and Fig. 6.28. Assigned traffic volumes on the Inner Ring Road lie in the range of 30 to 77 thousand pcu/day, while those on the connection roads are 10 to 20 thousand pcu/day except in Kantipath. Because through-traffic will be converted from inside the city core to the Inner Ring Road, future traffic volumes in the city core will remain at the existing level.

TABLE 6.10 TRAFFIC DEMAND ON THE INNER RING ROAD AND ITS CONNECTION ROADS (2015)

Section		Traffic Demand (1,000 pcu/day)	Congestion Rate
Inner Ring Road	North Section	30 ~ 48	0.4 ~ 0.7
	Bishnumati Section	51 ~ 77	0.7 ~ 1.1
	Bagmati Section	41 ~ 62	0.6 ~ 0.9
	Dhobi Khola Section	35 ~ 51	0.5 ~ 0.7
Connection Road	Bijeswari–Swayambhu–Ring Road West	12 ~ 16	0.9 ~ 1.2
	Kantipath–Ring Road North	55	1.1
	Dhobi Khola–Ring Road East South	16 ~ 18	0.9
	Teku–Ring Road South	20	1.1
	Hadigaun–Ring Road East North	20	1.1
	Nayabazar–Ring Road North	15	0.8

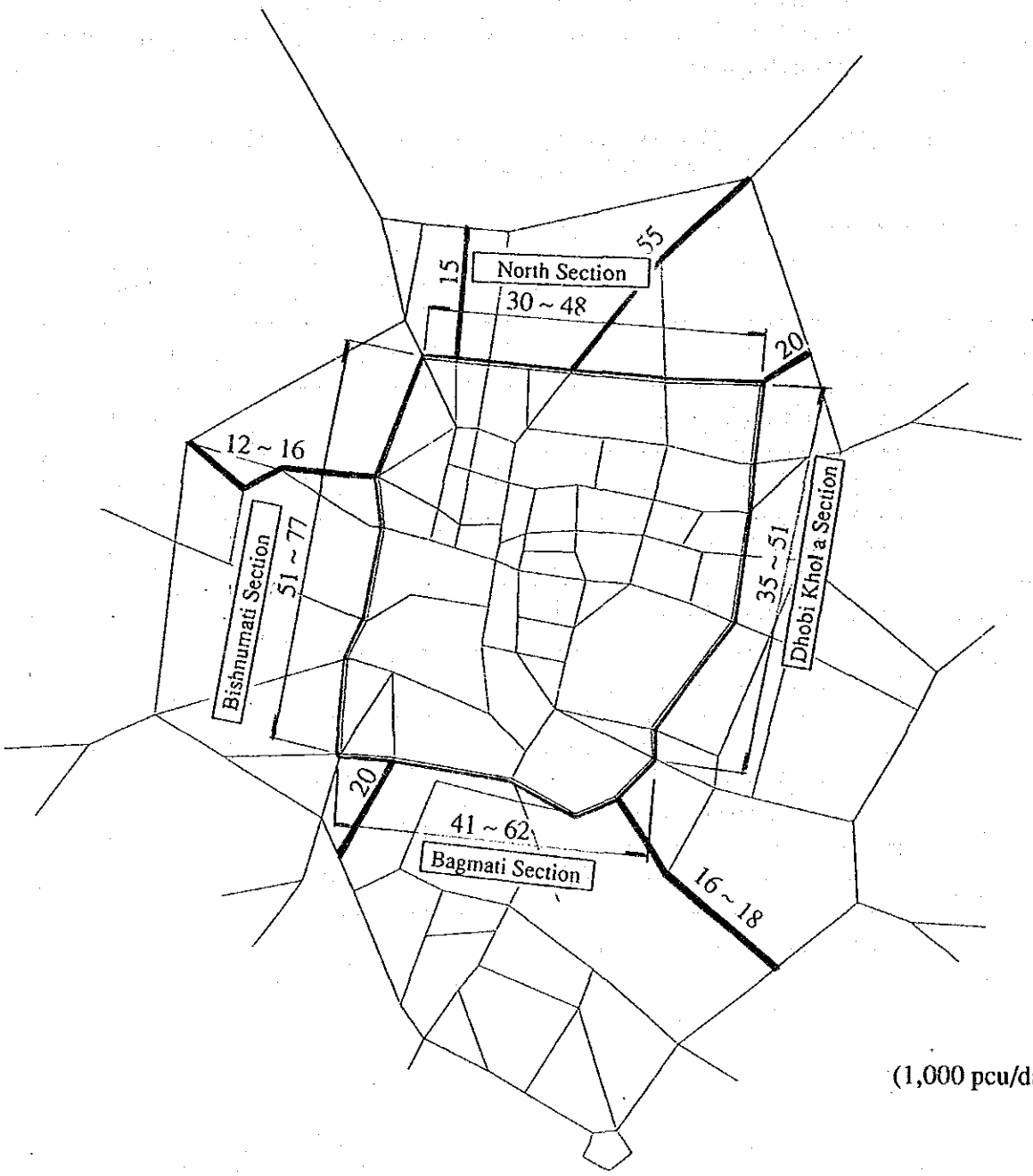


FIG. 6.28 TRAFFIC DEMAND ON THE INNER RING ROAD (2015)

(5) Road development with impending necessity to improve the existing bottleneck and alleviation of transportation-poor.

Traffic demands in 1991 and 1997 are shown in Table 6.11 and Fig. 6.29. Since the congestion rates at most of the bottleneck sections are high, these capacities should be increased. After construction or widening of these sections, the congestion rates in 1997 will be less than 1.0 or around 1.0. Though the congestion rate on Trisuli Road near the New Bus Terminal is only 0.6, the congestion rate will rapidly go up after opening long-distant bus terminal in a long run.

TABLE 6.11 TRAFFIC DEMAND ON EXISTING BOTTLENECK SECTIONS

Section (refer to Fig. 6.29)		1991		1997	
		Traffic Demand (1,000 pcu/day)	Number of Lanes	Traffic Demand (1,000 pcu/day)	Number of Lanes
Bagmati Bridge		27 *1 (2.1)	2	39 (0.8)	4
Access to the New Bus Terminal	New Access Road	–	–	13 (0.7)	2
	Trisuli Road	8 *2 (0.6)	2	11 (0.8)	2
New Baneswar - Old Baneswar		5 *3 (9.4)	1	19 (1.0)	2
Jhamsikhel – Ring Road	Western Section	–	–	9 (0.7)	2
	Eastern Section	2~12 *4 (3~21)	1	11~15 (0.8~1.1)	2
Jawalakhel – Ring Road		4~5 *4 (8~10)	1	3~4 (0.3)	2

( ) : Congestion Rate
*1 : Result of Traffic Count at Station B17
*2 : Result of Traffic Count at Station B23
*3 : Result of Traffic Count at Station B29
*4 : Result of Traffic Assignment

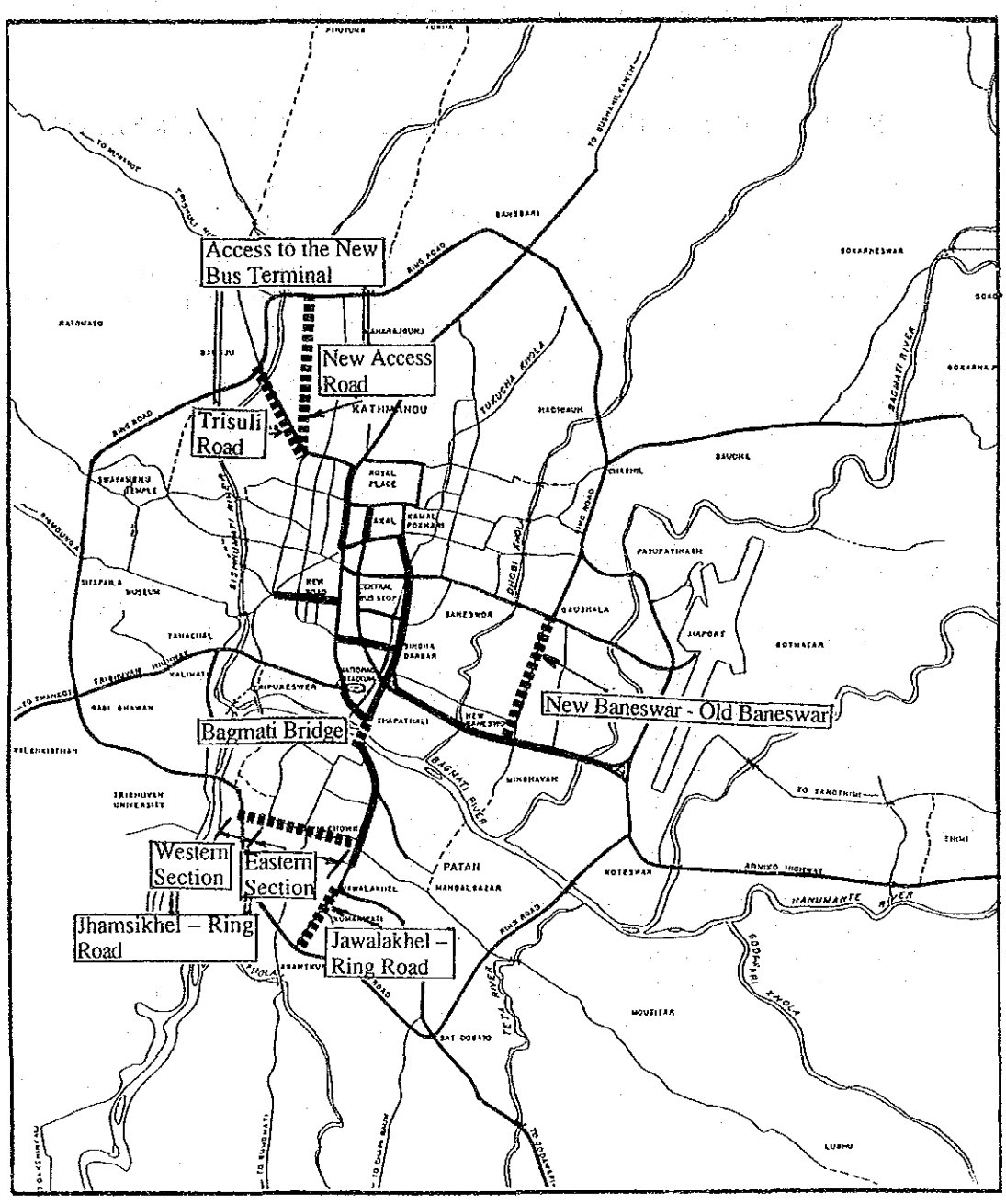


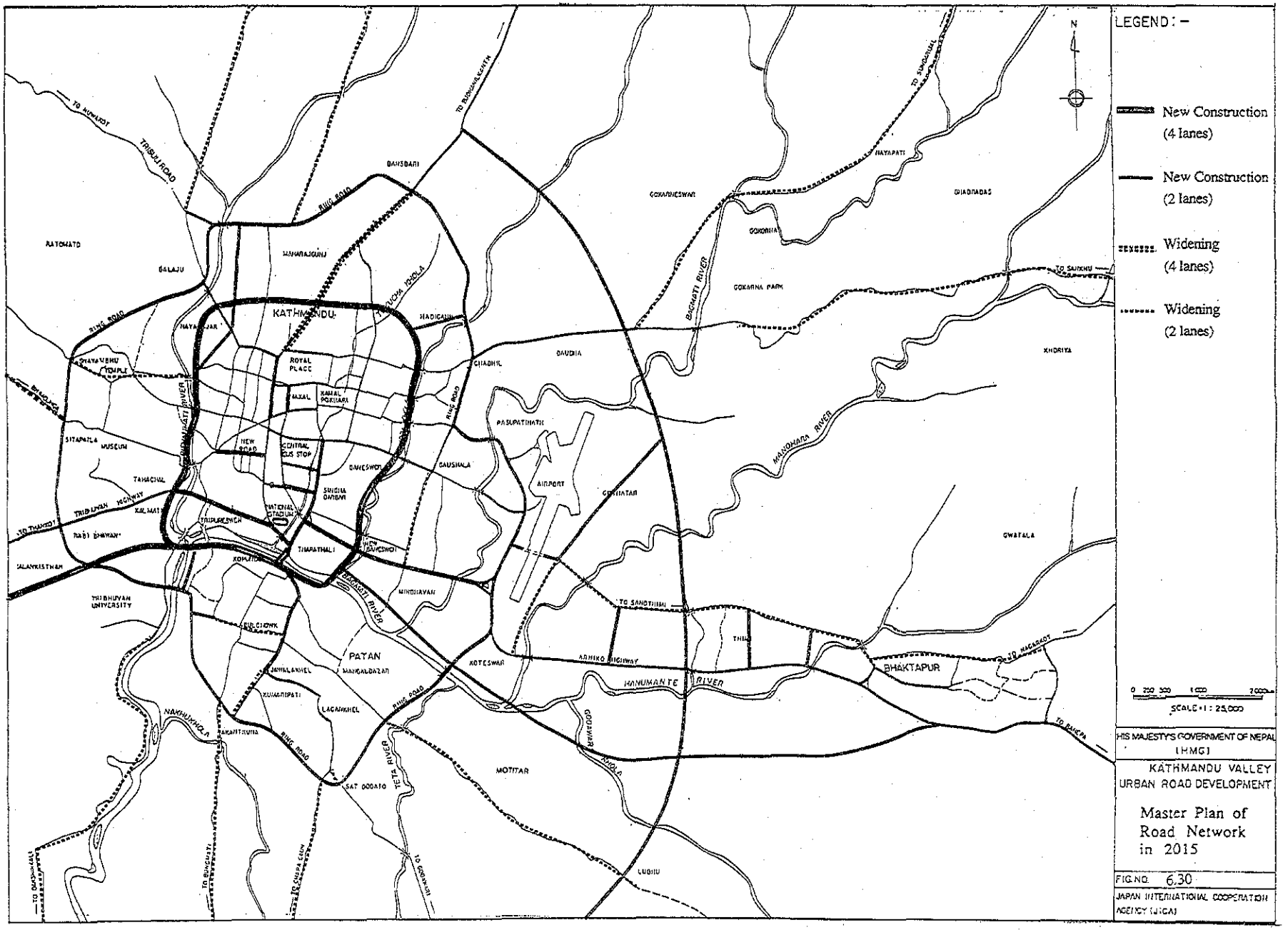
FIG. 6.29 EXISTING BOTTLENECK SECTIONS

6.5 Road Network Master Plan for the Year 2015

Fig.6.30 shows the proposed road development master plan in Kathmandu Valley for the year 2015, and Table 6.12 presents the summary of accumulated road length by type of road in the year 2015.

TABLE 6.12 ROAD LENGTH IN THE VALLEY

	Existing Network Road Length(km)	Future Network(2015) Road Length(km)
- Highway	34	49 (+15)
4-lanes	5	12 (+ 7)
2-lanes	29	37 (+ 8)
- Feeder Road	25	25 (+ 0)
2-lanes	5	25 (+20)
1-lane	20	0 (- 20)
- District Road	342	342 (+ 0)
2-lanes	14	66 (+52)
1-lane	328	276 (- 52)
- Urban Road	339	363 (+24)
4-lanes	7	25 (+18)
2-lanes	91	102 (+11)
1-lane	241	236 (- 5)
Total	740	779 (+39)
Summary of Improvement		
4-lanes	12	37 (+25)
2-lanes	139	230 (+91)
1-lane	589	512 (- 77)
Total	740	779 (+39)


LEGEND:-
New Construction (4 lanes)
New Construction (2 lanes)
Widening (4 lanes)
Widening (2 lanes)
N
SCALE 1 : 25,000
KATHMANDU
PATAN
BHAKTAPUR
RING ROAD
BAGMATI RIVER
MANOHARA RIVER
HANUMANTE RIVER
TRIBHUVAN UNIVERSITY
AIRPORT
PASUPATINATH
TO SANKHU
TO BANEPA
HIS MAJESTYS GOVERNMENT OF NEPAL (HMG)
KATHMANDU VALLEY URBAN ROAD DEVELOPMENT
Master Plan of Road Network in 2015
FIG NO. 6.30
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

6.6 Preliminary Cost Estimate

Preliminary cost estimate was conducted for the proposed road network in 2015 on the basis of the construction cost data as well as the bidding prices of the similar projects currently offered in the tender.

Table 6.13 shows the summary of preliminary cost estimate for the proposed road development plan.

Table 6.13 Preliminary Cost Estimate for Road Development Plan in Kathmandu Valley

Unit : NRs. Million

	Programme	Road Length (km)	Construction Cost		Land/House Acquisition Cost				
			Unit Cost (per km)	Amount	Right-of -way (m)	Land Area (ha)	Landuse Pattern	Unit Cost per ha	Amount
A-1	Road Development as the capital of Nation								
A-1-1	Construction of Arniko Bypass including 1 no. of bridge (L=100 m)	7.5	100	750	50	38	C	12	450
A-1-2	Construction of 2nd Tribhuban Highway to Hetauda	8.5	150	1,280	50	43	C	12	510
A-2	Road Development in the wave of outward shift of Urban areas								
A-2-1	Widening of Primary District Roads	43.7	20	870	14	61	C	12	730
	- Bhimdhunga (4.7 km), Tokha (4.0 km), Phuntung (3.0km), Sundarijal (9.0 km),								
	- Sankhu (8.0 km), Lubhu (5.0 km), Chapagaun (6.0 km), Bungmati (4.0 km)								
A-2-2	Construction of Outer Ring Road including 7 nos. of bridges (L=80m x 3, L=40mx4)	19.5	70	1,370	30	59	C	12	700
A-2-3	Construction of Thimi North-South Roads	1.8	40	70	20	4	C	12	40
A-2-4	Construction of Gothatar Service Road	2.5	70	180	20	5	C	12	60
A-3	Integration of Kathmandu, Patan and Bhaktapur								
A-3-1	Widening of Existing Thimi Feeder Road including 1 no. of bridge (L=60 m)	7.2	40	290	30	22	C	12	260
A-3-2	Construction of Baneswor - Thimi Short-cut Road including underpass (L=300 m)	0.8	650	520	20	2	C	12	20
A-4	Improvement of Urban Roads inside the Ring Road								
A-4-1	1st Stage: Construction of Inner Ring Road with 2-lanes								
	(1) West-east Link of Northern part of Kathmandu city	3.0	100	300	20	6	B	40	240
	(2) Bishnumati Link (West Link) including 1 no. of bridge (L=60 m)	4.5	70	320	20	9	A	40	360
	(Improvement section proposed by ADB is 2.8 km)		[50]	[140]					[25]
	(3) Bagmati Link (South Link) including 2 nos. of bridges (L=160 m x 2)	3.5	250	880	20	7	C	12	80
	(4) Dhobi Khola-lanes Link (East Link)	4.0	100	400	20	8	B	40	320
A-4-2	2nd Stage: Widening of Inner Ring Road from 2 to 4-lanes	15.0	100	1,500	10	15	A	100	1,500
	Linkages between Inner Ring Road and Ring Road								
	L-1: Widening of Bijeswari - Swayambhu	2.0	70	140	14	3	B	24	70
	L-2: Teku Bridge - Ring Road South	0.8	100	80	14	1	C	24	30
	L-3: Riverside Road on North Bank of Bagmati	2.4	100	240	14	3	C	24	80
	L-4: Hadigaun - Ring Road West	1.0	100	100	14	1	C	24	30
	L-5: Access from the Inner Ring Road to Patan	0.8	100	80	14	1	A	12	10
A-4-3	Widening of Kantipath to 4-lanes road	3.5	100	350	14	5	A	80	390
A-4-4	Widening of Bhaktapur Ring Road	3.0	40	120	30	9	B	24	220
A-5	Improvement of bottlenecks and transportation-poor								
A-5-1	Construction of New Bagmati Bridge with 2-lanes (L-160 m)	0.2	1,600	260	30	0	C	12	10
A-5-2	Improvement of Access to New Bus Terminal at Balaju	1.8	100	180	20	4	B	24	90
A-5-3	Widening of Old Baneswor - New Baneswor Road	1.5	70	110	14	2	A	80	170
A-5-4	Improvement of Patan Access								
	(1) Construction of Jhamsikhel - Ring Road	1.4	70	100	14	2	B	40	80
	(2) Widening of Jawalakhel - Ring Road	0.8	70	60	14	1	B	40	40
	(3) Widening of Sat Dobato - Ring Road	0.3	70	20	14	1	A	40	40
	Total	141.0		10,570		312			6,530

A: Commercial/Industrial Areas, B: Residential Areas, C: Agricultural Areas

CHAPTER 7

PUBLIC TRANSPORT DEVELOPMENT PLAN

7 PUBLIC TRANSPORT DEVELOPMENT PLAN

7.1 Basic Concept

7.1.1 Introduction

The situation of public transport in the Valley is serious as studied in Chapter 3. It is urgent to upgrade present public transport service level. However, for the improvement of service level of existing public transportation system, a variety of measures which include almost all of the measures are to be applied. These include legal, administrative and institutional measures as well as physical ones. Combined application of the above measures would bring about early solutions of the urban transportation issues in the Study area.

As far as public transport development plan is concerned, major focus of improvement, first of all, is placed on the relief of present chaotic service system in the short term while the fostering of the public transport system coordinated with growing urban function as the capital of a nation is another point to be focused in the long term.

Concept of improvement plan in public transport is to differ by regions within the Valley. For instance, the major concern of improvement plan in downtown area of Kathmandu city is different from that of urban fringes and/or suburban area and rural area. Development plan is to be formulated in consideration of these characteristics of areas.

Development concept should be formulated keeping consistency with the on-going plan as well as road development plan formulated in the previous Chapter. Regarding on-going public transport development, no physical plan is proposed except for construction of new long-distant bus terminal at north-west corner of the Ring Road, although there are some development proposals at conceptual stage by international organization. However, public transport plan is to be formulated in the context of ever-proposed development plans and concepts behind them.

7.1.2 Review of Current Development Proposal

(A) Construction of Long-distance Bus Terminals at North-West Corner of the Ring Road

This is a plan of construction of long-distance bus terminal at Balaju, north-west corner of the Ring Road. In this plan, long distant bus terminal, with capacity of 400 of departures/arrivals of buses a day and facilities for passenger services including terminal building and parking spaces for taxis and private cars as well as facility for boarding and alighting of limousine buses, is being proposed. With the realization of this terminal, concentration of heavy buses at the present

bus terminal at Ratna Park, located in the down town of Kathmandu city, is expected to be reduced.

The proposed site is located about 3.0 km north of Kathmandu city center and about 10 km from the airport. It is on the outskirts of the city and inside the Ring Road and along the Bishnumati River. The site is approximately rectangular with an area of about 6.2 ha as shown in Fig. 7.1.

Outline of the Project is as follows:

1) Site area: 62,200 m^2

2) Facilities :

- Boarding and alighting facilities for buses:

  8 of alighting berths, 12 of boarding berths, platform and roof,

- Boarding and alighting for city transport:

  6 taxi berths, 4 private-car berths, taxi pool and private-car parking lot, platform and roof,

- Terminal building:

  Operation service; office, drivers restroom, electricity room, passenger service; ticket counter, baggage storeroom, information, first aid room, bank, telephone room, post office, tea stand, waiting room,

- Parking lot for long-route buses:

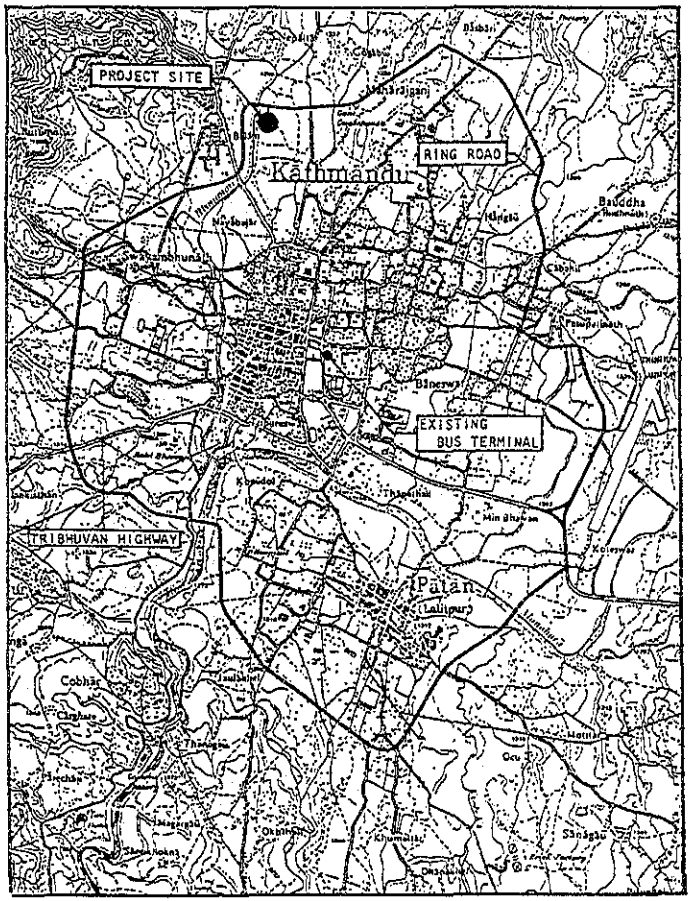
  Space for 124 buses, car washing equipment, fuel supply stand,

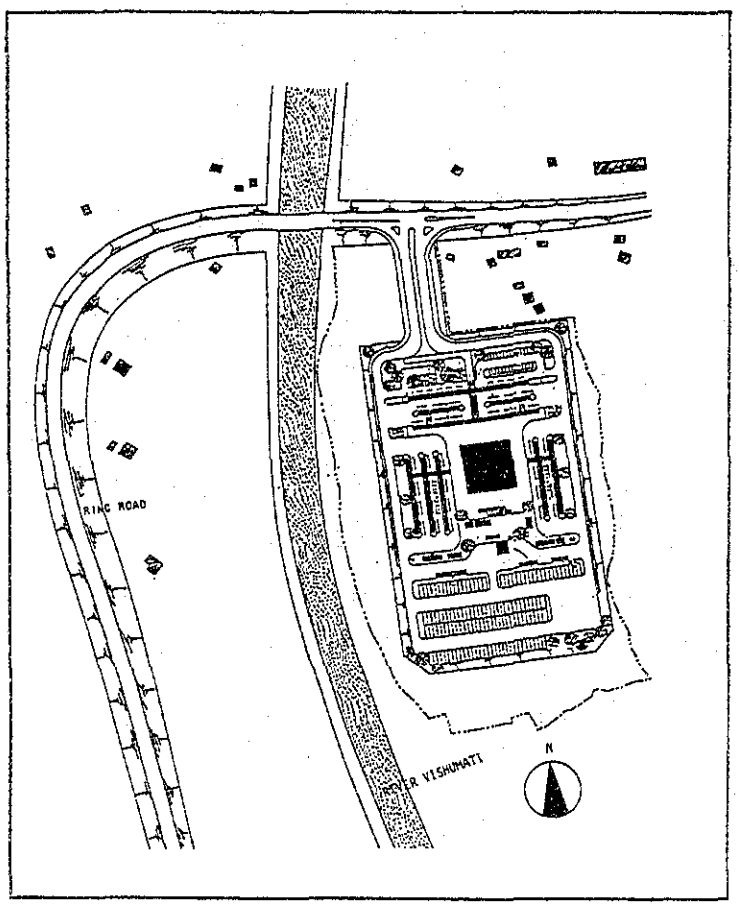
- Other installation:

  Toilet, lighting installation, drainage facility, deep well water supply facility,

- Approach road from the Ring Road:

  Approach road to each facility from the Ring Road.





LEGEND

HIS MAJESTY'S GOVERNMENT OF NEPAL
(H.M.G.)

KATHMANDU VALLEY
URBAN ROAD DEVELOPMENT
LOCATION MAP OF NEW
LONG-DISTANCE BUS TERMINAL

FIG. 7.1

JAPAN INTERNATIONAL COOPERATION
AGENCY (JICA)

(B) Extension of Trolley Bus System

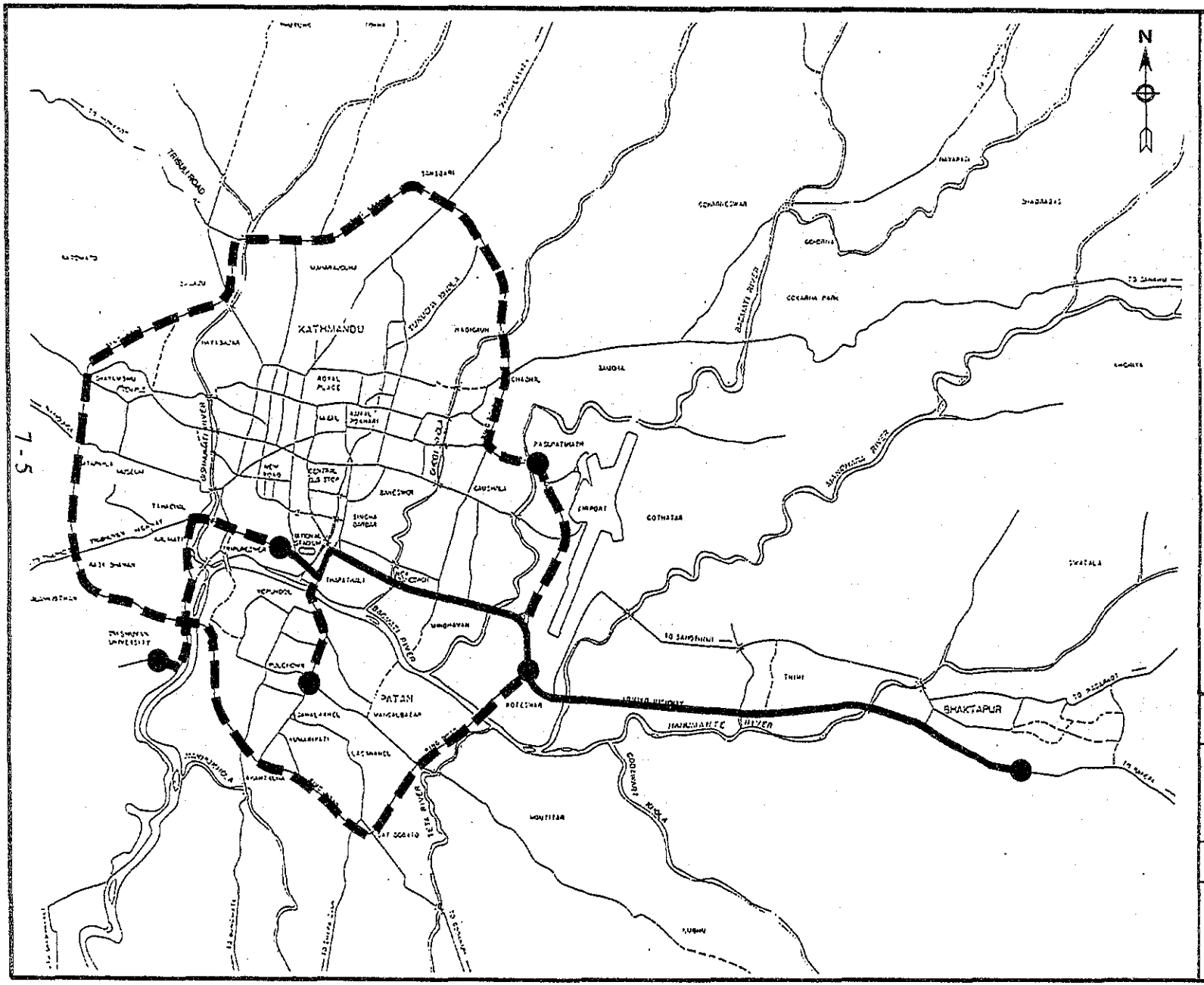
This is a plan still at conceptual stage proposed expecting of assistance from Chinese Government. The concept behind it is growing demand for mass-transit on the Ring Road and radial roads in the wave of urban expansion. Expansion of the trolley bus system is proposed on the following routes:

- Link from Tripureswar to Tribhuban University via Kalimati,
- Link from Thapathali to Patan Dhoka and Pulchok,
- Link from Koteswar to Pashupati via Airport, and
- Around the Ring Road.

(C) Proposal by KVUDPP Study

Proposal prepared in the KVUDPP Study includes legislative, institutional and physical improvement measures. Major points proposed by the Study are as follows:

- Increase in absolute fleet number,
- Modernization and upgrading of fleets with the introduction of fleet inspection system, and
- Regulation on tempo operation.



LEGEND

Existing

Proposed

0 250 500 1000 2000km

SCALE = 1:25,000

HIS MAJESTY'S GOVERNMENT OF NEPAL (H.M.G)

KATHMANDU VALLEY URBAN ROAD DEVELOPMENT

TROLLEY BUS ROUTE

FIG. 7.2

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

7.1.3 Development Concept

Scope of public transportation planning differs by the regions in the Study area due to different nature of traffic behavior. The major public transport service to be achieved in the areas within the Ring Road might be that of feeder service which connect vital points of the area in a convenient manner. This could be done by putting more frequent and regular services by buses, hopefully, those by minibus or taxi on the road network there. Public transport service in the fringes and suburban area, on the other hand, might be that of trunk line services to connect central cities and those area for their nature of transportation of relatively longer distant commuters. These services are preferable to be done by larger vehicles.

Bus service network both in central area and suburban area are not always serviced keeping balance with the locational pattern of users. This fact, along with the substandard service level, is forcing many people to walk long distance and to accept substandard public transport services.

The above recognition along with the development strategy formulated in Table 5.6 determines the scope of short-term development plan as described below:

- Public transport development plan in conjunction with on-going plans,
- Public transport planning to provide better services in the central areas,
- Public transport planning to provide sufficient trunk line services between major cores in the Valley.

The above concepts are illustrated in Fig 7.3.

With the continued expansion of urban area and extension of arterial roads both within the existing Ring Road and suburban area, more improved public transport system is inevitable to be introduced in the expectation of increasing urban activities and diversification of traffic behavior. The above recognition justifies the long-term prospect of public transportation development as described below:

- Dispersion of terminal facilities,
- Necessity of bus lane improvement taking advantage of improved road network,
- Promotion of ride-and-ride system at major terminals.

The above concepts are illustrated in Fig. 7.4.

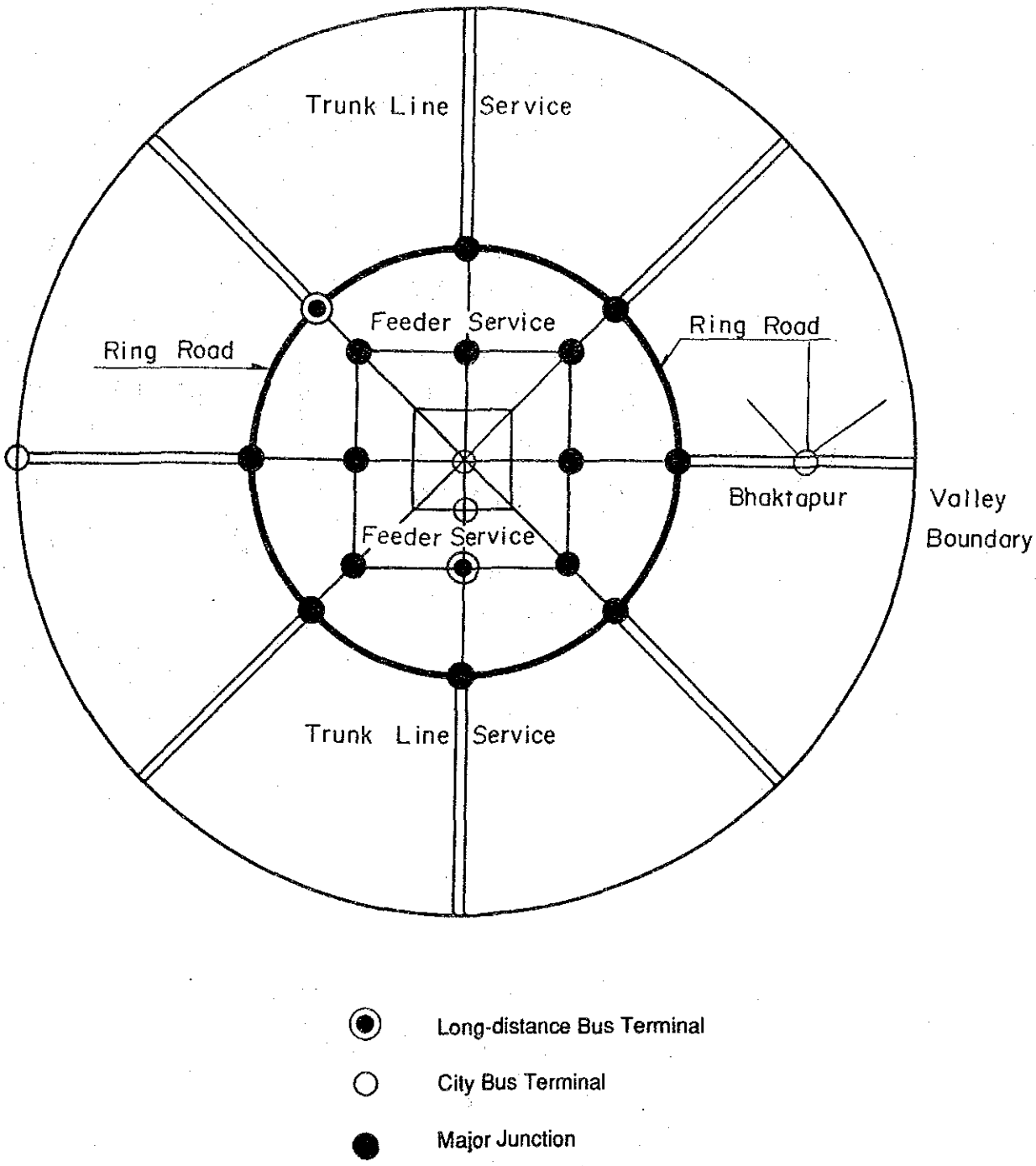


FIG. 7.3 PUBLIC TRANSPORTATION DEVELOPMENT CONCEPT (SHORT-TERM)

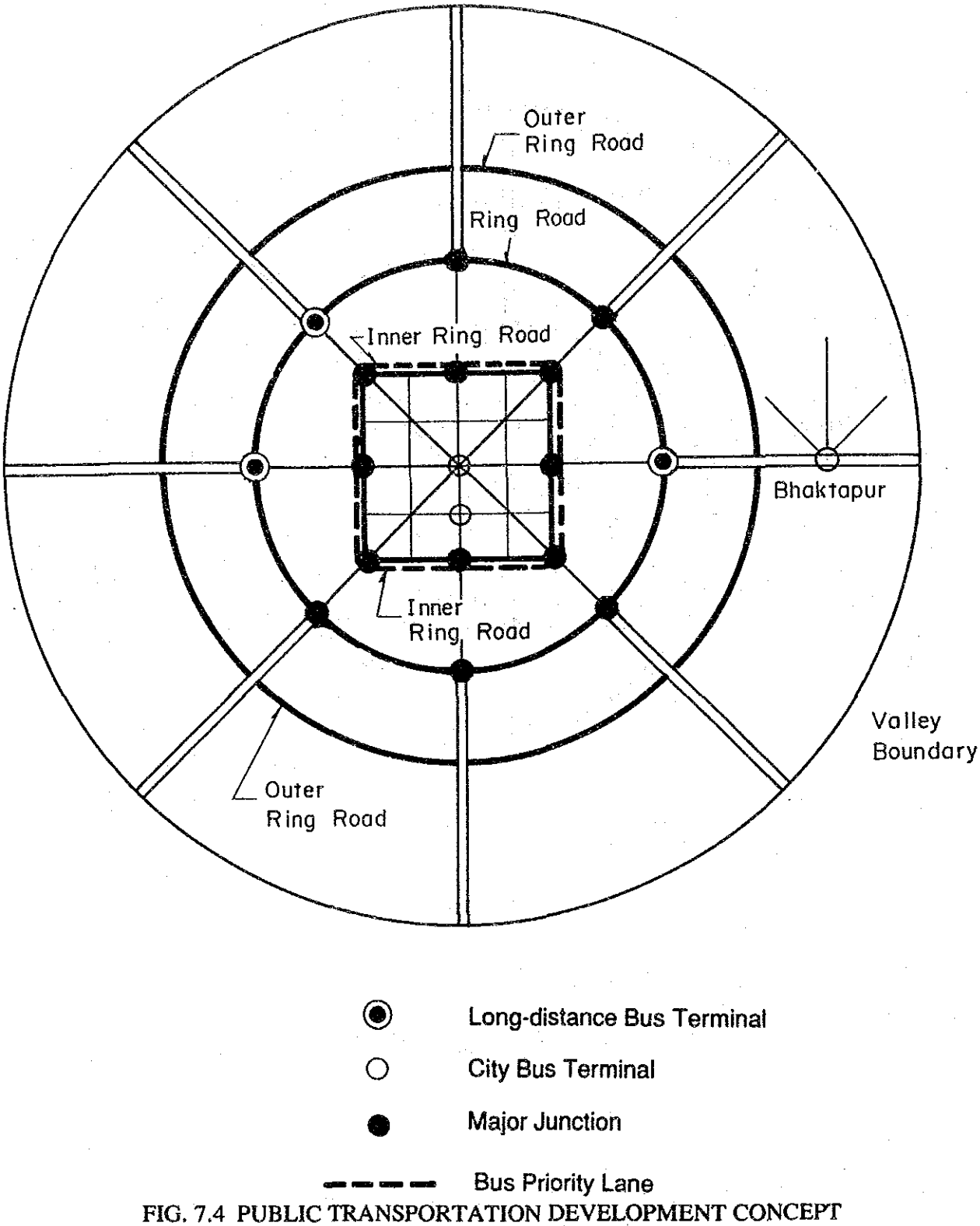


FIG. 7.4 PUBLIC TRANSPORTATION DEVELOPMENT CONCEPT (LONG-TERM)

7.2 Description of Plan

In conjunction with the above development concept, probable development plans have been selected as explained hereunder.

Short-term Development Plan

- Shuttle bus services at new long-distance bus terminal,
- Improvement of city bus services on district roads,
- Improvement of bus stop facilities at major junctions,
- Route regulation on three-wheeler public transport services.

Long-term Development Plan

- Construction of east-bound long-distance bus terminal,
- Introduction of bus priority lanes on the Inner Ring Road.

7.2.1 Shuttle Bus Service at New Long-distance Bus Terminal

(1) Planning Background

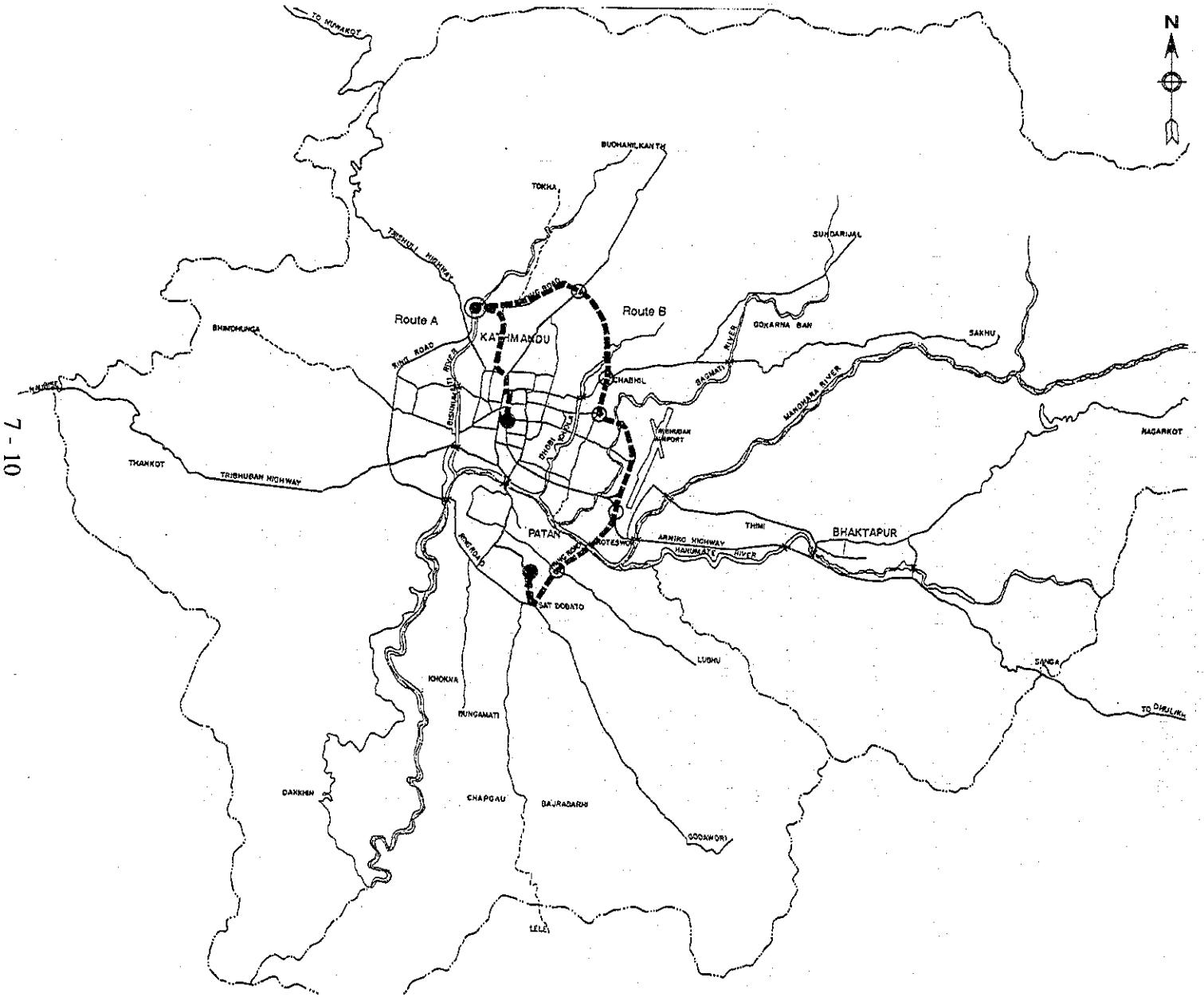
Improvement of city bus function with the opening of new long-distance bus terminal at the north-west corner of the Ring Road would be first step towards the overall level up of public transport system in the Valley. Four hundred (400) of departures and arrivals of long-distant buses at new terminal requires fairly great amount of transit services from the existing city bus terminal and residential areas. However, existing city bus terminal, being located in the downtown of Kathmandu which is about 4 km away from the new bus terminal, will remain as the center of city bus services in the Valley and it is expected that great number of passengers of city buses would need transit services to the new long-distance bus terminal. The purpose of this plan is to provide efficient transit services to the users.

(2) Service Routes

Shuttle bus service routes have been selected on the following two (2) routes through the examination of travel pattern of long-distant bus users.

Route A : New Long-distance Bus Terminal (Balaju) - Royal Palace - City Bus Terminal at Ratna Park

Route B : New Long-distance Bus Terminal (Balaju) - Bansbari - Chabahil - Pashupatinath - Koteswar - Sat Dobato - City Bus Terminal at Lalitpur (along the Ring Road)



7 - 10

LEGEND

- New Long-distance Bus Terminal
- City Bus Terminal
- Potential Boarding/Alighting Place

0 50 100 200 400km

SCALE=1 : 50, 000

HIS MAJESTY'S GOVERNMENT OF NEPAL (H.M.G)

KATHMANDU VALLEY URBAN ROAD DEVELOPMENT

PROPOSED SHUTTLE BUS SERVICE ROUTE

FIG. 7.5

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

(3) Operation Plan

The demand for shuttle bus at new long-distance bus terminal is estimated applying planning modules set up by JICA Study* as explained below:

1) Number of long distance bus passengers

Assuming average number of passengers at 40 for long distance buses at new terminal, number of passengers is estimated at 16,000 per day as shown below:

Number of Long Distance Bus Passengers

= Average Number of Passengers × Number of Departures and Arrivals of Long-Distance Buses

16,000 persons = 40 person/bus × 400 times

where the number of departures and arrivals of long distance buses is applied from proposed operation schedule as shown in Table 7.1.

TABLE 7.1 PROPOSED OPERATION SCHEDULE FOR LONG DISTANCE BUSES AT NEW TERMINAL

ROUTE	Daytime bus		Nighttime bus		Total	
	Departure	Arrival	Departure	Arrival	Departure	Arrival
West	46	46	59	59	105	105
South-east	1	1	42	42	43	43
South	4	4	23	23	27	27
East	18	18	0	0	18	18
North	7	7	0	0	7	7
Total	76	76	124	124	200	200

Source : Basic Design Study Report on the Project for Construction of Bus Terminal in Kathmandu, JICA, Aug. 1989.

2) Required Frequency of Shuttle Bus Services

Frequencies of shuttle bus services by routes are estimated applying the following formula:

* * Basic Design Study on the Project for Construction of Bus Terminal in Kathmandu, JICA.

Number of Services by Route

= Number of long-distance bus passengers

× Share of bus among possible access modes

× Share of transit passengers in potential service areas by route

× Average number of passengers for shuttle bus

where

- Share of bus among possible access modes:

  70% of bus share is assumed.

- Shares of transit passengers by routes and service area:

  Shares are determined as shown in Table 7.2 applying the results of traffic survey.

TABLE 7.2 SHARE OF TRANSIT PASSENGERS IN POTENTIAL SERVICE AREAS BY ROUTE

Route	Potential Service Area	Shares of Transit Passengers (%)
Route A	City inside	24.8
	(Subtotal)	24.8
Route B	Maharaj Ganj	9.4
	Bauddha	12.9
	Baneswar	9.2
	Airport	2.5
	Patan	7.6
	Godawari	6.2
	(Subtotal)	Total 47.8

- Average number of passengers for shuttle bus

  Assuming services by mini-bus, 30 persons/vehicle is being applied.

  Applying the above formula, the required number of shuttle bus services are estimated as below:

  Route A

  16,000 persons/day × 0.7 × 0.248 ÷ 30 persons/vehicle × 0.5
  = 46 vehicles/day

Route B

16,000 persons/day × 0.7 × 0.478 ÷ 30 persons/vehicle × 0.5
= 89 vehicles/day

3) Operation Plan

Operation plan for shuttle bus is proposed as shown in Table 7.3. Maximum number of fleets to be operated is estimated at 25 in the same table.

TABLE 7.3 SHUTTLE BUS OPERATION PLAN

	Route A	Route B	Total
Route Length (km)	4	17	
Average Speed (km/h)	15	30	
Operation Time for One Way (Min.)	16	34	
Waiting Time at Terminals (Min.)	5	5	
Time Required for One Circle (Min.)	42	78	
Number of Services per day	46	89	
Number of Services during Peak Hour*	7	14	
Frequency during Peak Hour (Min.)	9	4	
Maximum Number of Fleets to be Operated	5	20	25

* 15% of peak hour ratio (16 : 00 - 17 : 00) is assumed.

7.2.2 Improvement of City Bus Services on District Roads in Suburban Area

(1) Planning Background

Substandard bus service in terms of frequency and fleet condition as well as operation method as against the growing demand for public transport has brought about a great number of "transportation-poor" or people who are unable to get sufficient transport services. The issue is more serious in the suburban area than urban area because of the following reasons:

- Most of the roads in the suburban area are substandard for the operation of large buses,

- Existing bus routes are not always provided reflecting actual demand pattern of users,

- Other means of public transport such as tempo and mini-bus services by private companies are not well provided,

- Frequencies of bus services in the suburban area are low as against the growing demand for public transport, and

- Due to relatively larger shares of commuters in public transport users, sub-standard public transport service especially in the peak hours, is critical issue in the urban transportation.

With this consideration, focus of public transport development in the suburban area is placed on the following points:

- To provide bus service routes in the areas which are not serviced by present city bus system,

- To enhance the frequency of city bus services, and

- Upgrading of road standards.

Nature of public transport issues differs by route as identified in Table 7.4, 7.5 and Fig. 7.6 which would be classified into following three (3) groups:

Group A : Issues attributed to the fact that no city bus is serviced in the area. The following sections of routes are classified into this group:

- Dharamthali - Balaju,
- Tokha - Balaju,
- Bhaktapur - Thimi - Koteswar,
- Bungamati - Ring Road.

Group B : Issues attributed to insufficient bus service especially in terms of frequency. The following sections of routes are classified into this group:

- Sundarijal - Baralgaun,
- Sankhu - Chabahil (Baralgaun),
- Bhaktapur - Koteswar,
- Lubhu - Ring Road,
- Godawari - Sat Dobato,
- Dhapakhel - Sat Dobato,
- Chapagaon - Sat Dobato,
- Kirtipur - Ring Road,
- Pharping - Ring Road.

Group C : Issues attributed to physically poor road condition. The following sections of routes are classified into this group:

- Sundarijal - Baralgaun,
- Sankhu - Chabahil (Baralgaun),
- Lubhu - Ring Road (Patan),
- Chapagaun - Sat Dobato,
- Bungamati - Ring Road.

TABLE 7.4 CHARACTERISTICS OF ROUTES*

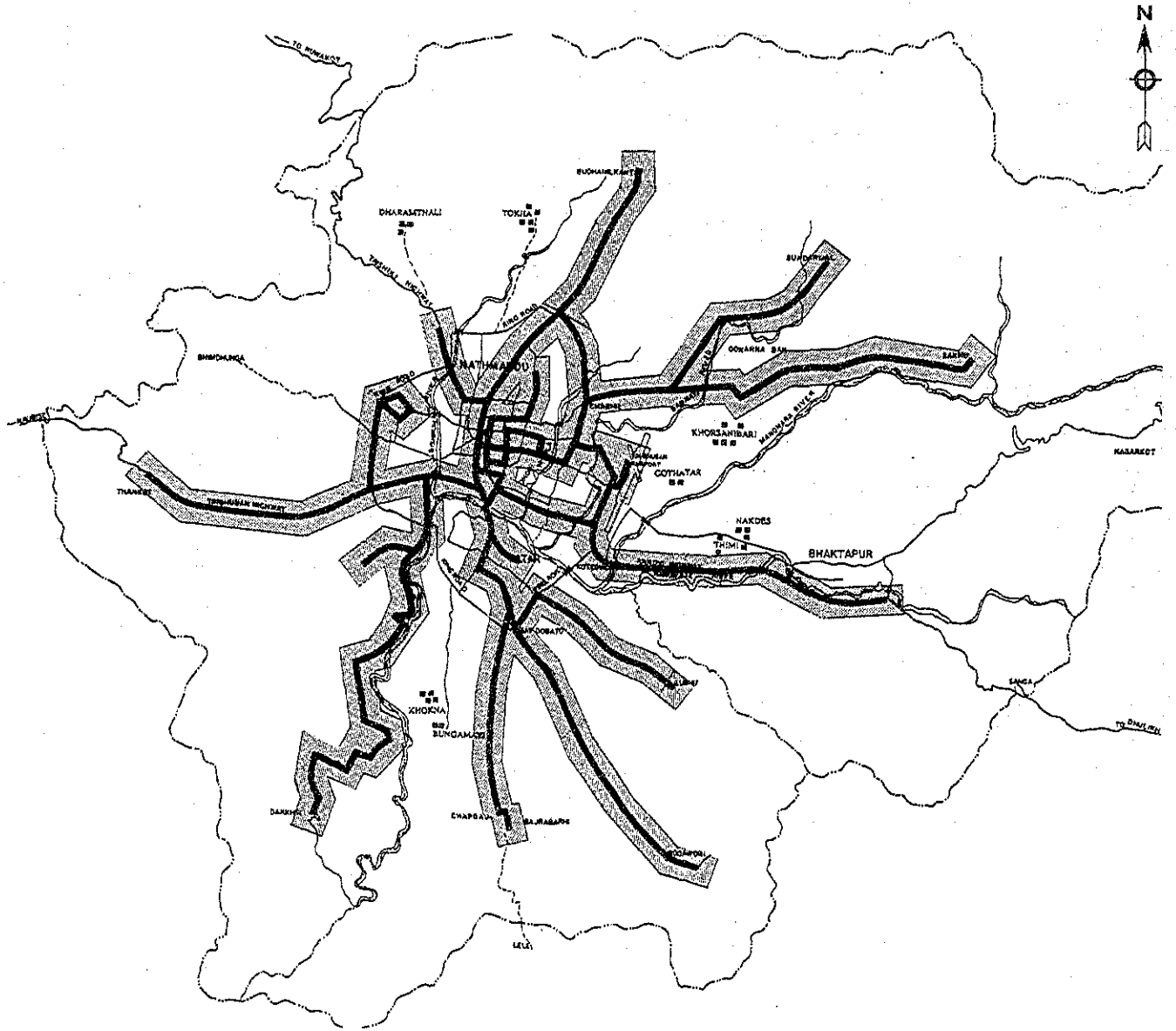
Route Section	Characteristics of Traffic					Road Condition		Congestion Rate
	Traffic Volume	Heavy Vehicle	Public Transport	Peak Ratio (%)	Traffic Volume (PCU)	Number of Lane	Capacity (PCU)	
Budhanilkantha - Balaju	328	65	123	12	589	1	500	1.18
Tokha - Balaju	554	64	153	10	682	1	500	1.36
Budhanilkantha - Bansbari	1,983	95	986	10	2,339	2	14,000	0.16
Sundarijal - Baralgaun	912	47	239	12	1,053	1	500	2.11
Sankhu - Chabahil	1,757	178	635	11	2,410	1	500	4.82
Bhaktapur - Thimi - Koteswar	687	71	290	11	1,221	1	500	2.44
Bhaktapur - Koteswar	7,388	1,228	2,751	10	12,202	2	22,000	0.55
Lubhu - Ring Road	1,333	239	335	14	1,959	1	500	3.92
Godawari - Sat Dobato	2,372	388	612	12	3,486	2	14,000	0.25
Chapagaon - Sat Dobato	1,566	155	553	13	1,862	1	500	3.72
Bungamati - Ring Road	(652)	(67)	(181)	13	(896)	1	500	1.79
Dakshinkali - Ring Road	2,946	443	912	11	4,513	2	14,000	0.32

* Results of Traffic Survey by KVUDPP, DHUD.

TABLE 7.5 PRESENT CITY BUS SERVICE LEVEL

– PEAK HOUR –

Route Section	Number of Buses Serviced	Average Number of Passengers Fleet	Number of Bus Passengers	Number of Fleets for Present Service
Budhanilkantha - Bansbari	2	58	116	3
Sundarijal - Baralgaun	1.5	88	132	2
Sankhu - Chabahil	1.5	71	107	3
Bhaktapur - Koteswar	8.6	56	480	12
Lubhu - Ring Road	2	102	204	1
Godawari - Sat Dobato	2	75	150	3
Dhapakhel - Sat Dobato	2	75	150	1
Chapagaon - Sat Dobato	2	103	206	2
Kirtipur - Ring Road	3	76	228	2
Pharping - Ring Road	1.3	76	101	4



LEGEND

0 0.5 1.0 2.0 4.0 km
SCALE

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(H.M.G)

KATHMANDU VALLEY
URBAN ROAD DEVELOPMENT
SERVICE AREA OF EXISTING CITY BUS

FIG. 7.6

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

(2) Description of Plan

1) Introduction of New City Bus Service Routes

Proposed Route

City bus services are requested to be extended on the routes classified in Group A.

Operation Plan

Operation schedule is established as shown in Table 7.6 in which 30 minutes of frequency during the peak hour is proposed to provide minimal level of service to the users. Maximum number of fleets to be assigned for this service is estimated at seven (7) as shown in the same Table.

TABLE 7.6 OPERATION PLAN AND NUMBER OF FLEETS TO BE SERVICED
– PEAK HOUR –

Route [1]	Route Length (Km)	Desirable Frequency during Peak Hour (Min.)	Time Required for One Cycle [2] (Min.)	Maximum Number of Fleets to be Serviced
Dharamthali - Balaju - Kathmandu	8	40	30	2
Tokha - Balaju - Kathmandu	7	30	30	1
Bhaktapur - Thimi - Koteswar - Kathmandu	13	60	30	2
Bungamati - Ring Road - Kathmandu	8	40	30	2
Total	–	–	–	7

1) : Routes classified in Group A only.
2) : 15 km/h of average speed is assumed.

2) Enhancement of Frequency of City Bus Service

Proposed route

Frequency of city bus service is proposed to be enhanced on the routes classified in Group B.

Operation Plan

Proposed frequencies of bus service during the peak hour are given in Table 7.7 in which number of buses serviced are estimated applying following criteria:

- Bus service is made by large bus,
- Maximum number of passengers per vehicle during peak-hour is 50 persons.

TABLE 7.7 CITY BUS OPERATION PLAN
– PEAK HOUR –

Route 1)	Route Length (Km)	Operation Time Required for One Cycle (Min.) 2)	Maximum Number of Passengers during Peak Hour (Person/vehicle)	Number of Buses Serviced during Peak Hour	Number of Fleets to be Assigned under New Operation Plan
Budhanilkantha - Bansbari - Kathmandu	10	90	50	2.3	4
Sundarijal - Baralgaun - Kathmandu	16	138	50	2.6	7
Sankhu - Chabahil - Kathmandu	17	146	50	2.1	6
Bhaktapur - Koteswar - Kathmandu	12	106	50	9.6	17
Lubhu - Ring Road - Patan	7	66	50	4.1	5
Godawari - Sat Dobato - Patan	10	90	50	3.0	5
Dhapakhel - Sat Dobato - Patan	3	34	50	3.0	2
Chapagaon - Sat Dobato - Patan	8	74	50	4.1	6
Kirtipur - Ring Road - Kathmandu	7	66	50	4.6	6
Pharping - Ring road - Kathmandu	16	138	50	2.0	5

1) : Routes classified in Group B only.
2) : 15 km/h of average speed is assumed.

Estimation of Additionally Required Number of Fleets

Additionally required number of fleets to realize the above operation plan has been estimated as shown in Table 7.8.

Total number of fleets to be newly provided is estimated at thirty (30).

TABLE 7.8 ESTIMATION OF ADDITIONALLY REQUIRED NUMBER OF FLEETS

Route 1)	Number of Fleets for Present Service	Number of Fleets to be Assigned under New Operation Plan	Additionally Required Number of Fleets
Budhanilkantha - Bansbari - Kathmandu	3	4	1
Sundarijal - Baralgaun - Kathmandu	2	7	5
Sankhu - Chabahil - Kathmandu	3	6	3
Bhaktapur - Koteswar - Kathmandu	12	17	5
Lubhu - Ring Road - Patan	1	5	4
Godawari - Sat Dobato - Patan	3	5	2
Dhapakhel - Sat Dobato - Patan	1	2	1
Chapagaon - Sat Dobato - Patan	2	6	4
Kirtipur - Ring Road - Kathmandu	2	6	4
Pharping - Ring road - Kathmandu	4	5	1
Total	33	63	30

1) : Routes classified in Group B only.

3) Upgrading of Road for Bus Operation

For the operation of bus, following routes included in Category C in principle are recommended to be upgraded.

- Sundarijal - Baralgaun,
- Sankhu - Chabahil (Baralgaun),
- Lubhu - Ring Road (Patan),
- Chapagaon - Sat Dobato,
- Bungamati - Ring Road,
- Tokha - Balaju,
- Bhaktapur - Thimi - Koteswar.

Concept behind the road development and typical cross-section for individual roads are presented in Chapter 6.

7.2.3 Improvement of Facilities at Major Bus Stops

1) Background

For the provision of better service to the users of public transport, facilities at major bus stops are urgent to be improved. This would induce efficient usage of nearby road spaces as well as providing better services to the users.

2) Selection of Bus Stops to be Improved

Bus stops to be improved have been selected applying following criteria:

- Bus stops with considerable number of boardings and alightings,
- Bus stops located on heavily trafficked roads, and
- Bus stops requiring urgent improvement work.

In addition, following functional classification about bus stops has been introduced:

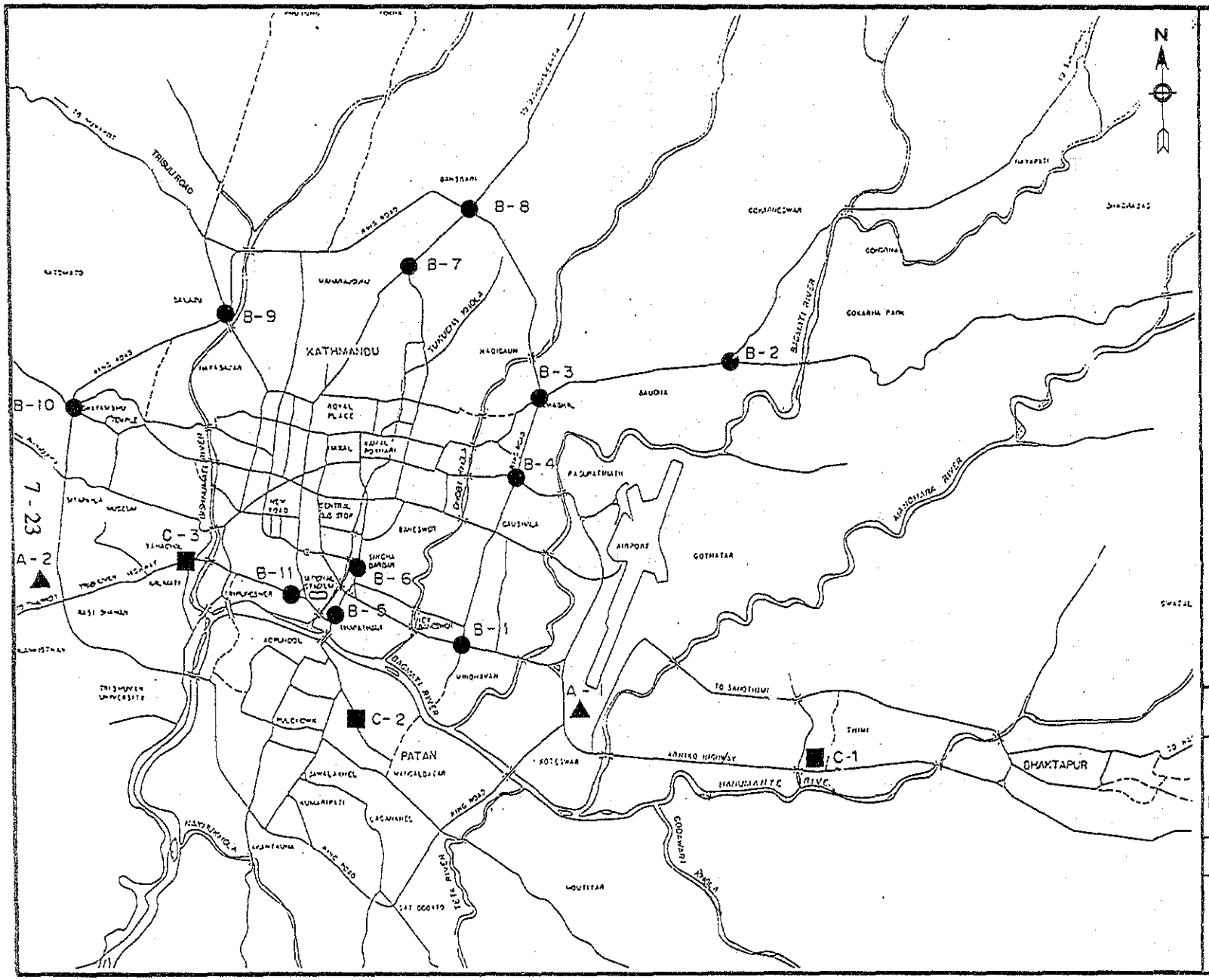
Classification		Function
Type A	:	Bus stops with junctional function between long distance bus and city bus
Type B	:	Bus stops with junctional function between city buses and/or mini-bus
Type C	:	Bus stops located at critical road sections

Selected bus stops along the above classification are listed in Table 7.9 and Fig. 7.7.

TABLE 7.9 IDENTIFICATION OF BUS STOPS BY FUNCTIONAL CLASSIFICATION

Type	Name of Bus Stops
Type A	Koteswar (A-1), Kalankisthan (A-2)
Type B	New Baneswar (B-1), Jorpati (B-2), Chabahil (B-3), Gausala (B-4), Thapathali (B-5), Singh Durbar (B-6), Maharajgunj (B-7), Maharajgunj Junction (Ring road)(B-8), Balaju Junction (Ring Road)(B-9), Swayambhu (B-10), Tripureswar (B-11)
Type C	Thimi (C-1), Patan Dhoka (C-2), Kalimati (C-3)

Number in bracket indicates location number (Ref. Fig. 7.7)



LEGEND

- ▲ Type A
- ● Type B
- ■ Type C

0 250 500 1000 2000km

SCALE = 1:25,000

HIS MAJESTY'S GOVERNMENT OF NEPAL (H.M.G)

KATHMANDU VALLEY URBAN ROAD DEVELOPMENT

IDETIFICATION OF BUS STOPS TO BE IMPROVED

FIG. 7.7

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

3) Description of Plan

Development plans by type of bus stop are described as below:

Type A:
- Construction of bus bays with set-back method (5 bays/direction)
- Provision of shelters
- Provision of signs

Type B:
- Construction of bus bays (2 bays/direction)
- Provision of shelters
- Provision of signs

Type C:
- Construction of bus bays with set-back method (1 bay/direction)
- Provision of shelters
- Provision of signs

Prototypes of the ground plans by type of bus stop are given in Appendix 7.1.

7.2.4 Route Regulation on Three-wheeler Public Transport

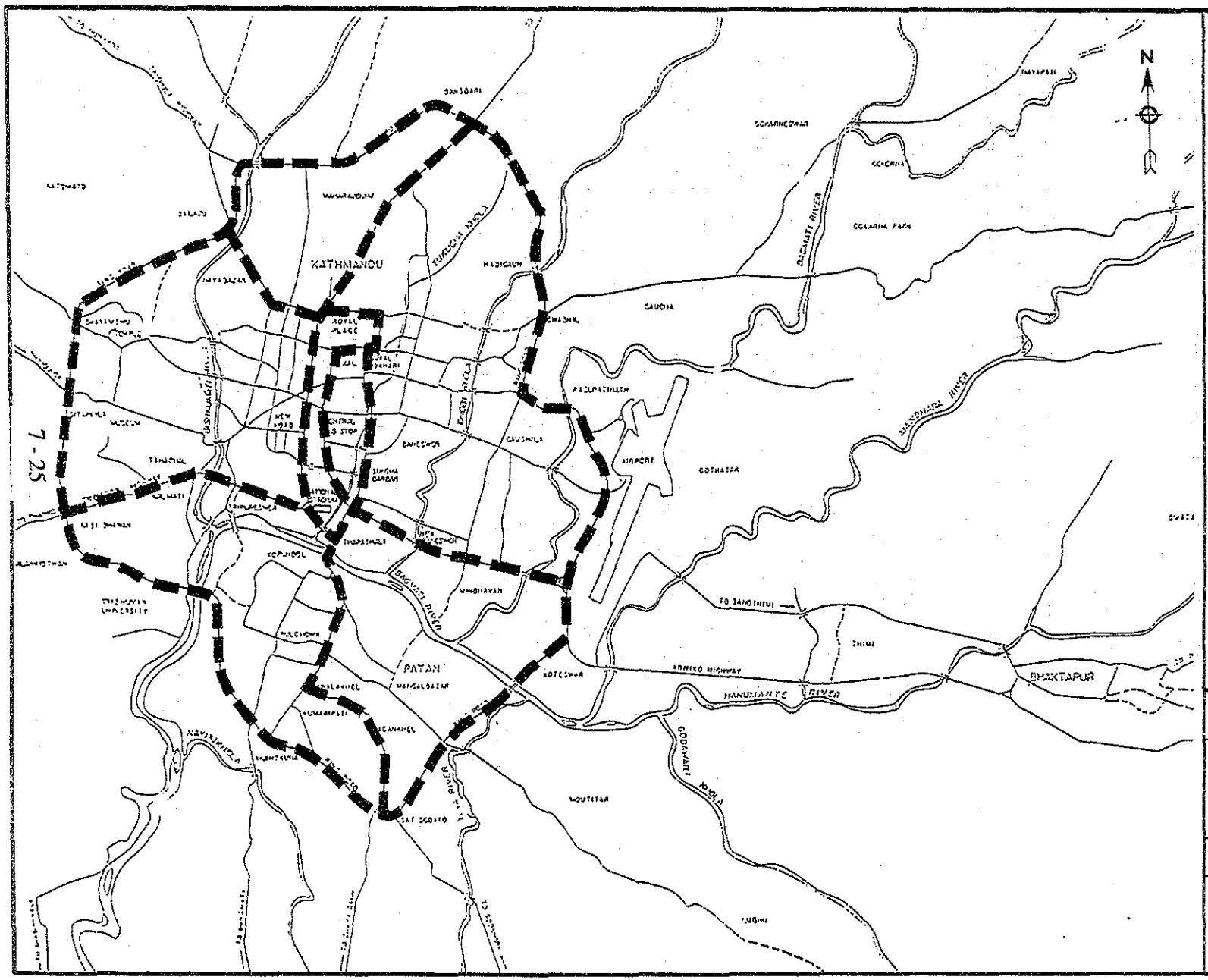
(1) Background

With the improvement of bus services on the trunk roads which radiate from the city center, feeder bus services inside the city area are inevitable to be improved. At present, most of the feeder services are made by buses, tempos and autorickshaws. However, the present service standards provided by these modes are low. Especially, standard of service provided by tempos is extremely low. It is requested that these modes of public transport are to be replaced by better modes of transport such as mini-buses.

(2) Description of Plan

It is proposed, first of all, to regulate the tempo operation on the arterial roads within the urban area as shown in Fig. 7.8. This would promote the transition to better modes of public transport under appropriate measures which include:

- More frequent service by mini-buses on arterial roads, and
- Introduction of fare system which encourages the usage of mini-bus.



7 - 25

LEGEND

0 250 500 1000 2000m

SCALE = 1:25,000

HIS MAJESTY'S GOVERNMENT OF NEPAL
(H.M.G)

KATHMANDU VALLEY
URBAN ROAD DEVELOPMENT
PROPOSED TEMPO REGULATION ROUTES

FIG. 7.8

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

7.2.5 Construction of East-bound Long-distance Bus Terminal

(1) Planning Background

With the expected increase of east-bound long-distance bus passengers with the opening of Sindhuli Road and so on, some of the facilities at the Balaju terminal being constructed at present are to be relocated to the east exit of Kathmandu city in the long run. Opening of east-bound long-distance bus terminal would reduce the travel time for the east-bound long distance bus passengers.

(2) Description of Plan

Taking locational advantage into account, location for new terminal is proposed in close proximity to the Arniko Highway-Ring Road intersection. The scale of new terminal is roughly estimate at one-third of that of Balaju terminal considering the share of east-bound long-distance buses contained at the long-distance bus terminal at Balaju.

7.2.6 Introduction of Bus Priority Lane on the Inner Ring Road

(1) Planning Background

As long as foreseeable future is concerned, bus would remain as major means of transportation in the Study area. Improved bus service would strengthen the inter-regional interdependence among industries and enhance the daily activities of people. Introduction of bus lane on the sections of Inner Ring Road would provide better accessibility among the regions in the urban area.

Estimated traffic volume on the Inner Ring Road after the opening of the road is over 30,000 in terms of ADT of which 1,000 ~ 2,000 vehicles are buses. This would suggest that Inner Ring Road has still enough capacity for overall traffic on this road even after the designation of bus priority lane on it at least, the period just after the opening of the road is concerned.

(2) Description of Plan

Taking the function of road and road width into consideration, bus priority lane is to be introduced on the sections of Inner Ring Road.

7.3 Evaluation

Traffic volume by bus on the proposed network in 2015 is simulated as shown in Fig. 7.9 while the costs required for the implementation of the above plans have been estimated as shown in Table 7.10. Total cost required is some NRs. 1,110 million which is equivalent to some 3,099 million yen.

With the implementation of the above plans, the public transportation situation in the Valley will be greatly improved which could be seen in the following facts.

- Integration among existing transport facilities,
- Provision of better service level,
- Alleviation of the transportation-poor,
- Promotion of functional specialization among different modes of public transport, and
- Incentive towards other transportational development plans.

However, for the realization of the above physical plans, the measures of traffic management in terms of administrative, legal and sometimes educational are to be accompanied for the smooth realization of the plans.

TABLE 7.10 ESTIMATION OF COST FOR PUBLIC TRANSPORT DEVELOPMENT

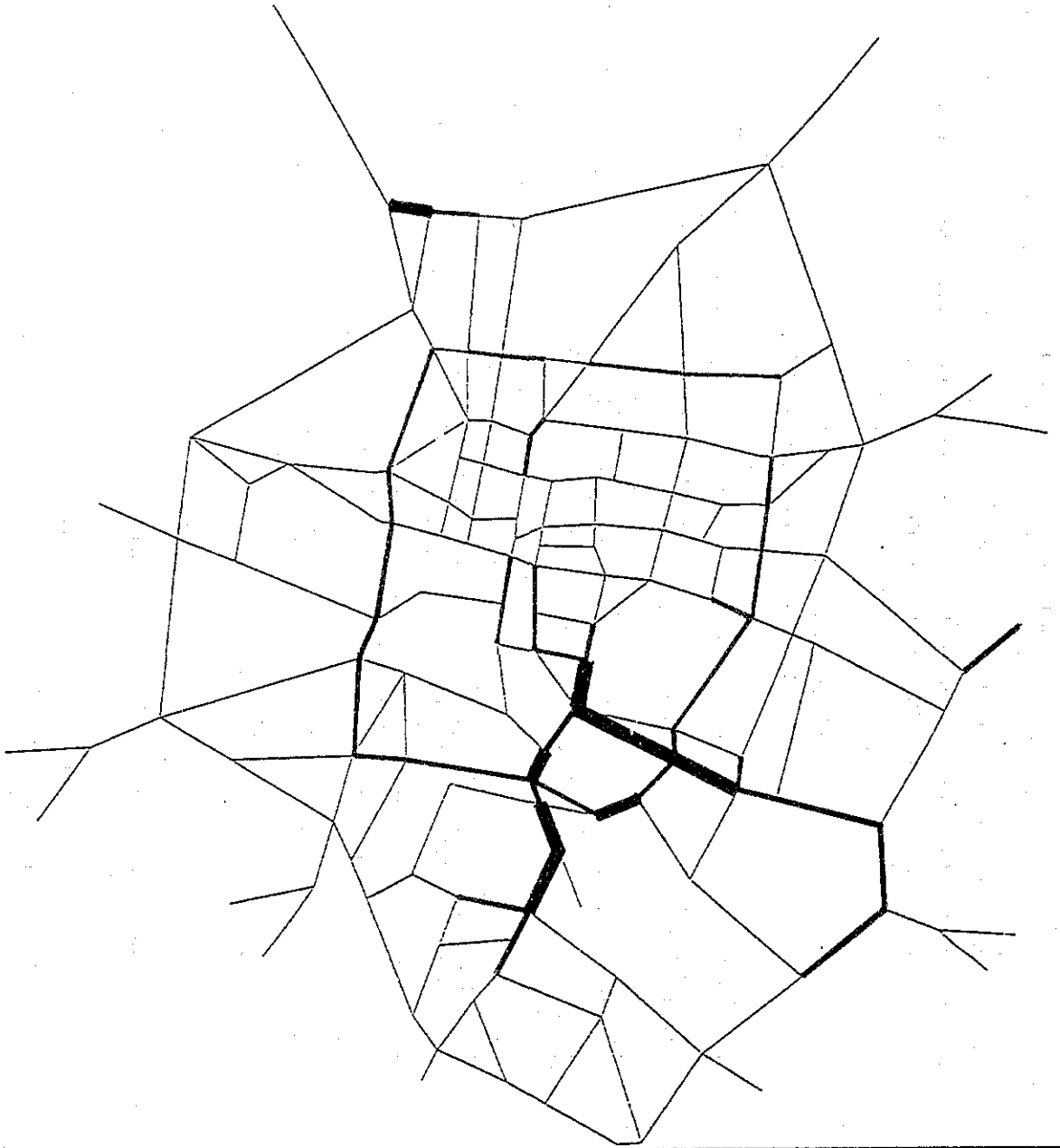
Unit: thousand

Plan	Estimated Cost
Shuttle Bus Service at New Long-distant Bus Terminal	NRs. 35,000 (¥100,000)
Improvement of Bus Services on District Roads in Suburban Area	NRs. 853,000 (¥2,380,000)
Improvement of Bus Stop Facilities	NRs. 18,750 (¥52,300)
Route Regulation on Three-Wheeler Public Transport	(1)
Construction of East-bound Long-distance Bus Terminal	NRs. 203,000 (¥567,000)
Introduction of Bus Priority Lane on Inner Ring Road	(2)
Total	NRs. 1,109,750 (¥3,099,300)

(1) Negligibly small
(2) Cost is included in road construction cost

7.4 Public Transport Development Master Plan

Public transport development plan formulated in this Chapter is presented in the form of master plan as shown in Fig. 7.10.



LEGEND

>=2, 000 Vehicles/day

>=1, 000 Vehicles/day

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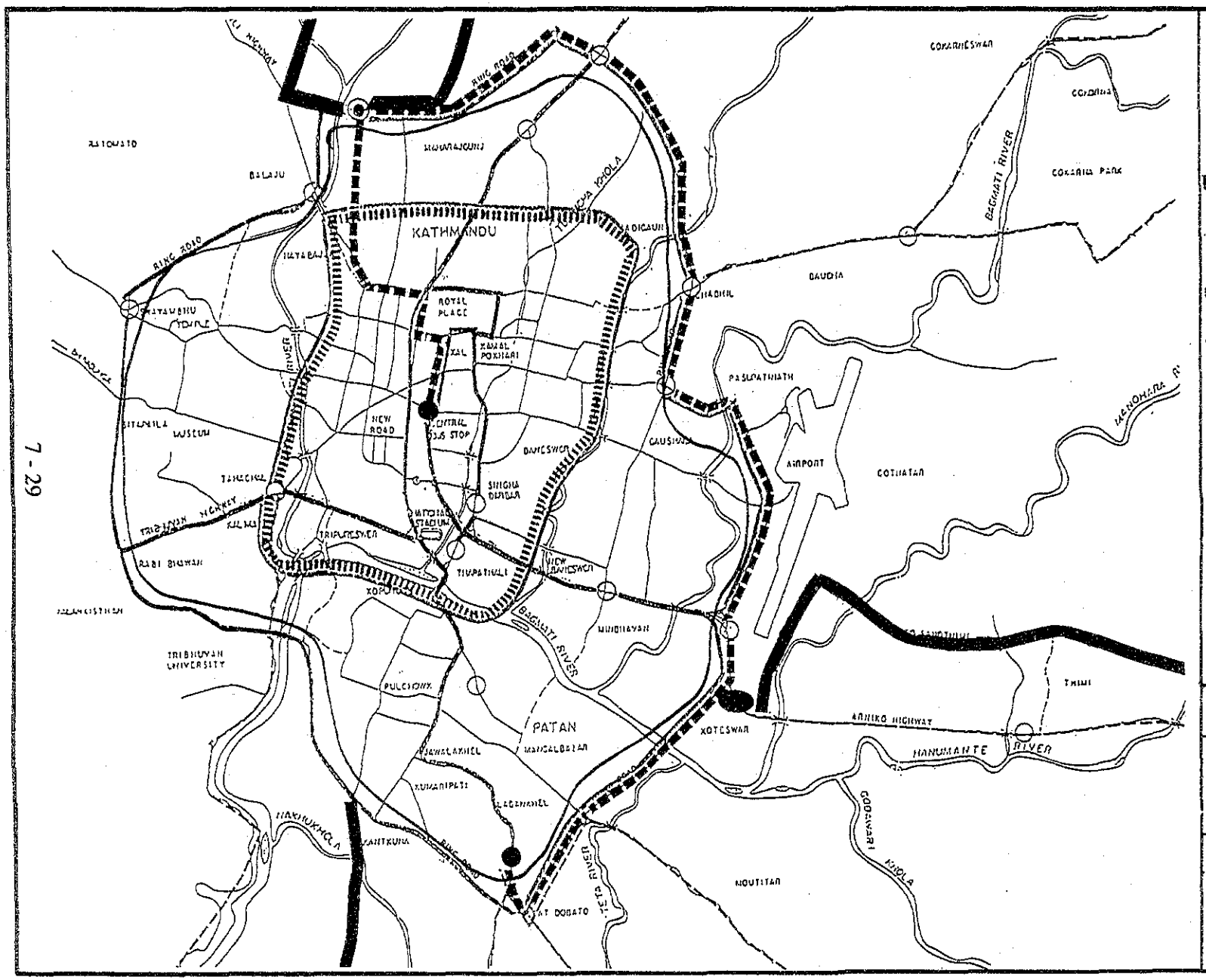
KATHMANDU VALLEY
URBAN ROAD DEVELOPMENT

TRAFFIC VOLUME ASSIGNED
(2015-PROPOSED NETWORK)

FIG. 7.9 - Bus -

JAPAN INTERNATIONAL COOPERATION
AGENCY (JICA)



LEGEND

- Shuttle Bus Route
- New City Bus Service Route
- Bus Service Improve on District Road
- Bus Priority Lane
- Tempo Regulation Route
- Long-distance Bus Terminal (On-going)
- Long-distance Bus Terminal
- Bus Stop to be Improved

HIS MAJESTY'S GOVERNMENT OF NEPAL
(H.M.G)

KATHMANDU VALLEY
URBAN ROAD DEVELOPMENT

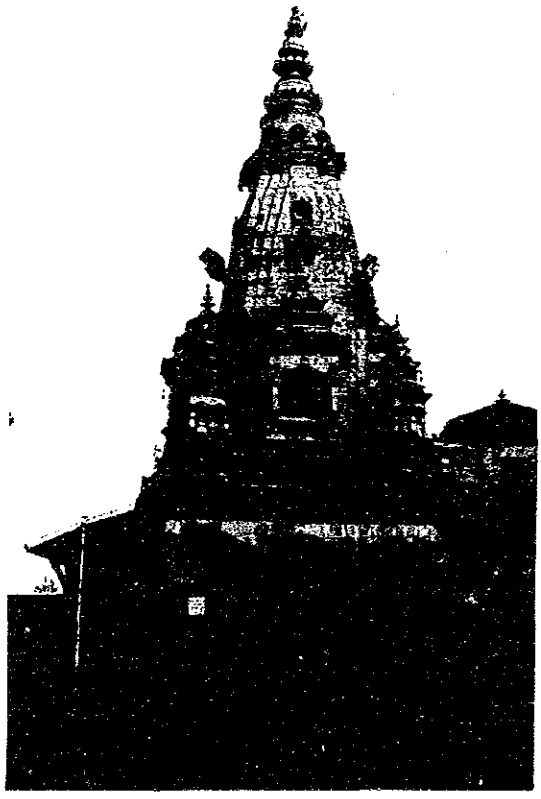
PUBLIC TRANSPORT DEVELOPMENT PLAN

FIG. 7.10

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

CHAPTER 8

TRAFFIC MANAGEMENT PLAN



8 TRAFFIC MANAGEMENT PLAN

8.1 Basic Concept

8.1.1 Introduction

Lack of proper measures in traffic management is major cause of present chaos in urban traffic in the Study area. At present, traffic management is mainly done by traffic police rather in disorganized manner. However, due to lack of integration among the measures being undertaken, no great achievement has been attained so far.

As to the legal and legislative means of traffic management, the Study area is provided with the minimum level of traffic codes. However, problem here is that these codes are not strictly observed by road users. Ineffective enactment of codes and resultant violation of them come from the following reasons:

- Lack of strict penalty system,
- No introduction of physical management measures.

The traffic situation in the Study area is getting worse. However, renovation of existing roads are very slow in implementation. In this circumstance, the role of traffic management is becoming more and more important for the realization of better urban traffic condition.

8.1.2 Development Concept

In expectation of immediate effect from the measures to be undertaken, emphasis is put more on the physical measure of traffic management rather than legislative and legal ones. Legal and legislative measures, which the Study area is provided with, would more effectively work, should supporting physical measures are given for the same purposes.

Taking the impacts of measures on the present urban traffic into account, following categories of traffic management have been proposed:

- Reduction of roadside parking and efficient use of road space,
- Improvement of intersections,
- Streamlining of pedestrian movement to avert mixed traffic, and
- Traffic education.

Introduction of the above four (4) categories of traffic management would bring about benefit both in tangible and intangible forms to the road users. These benefits will appear in the form of reduction of vehicle operation cost and traffic accidents and enhancement of urban amenity.

Traffic management is interpreted as a measure to be taken until large scale innovation work is undertaken. However, as far as Study area is concerned, the traffic situation on urban road is chaotic and disordered to the level that spoil the fruits of physical improvement works on infrastructure. This fact seems to come from extremely poor traffic behaviors of road users.

8.2 Description of Plan

8.2.1 Reduction of Roadside Parking

(1) Construction of Public Parking Lots

1) Planning Background

Roadside parking is one of the major causes of reduction of road capacities. Roadside parking is at present under the control of traffic police. However, the issue is getting worse in these days. This is because of increasing occasion of parking due to increased activities as a result of new location of business and commercial facilities and housings along the roadside as well as increase in absolute vehicle number. However, number of parking lot is very limited. This fact has led the situation to further serious one. Provision of public parking lot would reduce roadside parkings which inevitably would promote the efficient usage of road spaces.

2) Description of Plan

Probable Location of Parking Lots

Location of probable public parking lots has been selected through the field survey, taking into account of the following factors:

- Lot nearby the road where the issue of roadside parking is serious to the extent that hampers the road traffic,
- Lot where the acquisition of land is easy, for instance, land owned by public sector and/or old buildings of which demolition is being scheduled in the near future, and
- Lot with sufficient spaces for accommodation of vehicles and easy access from nearby roads.

Information about probable public parking lots is given in Table 8.1 and Fig. 8.1.

TABLE 8.1 OUTLINE OF PROPOSED PUBLIC PARKING LOTS

Location No.	Place	Location	Area (sq.m)	Probable Influential Area
1	Former Zonal Commissioner's Office	In front of Ratna Park	2,460	Downtown Kathmandu (New Road, Ratna Park)
2	Jamal Bahal Ground	In Front of National Theater	4,400	Downtown Kathmandu (Kantipath North)
3	Near Bhaktapur Gate	In front of Shree Padma High School	2,150	Downtown Bhaktapur
4	T.C.N. Office	Pachali	1,440	Pachali, Kathmandu (Tribhuvan Highway)
5	Guthi Sansthan Office	Ramshahpath	510	Kathmandu (Ramshahpath)
6	In front of Hotel Narayani	Pulchowk	2,330	Pulchowk, Patan

Prototype of Parking Lot

Regarding the structure of parking lot, multi-storied parking building has been proposed for the intensive use of the limited space. Typical plan is illustrated in Fig. 8.2.

Capacity of Parking Lots

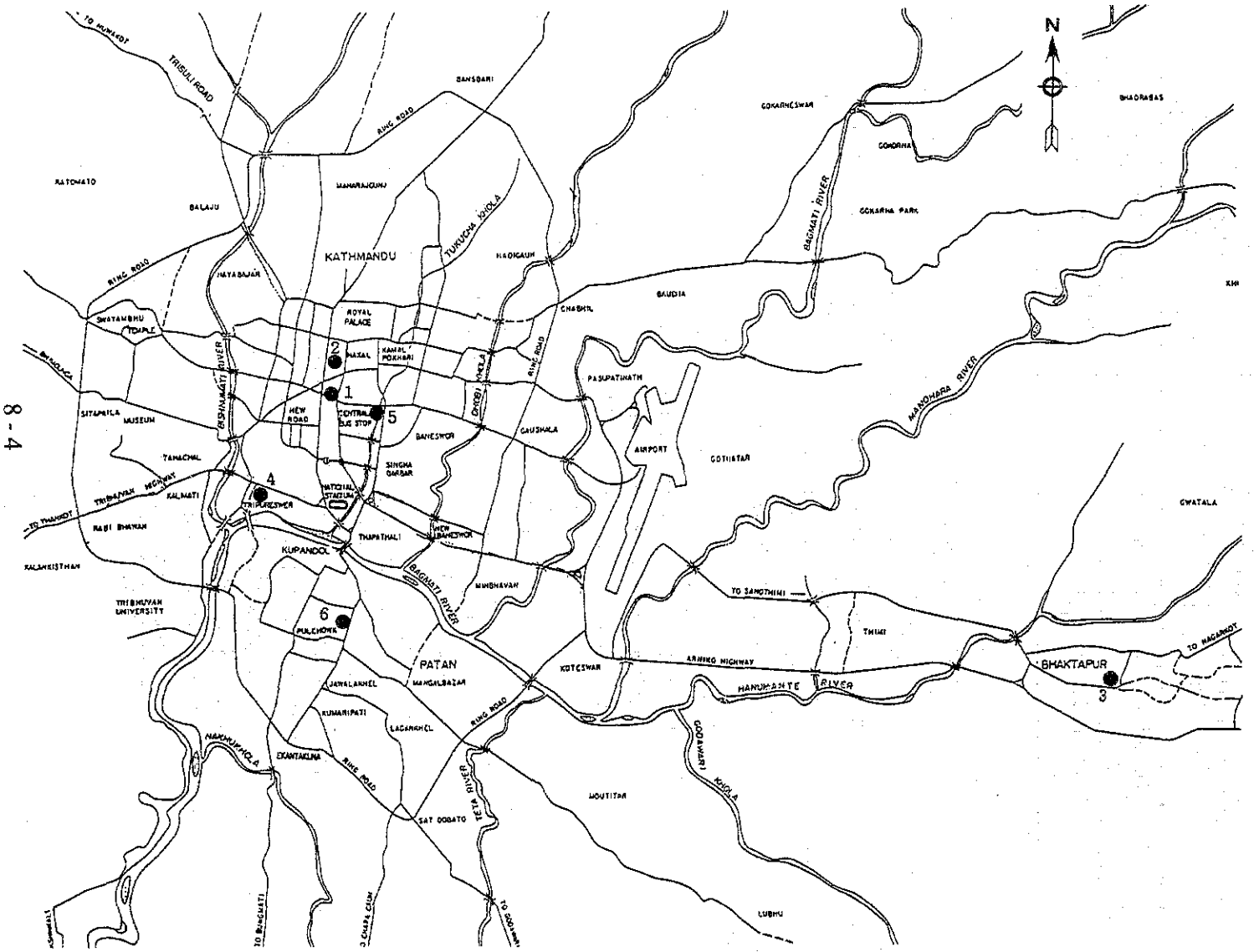
Capacities of parking lots have been estimated taking the sizes of space and probable structure of parking building into consideration as shown in Table 8.2. Total number of parking places in these lots is estimated at 1,040 as shown in the same Table.

3) Cost Estimate

Total cost required for the construction of these parking lots is estimated at about NRs. 114 million or 340 million yen as shown below:

Cost Estimates

	Unit: Million NRs.
Former Zonal Commissioner's Office	20
Jamal Bahal Ground	35
Near Bhaktapur Gate	17
T.C.N. Office	18
Guthi Sansthan Office	4
In Front of Hotel Narayani	20
Total	114



8-4

LEGEND

● Proposed Public Parking Lot

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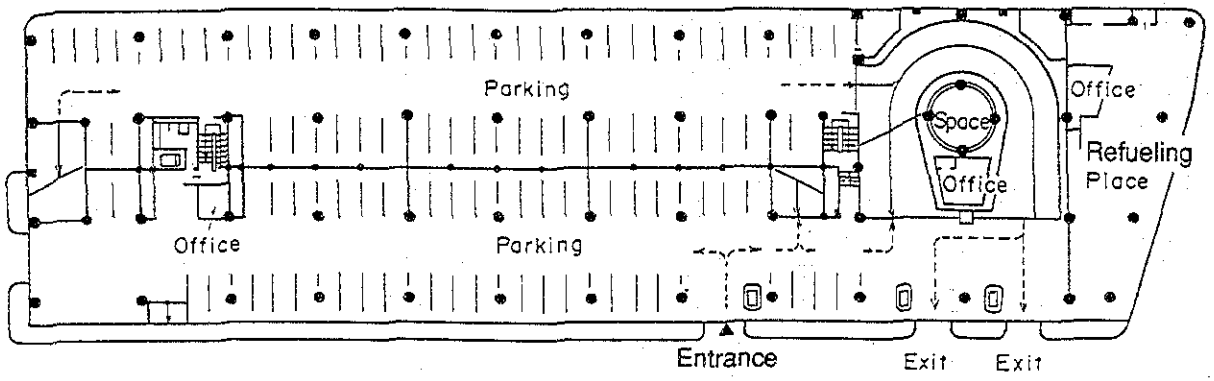
KATHMANDU VALLEY
URBAN ROAD DEVELOPMENT

LOCATION OF PROPOSED PUBLIC PARKING LOTS

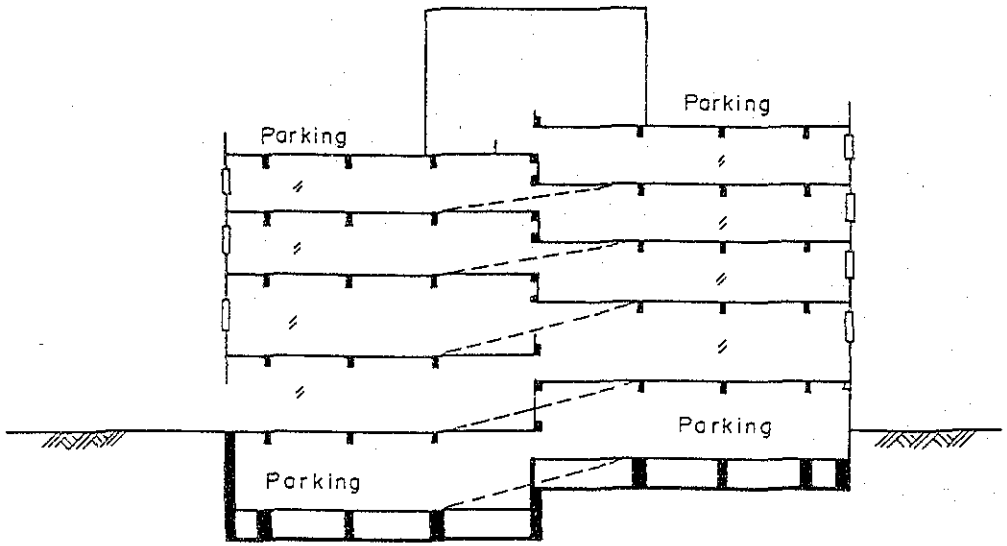
FIG. 8.1

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

(Plan)



(Section)



LEGEND

HIS MAJESTY'S GOVERNMENT OF NEPAL
(H.M.G)

KATHMANDU VALLEY
URBAN ROAD DEVELOPMENT

LAYOUT OF PARKING BUILDING

FIG. 8.2

JAPAN INTERNATIONAL COOPERATION
AGENCY (JICA)

TABLE 8.2 CAPACITY OF PARKING LOTS

Location No.	Place	1) Plottage (Sq.m)	2) Space for Parking per Floor (Sq.m)	No. of Floors	Total Space for Parking (Sq.m)	3) Number of Parking Place
1	Former Zonal Commissioner's Office	1,720	520	4	2,080	180
2	Jamal Bahal Ground	3,080	920	4	3,680	330
3	Near Bhaktapur Gate	1,500	450	4	1,800	160
4	T.C.N. Office	1,010	300	6	1,800	160
5	Guthi Sansthan Office	360	110	4	440	40
6	In Front of Hotel Narayani	1,630	490	4	1,960	170
	Total					1,040

1) 70% of building-to-land ratio is assumed.
2) 30% of floor area is assumed.
3) 11.25 sq.m/vehicle is assumed.

(2) Construction of Truck Yards along the Ring Road

1) Planning Background

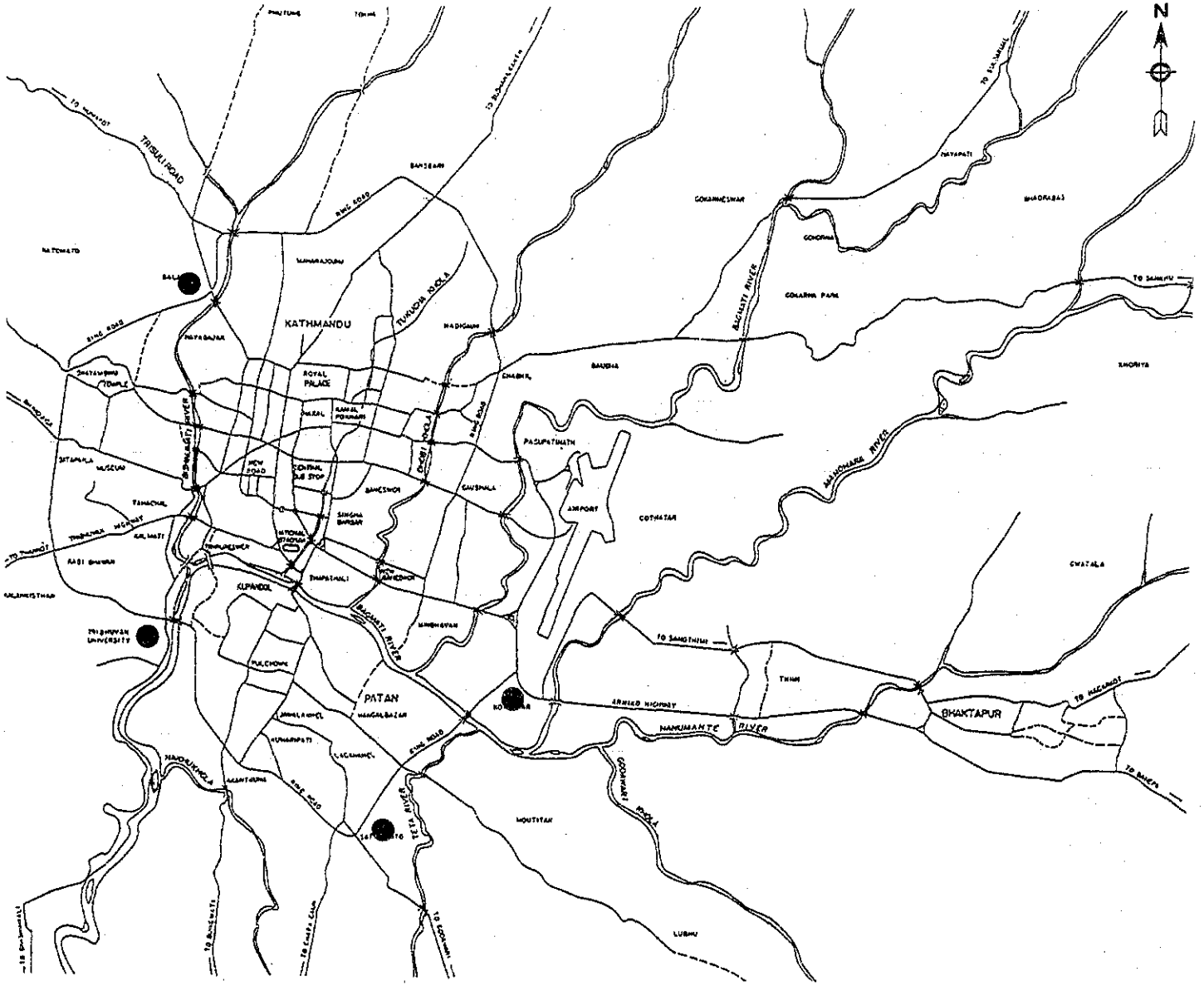
For the purpose of averting traffic congestion on arterial roads in the urban area, operation of heavy trucks during the day time is banned on the streets inside the Ring Road. In this situation, some of the roadsides on the Ring Road are used as the space for parking and place of on/off loading for heavy trucks.

2) Description of Plan

It is recommended to construct truck yards at the vital places on the road as shown in Fig. 8.3. The scale of these yards are 20 parking spaces with minimum provision of on/off loading facilities. Typical ground plan of truck yard is illustrated in Fig. 8.4.

3) Cost Estimate

Construction cost for the truck yard is estimated at NRs. 37.4 million or ¥104.4 million.



LEGEND

● Proposed Truck Yard

HIS MAJESTY'S GOVERNMENT OF NEPAL (H.M.G)

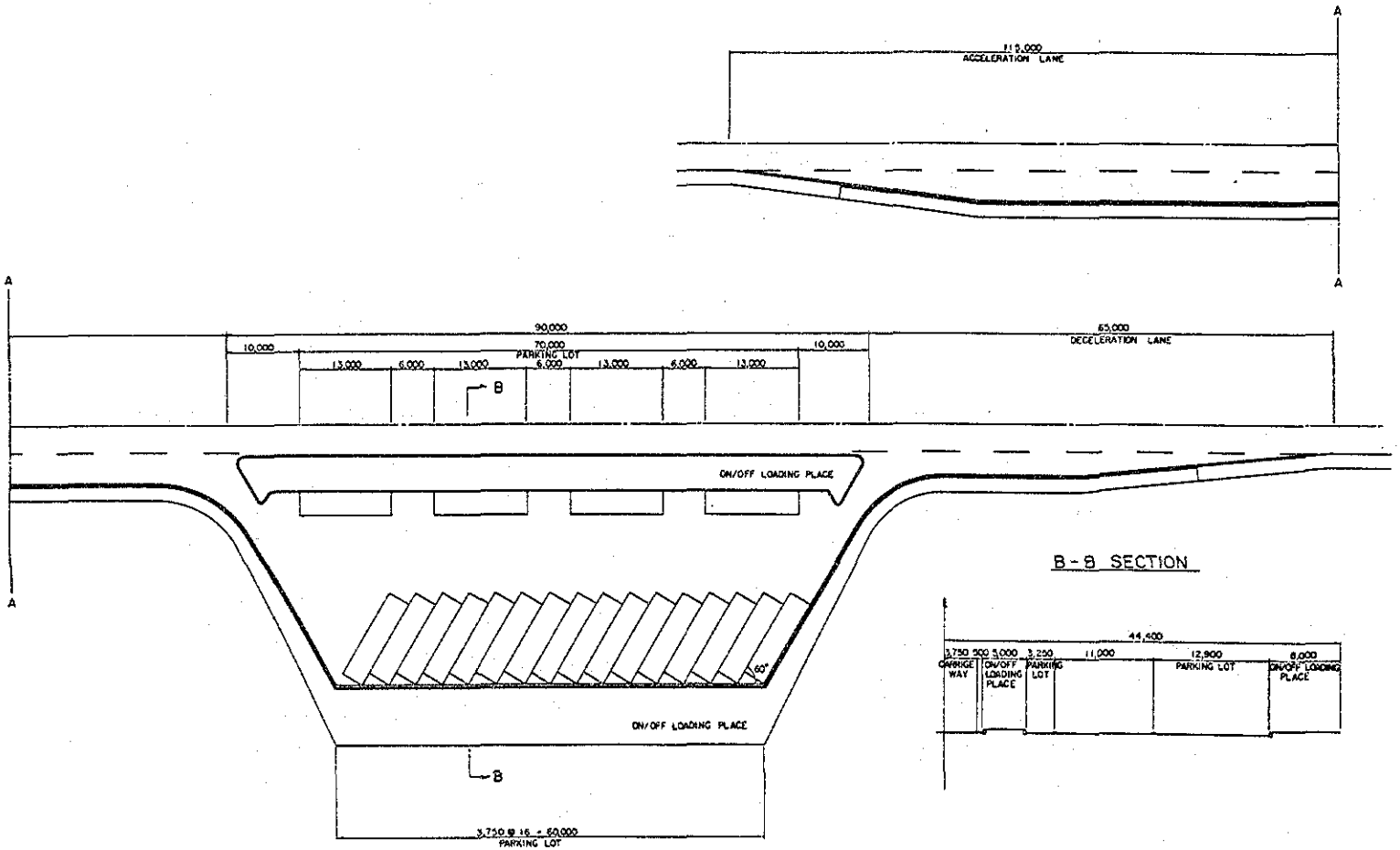
KATHMANDU VALLEY URBAN ROAD DEVELOPMENT

LOCATION OF PROPOSED TRUCK YARD

FIG. 8.3

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

LAYOUT PLAN of TRUCK YARD



B - B SECTION

LEGEND

HIS MAJESTYS GOVERNMENT OF NEPAL
(H.M.G)

KATHMANDU VALLEY
URBAN ROAD DEVELOPMENT

LAYOUT PLAN OF TRUCK YARD

FIG. 8.4

JAPAN INTERNATIONAL COOPERATION
AGENCY (JICA)

8.2.2 Improvement of Intersection

(1) Planning Background

Improper traffic management at intersections is becoming major cause of road congestion and traffic accident in nearby area. Some of the intersections, especially which are located in downtown area, are approaching their saturation levels and lowering vehicle speed. In addition, traffic accident data suggests the accident prone areas are located near the intersections with outdated facilities and those with improper management. Above facts justify the early improvement of intersection within the urban area.

(2) Description of Plan

Intersections to be improved have been identified as shown in Table 8.3 and Fig. 8.5 based on evaluation of saturation level and traffic accident data. Probable improvement measures are described by interchange in the same Table. Development plan of each of the intersections is illustrated in Appendix 8-1. Besides, traffic volumes at peak hour, which are the basic data for the development plan of intersections, are illustrated in Fig. 4.35, Fig. 4.36 and Appendix 8-2.

(3) Evaluation

Improvement plan of critical intersections would contribute a great deal to the realization of the smooth traffic flow and reduction of traffic accidents. Especially, the improvement of notorious Koteswor (Tinkune) interchange (Arniko Highway-Ring Road) into rotary interchange would contribute to the reduction of traffic accidents in this area. Total cost for the improvement of interchange is estimated at NRs. 32 million which is equivalent to 90 million yen as shown in Table 8.4.

TABLE 8.3 IDENTIFICATION OF INTERSECTIONS TO BE IMPROVED

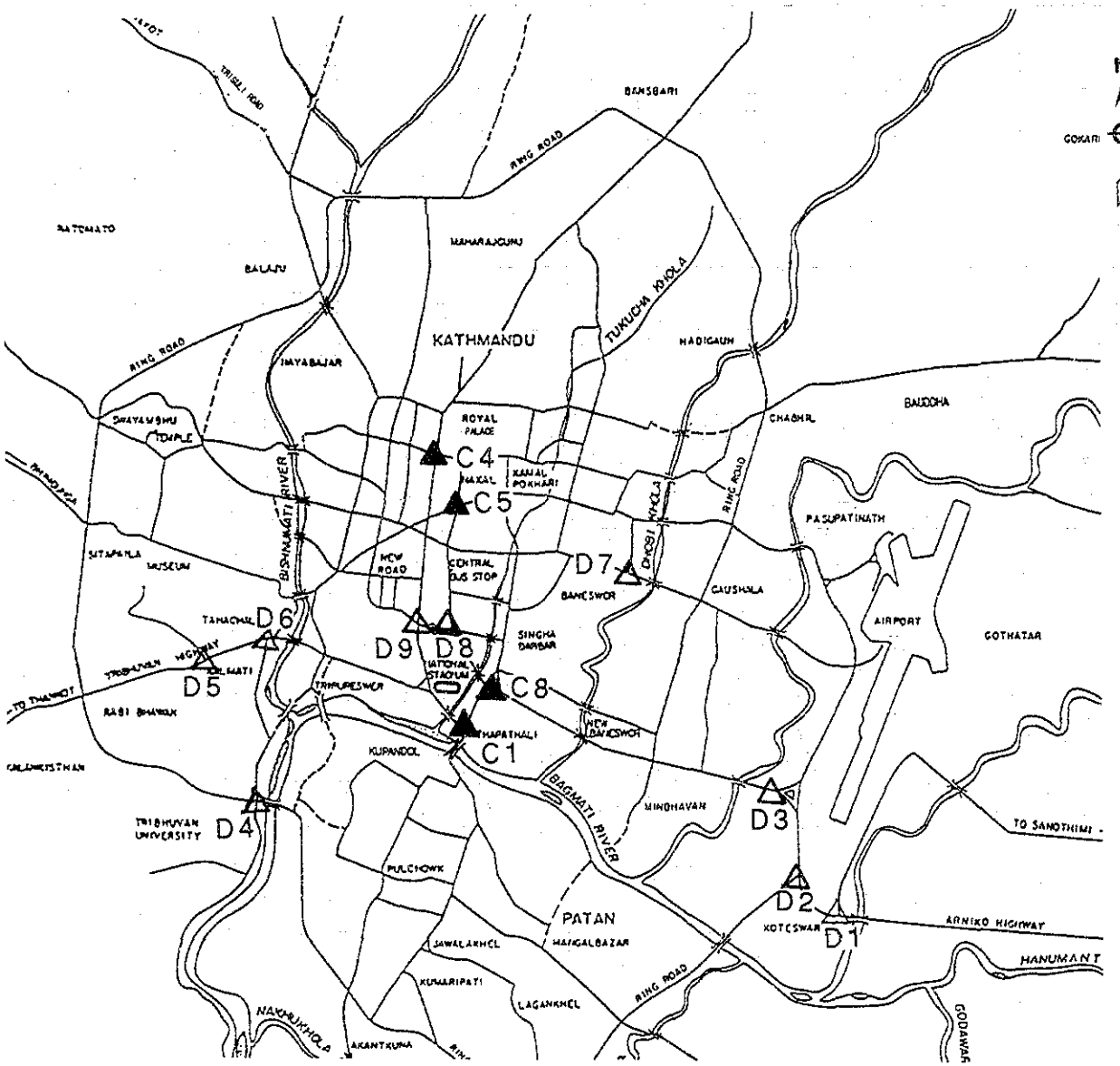
Name of Intersection	Present Issues	Measures for Improvement	Remarks
THAPATHALI (C1)	INTERSECTION WITH EXCEEDING CAPACITY CAUSES (1) Tight radius for left turning vehicles. (2) Improper channelisation of pedestrians. (3) No segregation of pedal cycles and slow-moving vehicles. (4) Improper phasing of existing traffic signals. (5) Bus stop near the intersection. (6) Improper road markings around the junction.	(1) Radius should not be less than 15 m. (2) Efforts must be made to divert cyclist and slow moving vehicles to where they can share facilities with pedestrians. (3) Two decades old traffic signals must be removed and phasing of signals have to be redesigned according to traffic volume.	Over-saturation
KESHARMAHAL (C4)	CAUSES (1) Inadequate turning radius for three left turning movements. (2) Improper channelisation of pedestrians. (3) Improper phasing of existing traffic signals. (4) No enforcement of offside priority in rotary. (5) No pedestrian refuge.	(1) 7.5 - 15.00 m compound curves and minimum 9 m radius of simple curves are recommended. (2) Pedestrian crossing should be provided. (3) Signals should be shifted as per intersection improvement and phasing of signals must be adjusted. (4) Flag poles shown in the drawing must be adjusted or removed.	Over-saturation Morning Peak : 1.02 Evening Peak : 1.20
TINDHARA (C5)	CAUSES Similar as C4	Similar as C4 except for traffic signals.	Over-saturation Morning Peak : 1.02 Evening Peak : 1.20
MAITIGHAR (C8)	CAUSES (1) Inadequate turining radius for vehicles coming from Thapathali and going towards Babar Mahal. (2) Inadequate visibility for drivers due to commercial activity inside the rotary. (3) Walkways along the rotary and no proper channelisation of pedestrians. (4) Poor road marking and road signs. (5) Poorly designed barriers on physical island causes night time accident (6) No lighting arrangement around the junction.	(1) Proposed radius is shown in the drawing. (2) Buildings inside the rotary must be demolished and proper road signs must be introduced. (3) Proper marking for channelisation of vehicles are recommended (4) Proper lighting installation is strongly recommended.	Over-saturation Morning Peak : 1.10 Evening Peak : 1.13

TABLE 8.3 IDENTIFICATION OF INTERSECTIONS TO BE IMPROVED (Continued)

Name of Intersection	Present Issues	Measures for Improvement	Remarks
ARNIKO HIGHWAY - SANO - THIMI (D1)	ACCIDENT PRONE INTERSECTION CAUSES (1) Inadequate turning radius (2) Improper channelisation of pedestrians and vehicles (3) No walkway on major road. (4) No enforcement for priority. (5) Poor road sign and markings	(1) 15 m radius is recomended for turning vehicles. (2) Major/Minor priority must be enforced (3) Introduction of road signs and markings.	
KOTESHWOR - RING ROAD (D2)	CAUSES (1) Uncontrolled parking, illegal access and spread of unauthorised commercial acitivity (2) Excessive speed on intersection approaches (3) Minor road traffic failing to stop or yield. (4) Others same as D1	(1) Strong building regulations should include building line. (2) Others same as D1.	
KOTESHWOR (TINKUNE) (D3)	CAUSES (1) Three-legged intersection without proper channelization (2) Collision among through, crossing and merging traffic. (3) Unpaved shoulder (4) Poor road marking and traffic sign (5) No lighting installation (6) No formal crossings for pedestrians	(1) Channelisations are shown in the Drawing. (2) Collisions are reduced by converting to roundabout	
RING ROAD (BALKHU) (D4)	CAUSES (1) Poor road geometry (2) No road marking and traffic sign (3) No facility for pedestrians	(1) Radius should not be less than 15 m. (2) Buildings at minor road side must be demolished to provide sufficient visibility of the intersection.	

TABLE 8.3 IDENTIFICATION OF INTERSECTIONS TO BE IMPROVED (Continued)

Name of Intersection	Present Issues	Measures for Improvement	Remarks
SOALTEE INTERSECTION (D5)	CAUSES (1) Inadequate turning radius (2) Excessive speed on intersection (3) No facility for pedestrian crossing (4) Poor road markings and traffic sign (5) Minor road traffic failing to stop or yield.	(1) 7.5 m and 15 m compound curve is recommended for turning vehicles. (2) Reflective paints and warning sign must be used to highlight the presence of intersection (3) Guardrails and traffic signals are recommended	
KALIMATI (D6)	CAUSES (1) Encroachment of market stalls in intersection (2) Poor road geometry (3) Pedestrian/vehicle conflict	(1) Unauthorised development must be stopped immediately (2) Proper channelisation of vehicles should be provided and pedestrian crossing must be clearly marked. (3) Pedestrian/vehicle conflict must be reduced by providing traffic signals	
MAITIDEVI (D7)	CAUSES (1) Similar as D6	(1) Same as D4 except for traffic signals. (2) Guardrails are recommended.	
BHADRAKALI (D8)	CAUSES (1) Narrow merging lane (2) Poor turning radius (3) Poor road markings and traffic sign (4) Bus stop near intersection	(1) Minimum 15 m radius is recommended (2) Existing bus stop near the intersection should be removed. (3) Proper lighting arrangement around the intersection is recommended.	
NAGASTHAN (D9)	CAUSES (1) Heavy cross traffic (2) Pedestrians exposed to high risk (3) Congestion	(1) Compound curve 7.5 - 15 m. radius is recommended	



LEGEND

▲ : Intersection with Exceeding Capacity

△ : Accident Prone Intersection

0 250 500 1000 2000km

SCALE=1 : 25, 000

HIS MAJESTY'S GOVERNMENT OF NEPAL (H.M.G)

KATHMANDU VALLEY URBAN ROAD DEVELOPMENT

LOCATION OF INTERSECTION TO BE IMPROVED

FIG. 8.5

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

TABLE 8.4 ESTIMATION OF COST FOR INTERSECTION IMPROVEMENT

Unit: 1,000 NRs

No.	Name of Intersection	Type of Improvement	Improvement Cost
C1	Thapathali	Traffic Signal	-*)
C4	Kesharmahal	Traffic Signal	6,900
C5	Tindhara	Rotary	1,500
C8	Maitighar	Rotary	3,600
D1	Arniko Highway - Sanothimi	Priority Intersection	400
D2	Koteswor - Ring Road	Rotary	700
D3	Koteswor (Tinkune)	Rotary	18,600
D4	Ring Road (Balkhu)	Priority Intersection	600
D5	Soaltee Intersection	Traffic Signal	6,400
D6	Kalimati	Traffic Signal	7,100
D7	Maitidevi	Priority Intersection	600
D8	Bhadrakali	Rotary	2,800
D9	Nagasthan	Traffic Signal	7,600
Total			56,800

*): Cost for improvement at intersection C1 is included in the construction cost of the New Bagmati Bridge.

It is noted that Thapathali intersection (C1) is directly related to the improvement plan of New Bagmati Bridge Project, which is planned to be implemented in the short-term, so that the improvement cost of Thapathali intersection is deleted from the above and included in the construction cost of New Bagmati Bridge Project.

8.2.3 Pedestrian Management

(1) Planning Background

Intrusion of pedestrians into carriageway is major cause of traffic accident and deteriorating urban traffic situation. As to pedestrian management, at present, no appropriate regulation method is being undertaken except for manual control by traffic police at major intersections. Problem of intrusion of pedestrians into carriageway is getting worse in these days and traffic management to prevent it is a very urgent issue.

The intrusion of pedestrians into the carriageway comes from the following facts:

- Poor traffic behaviors of pedestrians,
- No designation of pedestrian crossing points on major roads,
- Narrow road and no designation of pedestrian path,
- Loose control on illegal activities on roadsides,
- No designation of the places for boarding and alighting for public transport.

However, for the complete solution of the issues most of the measures relating to urban traffic improvement are to be applied in proper order. Intrusion of pedestrians is serious and has to be solved as it does relate to the issue of basic human needs.

(2) Description of Plan

In expectation of the prompt effects, introduction of the following physical measures are proposed here:

- Installation of pedestrian intrusion control fences,
- Installation of pelican signal/zebra crossings.

1) Installation of pedestrian intrusion control fence

The aim of this plan is to install fences on the center line of road section where traffic is busy with great number of road crossings. Probable sites for the implementation of this plan have been selected on the section along Arniko Highway and the Ring Road as shown in Fig. 8.6 from the following reasons:

- Sufficient carriageway width (4 lanes),
- Higher driving speed,
- Large volume of pedestrians crossing road,
- Resultant high inclination of fatal accidents revolving pedestrians.

This plan entails the designation of places of road crossing and U-turn lanes for the access to the building faced opposite lane. The typical plan is illustrated in Fig. 8.7.

2) Installation of pelican signal/zebra crossings

The aim of this plan is to improve the place of road crossing through the installation of pelican signal at road section with busy traffic. Probable locations of this plan are selected as shown in Fig. 8.7 in consideration of the following factors:

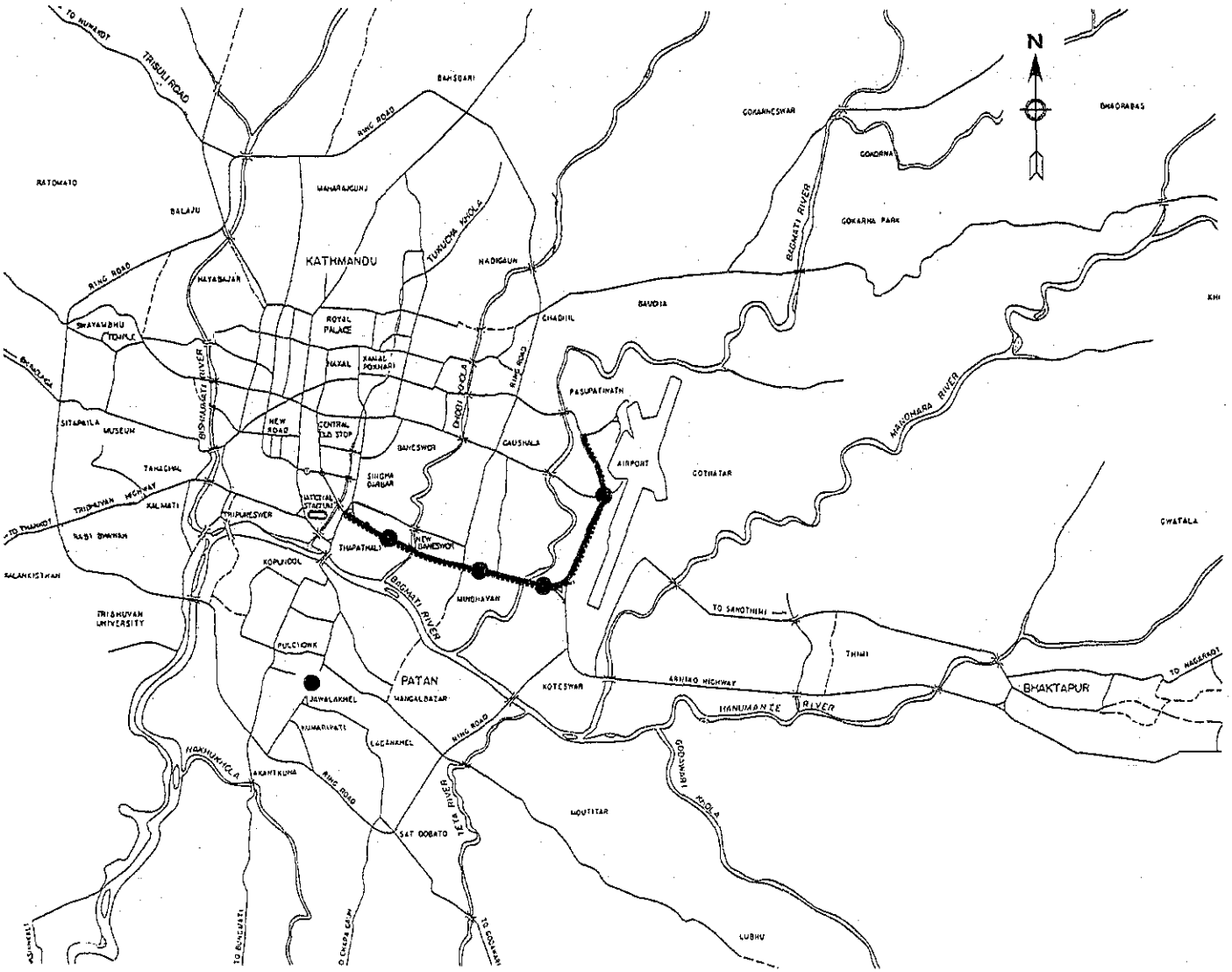
- Accident prone area,
- Nearby break points of pedestrian intrusion control fences.

(3) Evaluation

The above measures of controlling crossing of roads by pedestrians would greatly contribute to the reduction of traffic accident revolving pedestrians and would enhance driving condition for vehicles. The cost required for the implementation of these plans is estimated at NRs 32 million or some 95 million yen as shown below:

Implementation Cost Estimate

Pedestrian Intrusion Control Fence (2,400 m x 2)	:	NRs. 23 million
Pelican Signal (5 places)	:	NRs. 9 million
Total		NRs. 32 million



LEGEND

- Pedestrian Intrusion Control Fence
- Pelican Signal

HIS MAJESTY'S GOVERNMENT OF NEPAL
(H.M.G)

KATHMANDU VALLEY
URBAN ROAD DEVELOPMENT
LOCATION OF PEDESTRIAN CONTROL DEVICE

Fig. 8.6

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

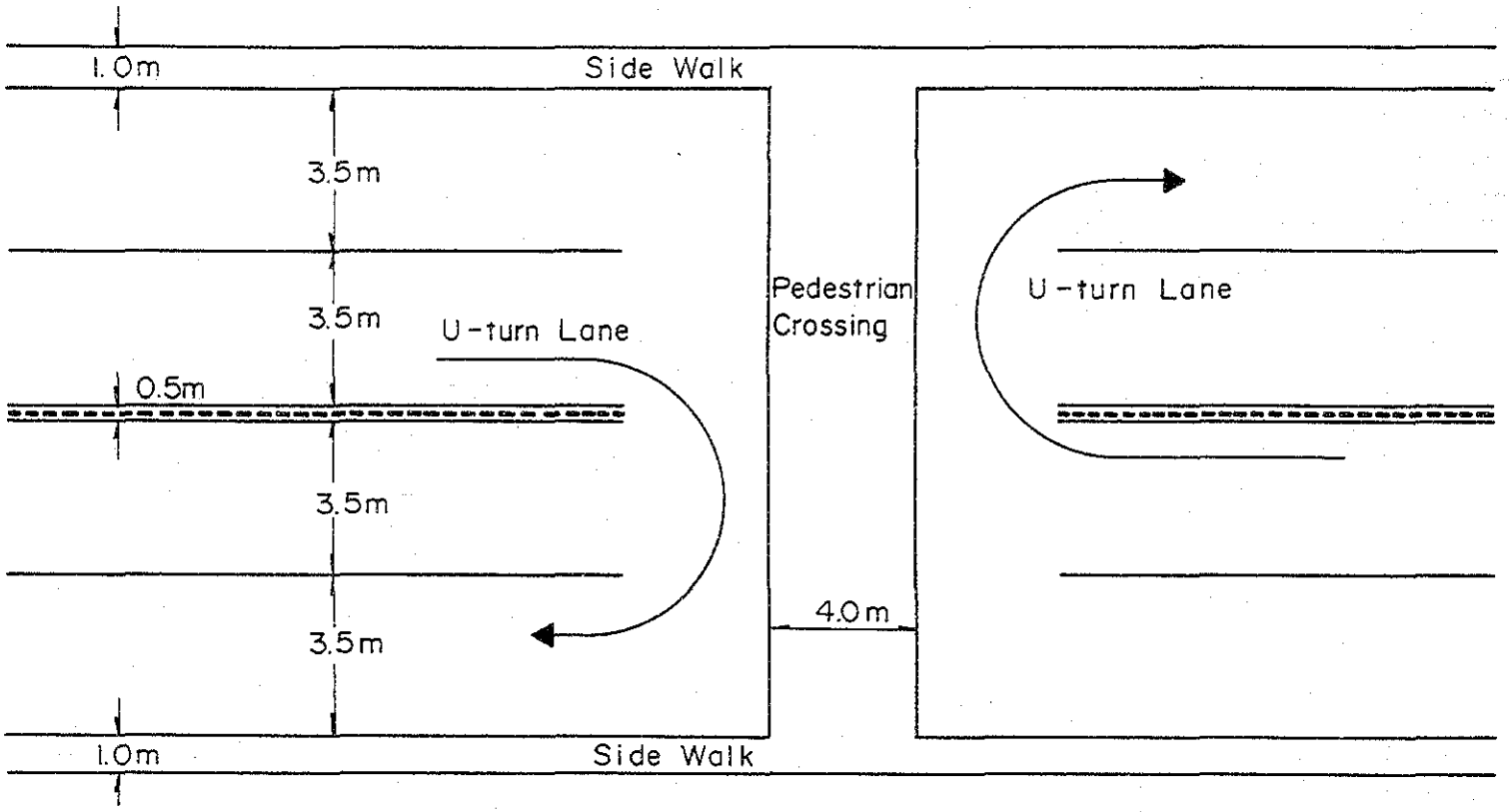


FIG. 8.7 PLAN OF PEDESTRIAN INTRUSION CONTROL FENCE

8.2.4 Traffic Engineering Institute

(1) Planning Background

To deal with traffic and transportation problems including research and training for traffic management and control, it is essential to establish an autonomous body named "Traffic Engineering Institute" under Ministry of Works & Transport, His Majesty's Government of Nepal.

(2) Description of Plan

The scope of work of the proposed Institute will be as follows:

1) To conduct study and research on traffic and transportation problems,

2) To conduct study and research on road accidents,

3) To impart training for enforcement personnel,

4) To create computerized data base on,

   a) Speed - volume on important roads and urban roads all over the Kingdom,
   b) Road accidents,
   c) Traffic law violations,
   d) Vehicle population, including their age and mechanical condition,
   e) Transportation network.

5) To establish continuous traffic study on,

   a) Vehicle speed,
   b) Traffic volume,
   c) Axle load,
   d) Transverse distribution,
   e) Environmental (Air and Noise) pollution due to road traffic.

6) To impart traffic engineering education to school and college students, and general public by using mass media viz. newspaper advertisements, Radio, T. V., seminars and workshops,

7) To adopt engineering measures like introduction of one-way system, speed limits, parking prohibition, signal system and so on,

8) To make scientific investigation of road accidents,

9) To guide and coordinate the related activities of Department of Roads, Department of Transport Management, Sajha Yatayat, Nepal Transport Corporation and Central Traffic Police,

10) To coordinate the traffic research activities which may be conducted at Institute of Engineering, Tribhuvan University in future.

(3) Organizational Structure

The Institute will have the following sections:

1) Secretariat with administration and accounts units,

2) Computer centre,

3) Training unit,

4) Study and research unit,

5) Coordination unit,

6) Documentation centre cum library

7) Education and publication unit

(4) Evaluation

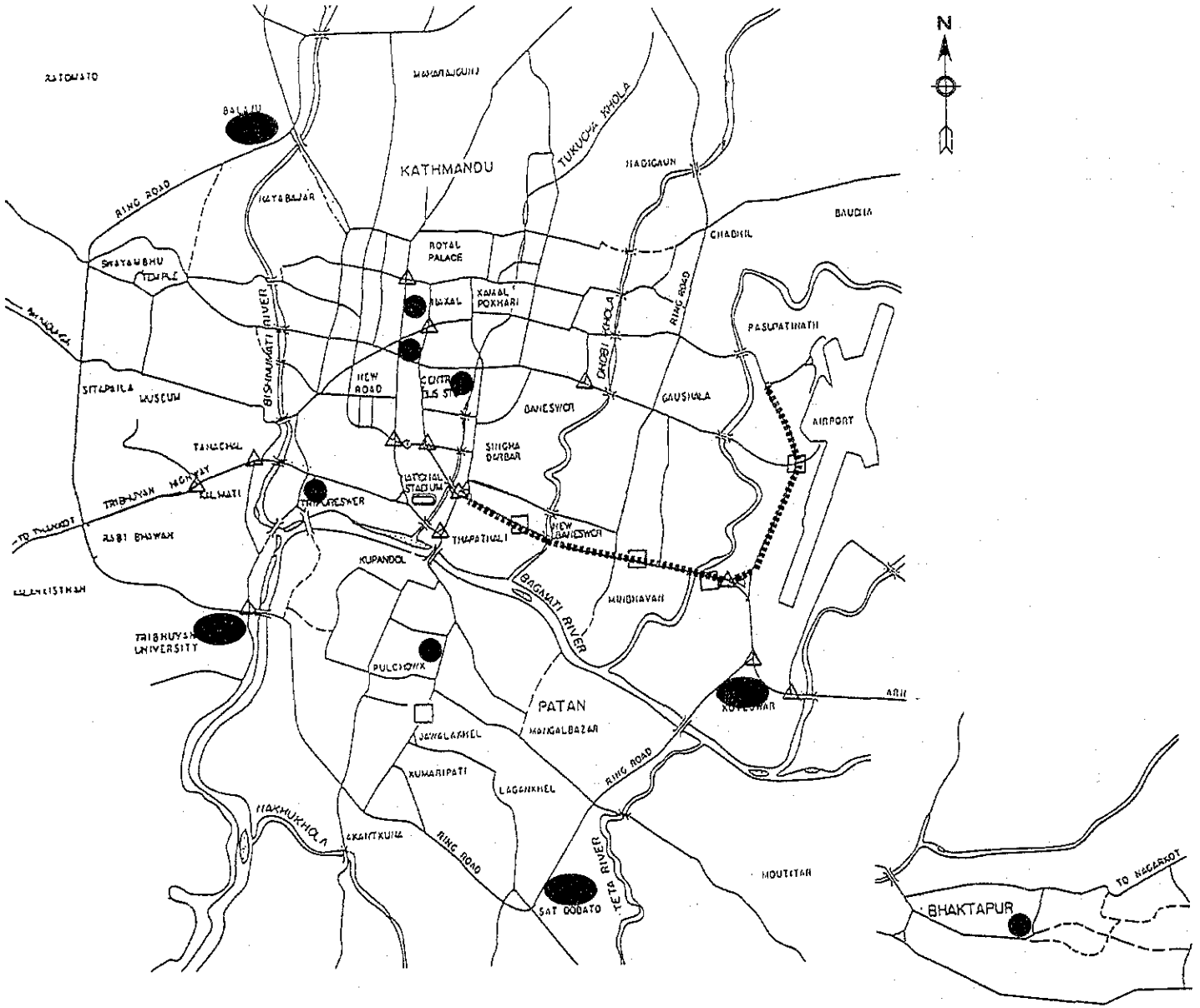
Traffic engineering institute would contribute to the basic study of traffic issues and diffusion of knowledge which would improve the poor traffic behaviors. The cost required for the implementation of this plan is estimated at NRs. 11.5 million or some 32 million yen .

8.3 Formulation of Traffic Management Master Plan

The above proposed plans are described in the form of master plan for traffic management as shown in Fig. 8.8

Estimated Cost for Traffic Management Plan

1. Reduction of Roadside Parking	
(1) Public Parking Lot	NRs. 114 million (¥336 million)
(2) Truck Yard	NRs. 38 million (¥104 million)
Subtotal	NRs. 152 million (¥440 million)
2. Improvement of Intersection	NRs. 57 million (¥168 million)
Subtotal	NRs. 57 million (¥168 million)
3. Pedestrian Management	
(1) Pedestrian Intrusion Control Fence	NRs. 23 million (¥67 million)
(2) Pelican Signal	NRs. 9 million (¥28 million)
Subtotal	NRs. 32 million (¥95 million)
4. Traffic Engineering Institute	NRs. 12 million (¥32 million)
Subtotal	NRs. 12 million (¥32 million)
Grand Total	NRs. 253 million (¥735 million)



LEGEND

- Public Parking Lot
- Truck Yard
- Intersection to be Improved
- Pelican Signal
- Pedestrian Intrusion Control Fence

HIS MAJESTY'S GOVERNMENT OF NEPAL
(H.M.G)

KATHMANDU VALLEY
URBAN ROAD DEVELOPMENT

TRAFFIC MANAGEMENT PLAN

FIG. 8.8

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

CHAPTER 9

DEVELOPMENT PLAN AND IMPLEMENTATION SCHEDULE

9 DEVELOPMENT PLAN AND IMPLEMENTATION SCHEDULE

9.1 Short-term Development Plan

The master plan study for the year 2015 was categorized into three (3) items, namely road development plan, public transport plan and traffic management plan and the results of the study were presented through Chapter 6 to Chapter 8.

On the basis of the above master plan study, the short-term development plan was established. The basic attitude for formulating the short-term development plan is to give minimal level of improvement on transportation infrastructure and management measures so as to extract maximum services from the existing facilities as stated in Chapter 5 of this report. In addition, target of the short-term development is also given to improve minimum level of transport services to the public and to secure the safety on roads.

With this consideration, the following two major targets were introduced for the short-term development plan:

(1) Improvement of bottlenecks in urban roads

(2) Improvement of the transportation-poor

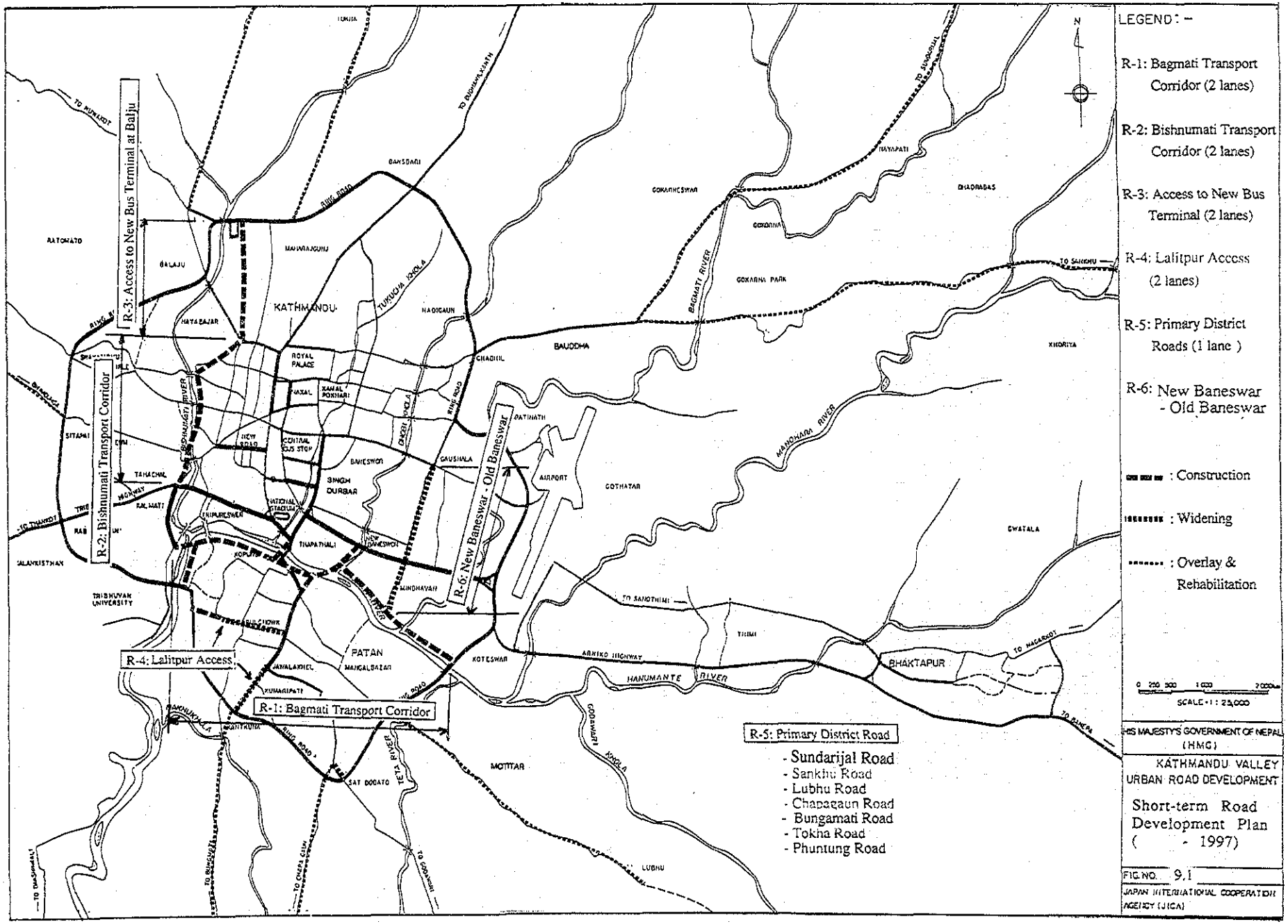
9.1.1 Short-term Road Development Plan

The road development plan in the short -term for the year 1992 -1997 has been studied by the Study team on the basis of the road master plan established in Chapter 6.

The recommended road network to be implemented in the short-term was presented in Fig. 9.1 and the concept of road development in the short-term plan is described below:

(1) Improvement of Bagmati Transport Corridor

As stated in Chapter 5, the integration of Kathmandu and Lalitpur cities is progressing accompanied with the rapid urbanization of Lalitpur city as well as the new development areas outside the Ring Road. The present traffic volume across Bagmati Bridge is about 50,000 ADT according to the survey result in December 1991, which exceeds far beyond the capacity of existing 2-lane bridge at Kupandol. River crossing capacity of the Bagmati River is too small to meet the traffic demand between Kathmandu and Lalitpur.


R-3: Access to New Bus Terminal at Balju
R-2: Bishnumati Transport Corridor
R-6: New Baneswar - Old Baneswar
R-4: Lalitpur Access
R-1: Bagmati Transport Corridor
KATHMANDU
PATAN
BHAKTAPUR
R-5: Primary District Road
- Sundarijal Road
- Sankhu Road
- Lubhu Road
- Chapagaun Road
- Bungamati Road
- Tokha Road
- Phuntung Road
LEGEND :-
R-1: Bagmati Transport Corridor (2 lanes)
R-2: Bishnumati Transport Corridor (2 lanes)
R-3: Access to New Bus Terminal (2 lanes)
R-4: Lalitpur Access (2 lanes)
R-5: Primary District Roads (1 lane)
R-6: New Baneswar - Old Baneswar
: Construction
: Widening
: Overlay & Rehabilitation
SCALE : 1 : 25,000
HIS MAJESTY'S GOVERNMENT OF NEPAL (HMG)
KATHMANDU VALLEY URBAN ROAD DEVELOPMENT
Short-term Road Development Plan (- 1997)
FIG.NO. 9.1
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

Moreover, this existing bridge had been suspended due to collapse of foundation since August 1991 till March 1992. During that time, the traffic flow between Kathmandu and Lalitpur had been seriously disturbed.

It is considered that the expansion of river crossing capacity including the provision of alternative bridge across Bagmati River is essential for facilitating the traffic demand between Kathmandu and Lalitpur as well as for securing the reliable transport route in the area.

Under such situation, the need for a high capacity road connecting Kathmandu and Lalitpur cities was recognized and the improvement of Bagmati transport corridor was proposed to:

1) facilitate the anticipated future traffic movement in north-south direction between Kathmandu and Lalitpur and the expansion of urban development south of Lalitpur,

2) decrease the traffic on the existing Bagmati Bridge at Kupandol by diverting traffic, and

3) enhance the development of low density areas along the Bagmati River on both north and south banks.

The Bagmati transport corridor consists of the following improvement measures as illustrated in Fig. 9.2.

<u>The Improvement of Bagmati Transport Corridor</u>

- Construction of South Link of Inner Ring Road (south bank) connecting Arniko Highway near Dhobi Khola at east end and Kuleswar-Kalimati Road at west end with the following linkages:
    - Linkage between Inner Ring Road at Teku to the Ring Road South (Teku Access)
    - Linkage between Inner Ring Road at Dhobi Khola to the Ring Road East South (Riverside Road on North Bank of Bagmati)
    - Construction of New Bagmati Bridge with 2 lanes at Kupandol
    - Access from the Inner Ring Road to Patan West

The alignment of the proposed south link of the Inner Ring Road is located about 1 km down stream of Shankhamol temple, therefore, it would not interfere the historical monuments conservation project in Patan which is under preparation by GTZ and His Majesty's Government of Nepal.

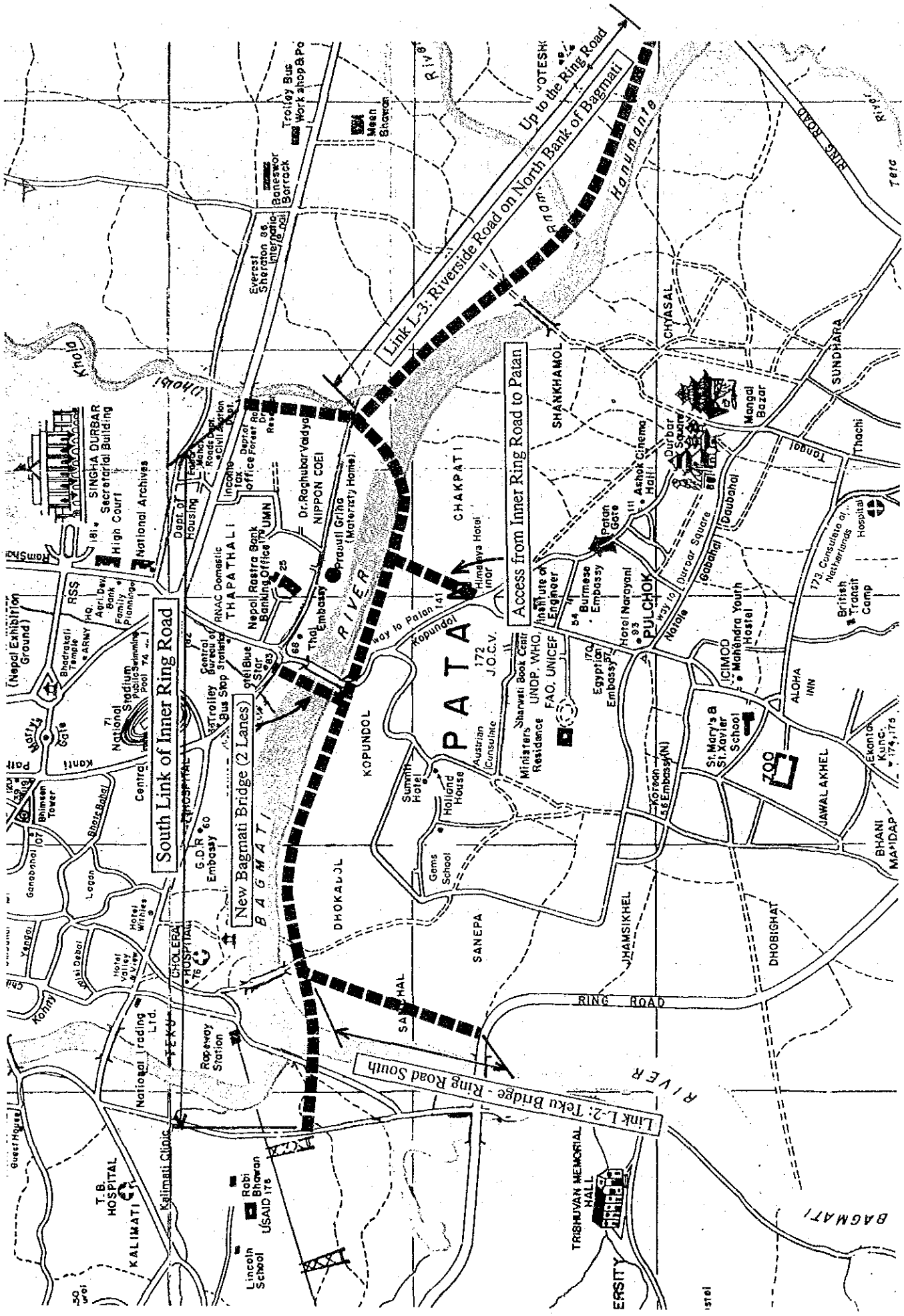


Fig. 9.2 Improvement of Bagmati Transport Corridor

Kathmandu Valley Urban Development Plans and Programmes (KVUDPP) recommended in their study the construction of Shankhamol Bridge to provide a second crossing over Bagmati River from Arniko Highway in the north to north-east Patan. The Study team recommends to construct the south link of the Inner Ring Road along the Dhobi Khola instead of the Shankhamol Bridge in the context of the overall road network to serve the urban areas and in conjunction with local development and environmental issues.

(2) Improvement of Bishnumati Transport Corridor

The Bishnumati link road proposed in KVUDPP study will be a part of the Inner Ring Road in its western section. The improvement of Bishnumati transport corridor is a long standing MHPP proposal and implementation is being recommended in the study of KVUDPP.

The road is planned to:

1) facilitate the traffic movement north-south between Kathmandu and Lalitpur,

2) relieve the historic core area of Kathmandu by intercepting traffic approaching from the west as well as divert traffic from the congested areas of Kantipath, and

3) provide the opportunity to improve the environment of bank along the river by creation of a hard edge.

The Bishnumati link road is proposed as a new strategic link to provide service and access to the historic core areas of Kathmandu and to divert traffic flow from city center. It is also expected to induce development in the area close to the central areas.

The Study team agreed to implement the Bishnumati link road in the short-term plan as a part of the proposed Inner Ring Road taking into consideration the needs of the project from the view-point of traffic demand as well as the environment protection.

KVUDPP recommended the implementation of Bishnumati link road of which alignment is shown in Fig.9.3. The road, starting from Kalimati, follows the west bank of the Bishnumati River to beyond the existing pedestrian suspension bridge at Kankeswari, then crosses to the east bank via new bridge and continues northwards along the river to Indrayani Temple. Passing to the east of the temple, the road moves inland and continues to the east through the southern limits of the improved GLD plot to a junction on the Balaju road.

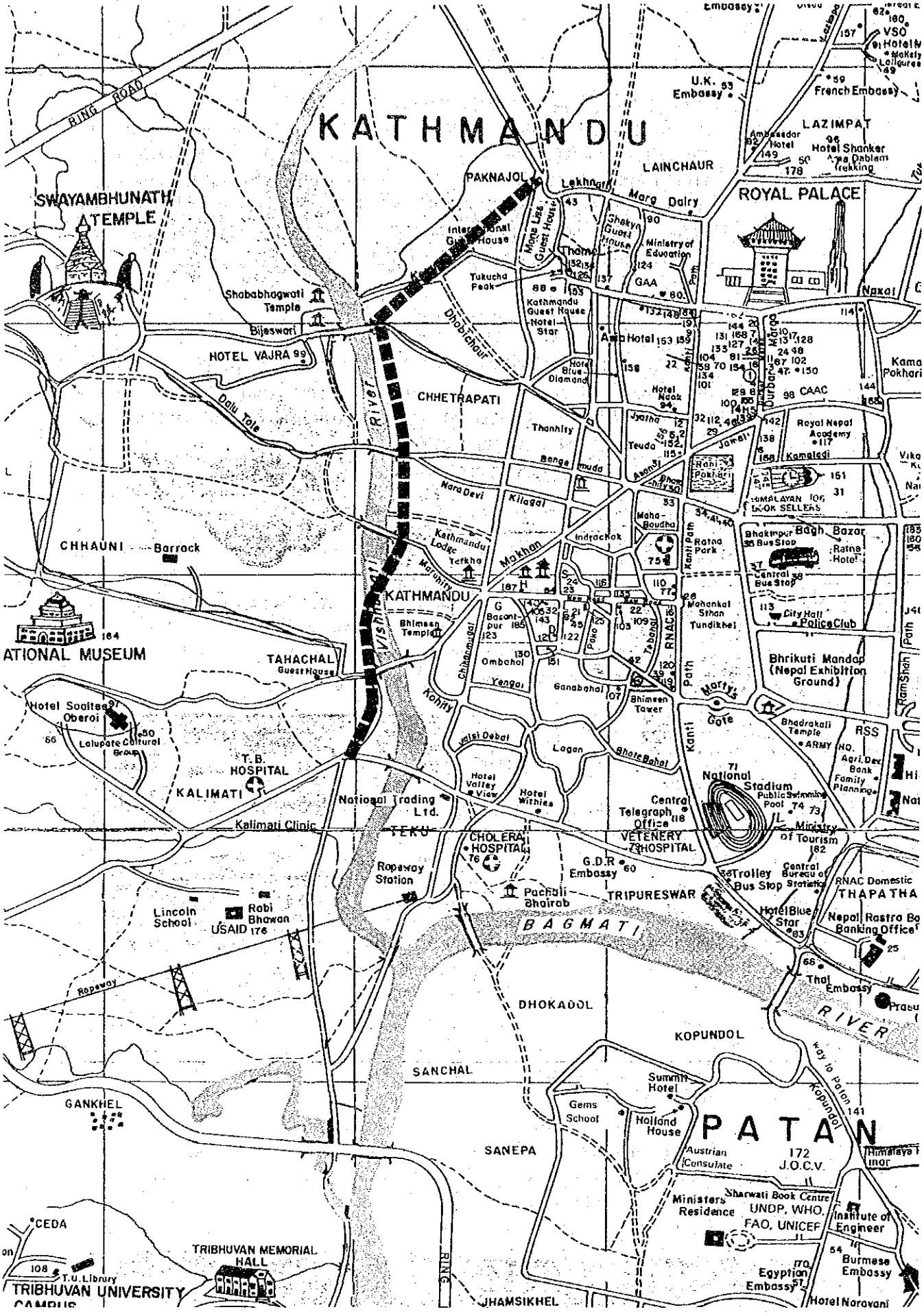


Fig. 9.3 Improvement of Bhishnumati Transport Corridor

It is noted that the north end of the Bishnumati link road is planned to connect with the proposed access to the new bus terminal at Balaju to realize more efficient and smooth traffic flow in the central areas by dispersing the traffic to Bishnumati link road.

The south end of proposed link of Bishnumati Corridor was planned to be connected with Kalimati intersection of Tribhuvan Highway. Since the Bishnumati Corridor will be a part of the proposed Inner Ring Road in future, the south end should be extended and connected with the Bagmati Corridor.

The section from the Kalimati intersection to the beginning point of proposed link of Bagmati Corridor, however, is already widened and upgraded to the 4-lane road which meets the requirement of standard of the proposed Inner Ring Road.

It could be, therefore, utilized as a part of Inner Ring Road without any major improvement, and therefore be deleted from the improvement plan in the short-term.

(3) Access to the New Bus Terminal at Balaju

New bus terminal is under construction with a financial assistance with Japanese government and its construction is supposed to be completed by March, 1993. All the long-distance bus services of Kathmandu city will be shifted from the existing bus terminal at Ratna Park to this place upon completion of the new bus terminal.

The existing road, which is only one lane road with 4.0 wide, is planned to be used as an access from Nayabazar near the city center to the new bus terminal. The necessity of widening may arise in the near future to cope with the future traffic demands, however, widening of the road would be very difficult due to dense location of houses and buildings along the road.

The Study team recommends to provide new access (as shown in Fig. 9.4) from the city center to the new bus terminal instead of widening of the existing road because of the following reasons:

1) Widening of the existing road might be very difficult due to dense location of houses and buildings along the road,

2) New access is planned to be connected with the Bishnumati link road proposed by KVUDPP, which might reduce traffic congestion in the city center caused by shifting of new bus terminal around Nayabazar area (by dispersing the traffic to Bishnumati Link), and

3) Proposed road (New access) might induce the urbanization in the surrounding areas of north-western part of Kathmandu.

The Study team proposes a partial one-way system from the entrance of Indian Embassy to the proposed New Access in order to obtain smooth operation of the public transport services taking into consideration the small traffic capacity of the Lekhnath Marg.

Appendix 9.1 shows the result of study in connection with access to the new bus terminal.

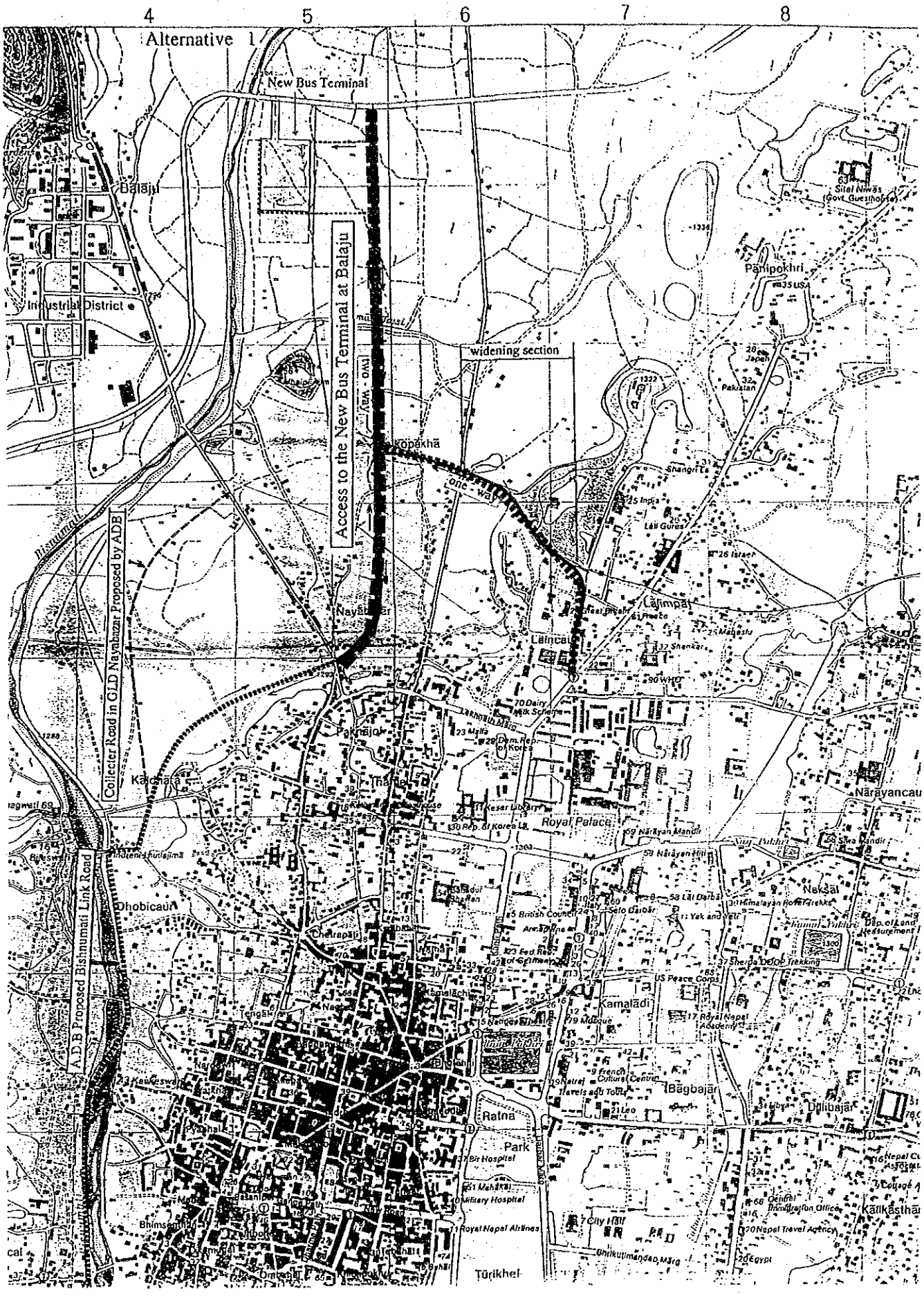


Fig. 9.4 Construction of Access to the New Bus Terminal at Balaju

(4) Improvement of Lalitpur Access

To cope up with the rapid motorization resulted from urbanization of Lalitpur city, strengthening of road network is indispensable. The roads in Lalitpur city should be widened and extended to provide more efficient traffic flow as well as to improve the access to the public transport services.

The following roads are recommended to be improved in the short-term plan. (See Fig. 9.5)

- Extension and Widening of Jhamsikhel-Ring Road
- Widening of Jawalakhel - Ring Road
- Widening of Sat Dobato - Ring Road

(5) Improvement of radial roads connecting with the central area

The expansion of urban areas will proceed along the major roads radiating from the Ring Road. These roads are used to be major bus routes, however, they are far below satisfactory standard as main bus routes with the exception of national highway. Improvement of these roads are proposed in order to improve the bus service on major bus route and to promote the urban development in the Valley.

It may be desirable to upgrade the standard of the existing road through the following measures to provide all weather access to public transport vehicles.

(a) Widening of Roads - 2 lanes
- Sundarijal Road (Primary District Road)

(b) Overlay and Reconstruction of Primary District Roads
- Sankhu Road
- Lubhu Road
- Chapagaun Road
- Bungamati Road

(c) Pavement of Gravelled Primary District Road
- Bhimdhunga Road
- Tokha Road
- Phuntung Road

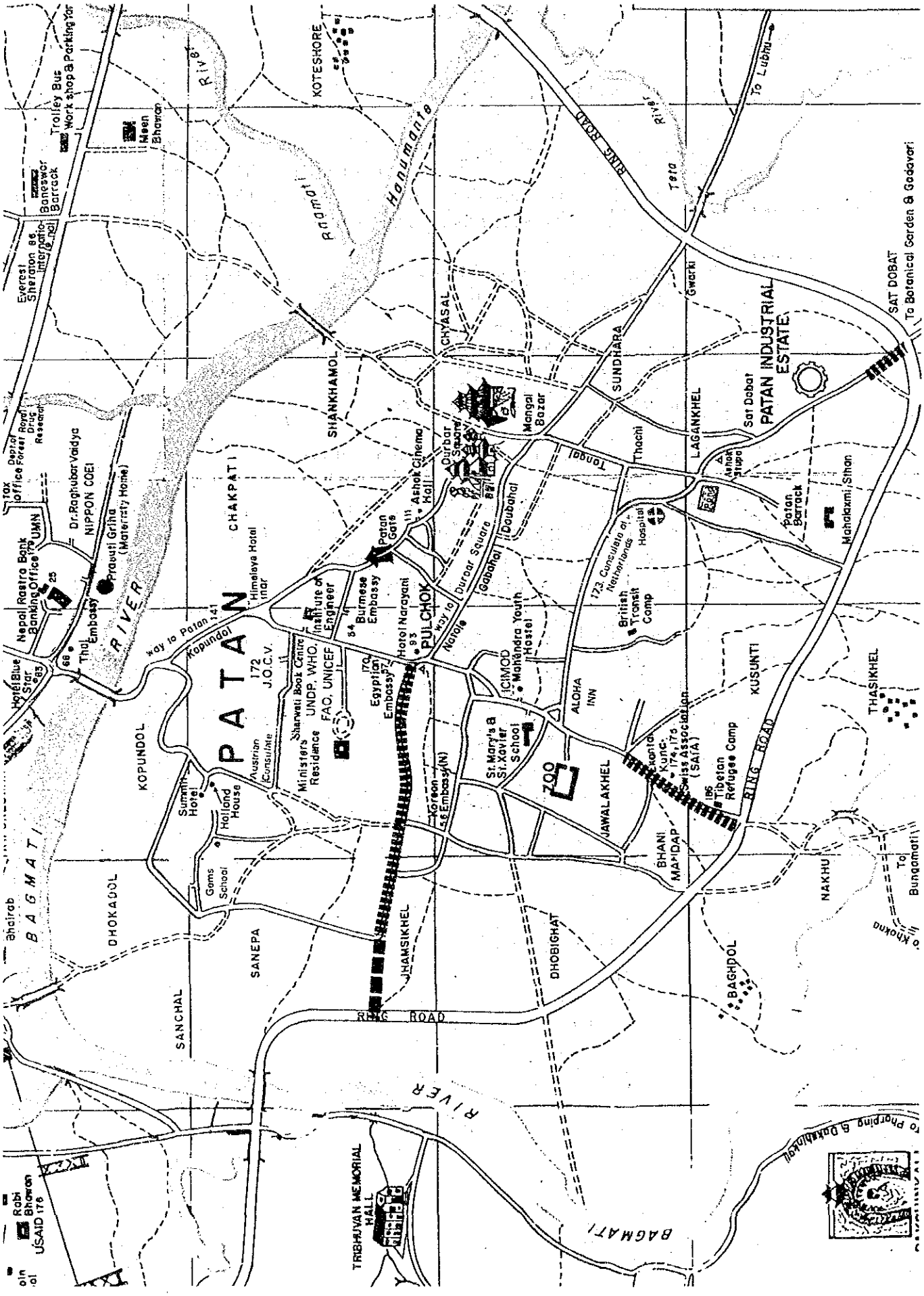


Fig. 9.5 Improvement of Patan Access

9.1.2 Short-term Public Transport Development Plan

Regarding the short-term development plan for public transport, following plans are recommended to be implemented for the early solution of issues in public transport:

(1) Shuttle bus operation to and from new long distance bus terminal,

(2) Improvement of bus operation along the radial district roads,

(3) Operation on city-bus along the radial district roads which are not served by existing bus services,

(4) Tempo bus regulation on arterial roads in the city center, and

(5) Improvement of bus stops.

9.1.3 Short-term Traffic Management Plan

Regarding the traffic management plan, all the plans proposed are recommended to be implemented in the short-term plan for the realization of streamlined urban traffic. They will contribute to the reduction of urban congestion and traffic accidents.

The proposed plan to be implemented in the short-term plan are as follows:

(1) Construction of public parking lots,

(2) Construction of truck yards,

(3) Improvement of intersections, and

(4) Installation of pedestrian intrusion control fences and pelican signals.

9.2. Implementation Schedule

Implementation schedule has been prepared on the basis of the short-term and long-term development plan proposed in the previous section. The schedule has been prepared in line with the transport development strategy established in Chapter 5 and summarized as shown in Table 9.1 and its implementation is illustrated in Fig.9.6.

9.2.1 Implementation Schedule of Short-term Development Plan

Implementation schedule of short-term development plan was prepared by the Study team taking into account the following factors:

1) Time requirement for subsequent services including feasibility study and detailed design required for implementation of the project,

2) Necessary arrangement for land/house acquisition and compensation to be done by His Majesty's Government of Nepal, and

3) Balance of the disbursement schedule of funds required for implementation of the projects.

Summary of the short-term implementation schedule for road, public transport and traffic management development is presented in Table.9.2.

The investment programme were also prepared on the basis of the implementation plan proposed above as shown in Table 9.3.

9.2.2 Implementation Schedule of Long-term Development Plan

The target of Long-term Plan is set up for the year 2015 in accordance with the S/W of this Study, however, it is too long to formulate the implementation schedule of the long-term plan. The Study team therefore divided the long-term period into two phases, namely middle-term (1998 - 2005) and long-term (2006 - 2015) for the purpose of implementation schedule.

The middle-term and long-term implementation schedules are prepared taking into consideration the following factors and summarized in Table 9.4.

Middle-term Plan

1) Engineering requirement from the view point of traffic flow and demand
2) Enhancement of urban development and control of urban sprawl in the fringes
3) Formation of skeleton for long-term road development plan

Long-term Plan

1) Establishment of road network for well -balanced urban development
2) Engineering requirement from the view point of traffic demands
3) Homogeneous development of the Valley

The investment programme has been prepared on the basis of implementation schedule mentioned above and presented in Table 9.5.

Preliminary economic evaluation has been conducted on the basis of the investment programme to confirm the economic viability of proposed road development plan recommended in the master plan.

Basic assumption for the evaluation is described below:

1) Cost stream is prepared referring to Table 9.3 and Table 9.5. Only economic cost for construction is used for cost/benefit calculation. Costs of land acquisition and maintenance are excluded in the calculation.

2) Benefit is calculated from the result of traffic assignment for the years 1997 and 2015. Benefit includes saving in vehicle operating cost as well as passenger travel time cost derived from the proposed projects.

3) 25 years of project life is assumed since the opening of the projects.

Benefits for the years 1997 and 2015 are calculated as follows:

1997	174	million NRs/year
2015	2,020	million NRs/year

Internal Rate of Return (IRR) came up with 13.6% under the above assumptions. Information about the above calculation is attached in Appendix 9-2.

Table 9.1 Concept of Implementation Schedule for Road Development

Road Development Plan and Projects	Project Length (km)	Overall Implementation Plan		
		Short-term Plan (~1997)	Middle-term Plan (1998 ~2005)	Long-term Plan (2006 ~2015)
1. Road Development as a Capital of Nation				
(1) Construction of Amiko Bypass	7.5			O
(2) Construction of 2nd Tribhuvan Highway	8.5			O
2. Road Development in the wave of outward shift of Urban Areas				
(1) Widening of the following Primary District Roads:	43.7		O	
- Bhmdhunga (4.7), Tokha (4.0), Phuntung (3.0), Sundarijal (9.0), Sankhu (8.0)				
Lubhu (5.0), Chapagaun (6.0), Bungamati (4.0)				
(2) Construction of Outer Ring Road	[19.5]			
- Jorpati (Balargau) - Lubhu Section	9.0		O	
- Budhanikantha Road - Jorpati Section and Lubhu - Bungamati Section	10.5			O
(3) Construction of Thimi North-South Ladder Step Roads	1.8		O	
(4) Construction of Gothathar Road	2.5		O	
3. Road Development for the Integration of Kathmandu, Lalitpur and Bhaktapur				
(1) Widening of Existing Thimi Feeder Road	7.2		O	
(2) Widening of Existing Bhaktapur Ring Road	3.0		O	
(3) Construction of Baneswar-Thimi Short-cut Road	0.8		O	
4. Road Development to Streamline Traffic Flow inside the Ring Road				
(1) Construction of Inner Ring Road with 2 lanes	[15.0]			
[1st Stage: 2 lanes]				
- North Section (West-East Transport Corridor in Northern Kathmandu)	3.0		O	
- West Section (Bishnumati Transport Corridor)	4.5	O		
- South Section (Bagmati Transport Corridor)	3.5	O		
- East Section (Dhobi Khola Transport Corridor)	4.0		O	
[2nd Stage: 4 lanes]				
- Widening of Inner Ring Road from 2 lane roads to 4 lanes road	15.0			O
(2) Construction and Widening of Linkages between Inner Ring Road and Ring Road				
- L-1: Bijeswari-Swayambhu	2.0		O	
- L-2: Teku Bridge to the Ring Road	0.8	O		
- L-3: Riverside Road on North Bank of Bagmati	2.4	O		
- L-4: Hadigaun - Ring Road North	1.0		O	
- L-5: Access from the Inner Ring Road to Patan	0.8	O		
(3) Widening of Kantipath from 2 to 4 lanes road	3.5		O	
(4) Widening of Bhaktapur Ring Road to 2 lanes road	3.0		O	
5. Road Development with Impending Necessity to Improve the Existing Bottleneck				
and Alleviation of Transport-poor				
(1) Construction of New Bagmati Bridge with 2 lanes	0.2	O		
(2) Construction of Access to New Bus Terminal Balaju	1.8	O		
(3) Widening of Old Baneswar - New Baneswar	1.5	O		
(4) Improvement of Patan Access				
- Construction of Jhamsikhel-Ring Road	1.4	O		
- Widening of Jawalakhel - Ring Road	0.8			
- Widening of Sat Dobato - Ring Road	0.3			

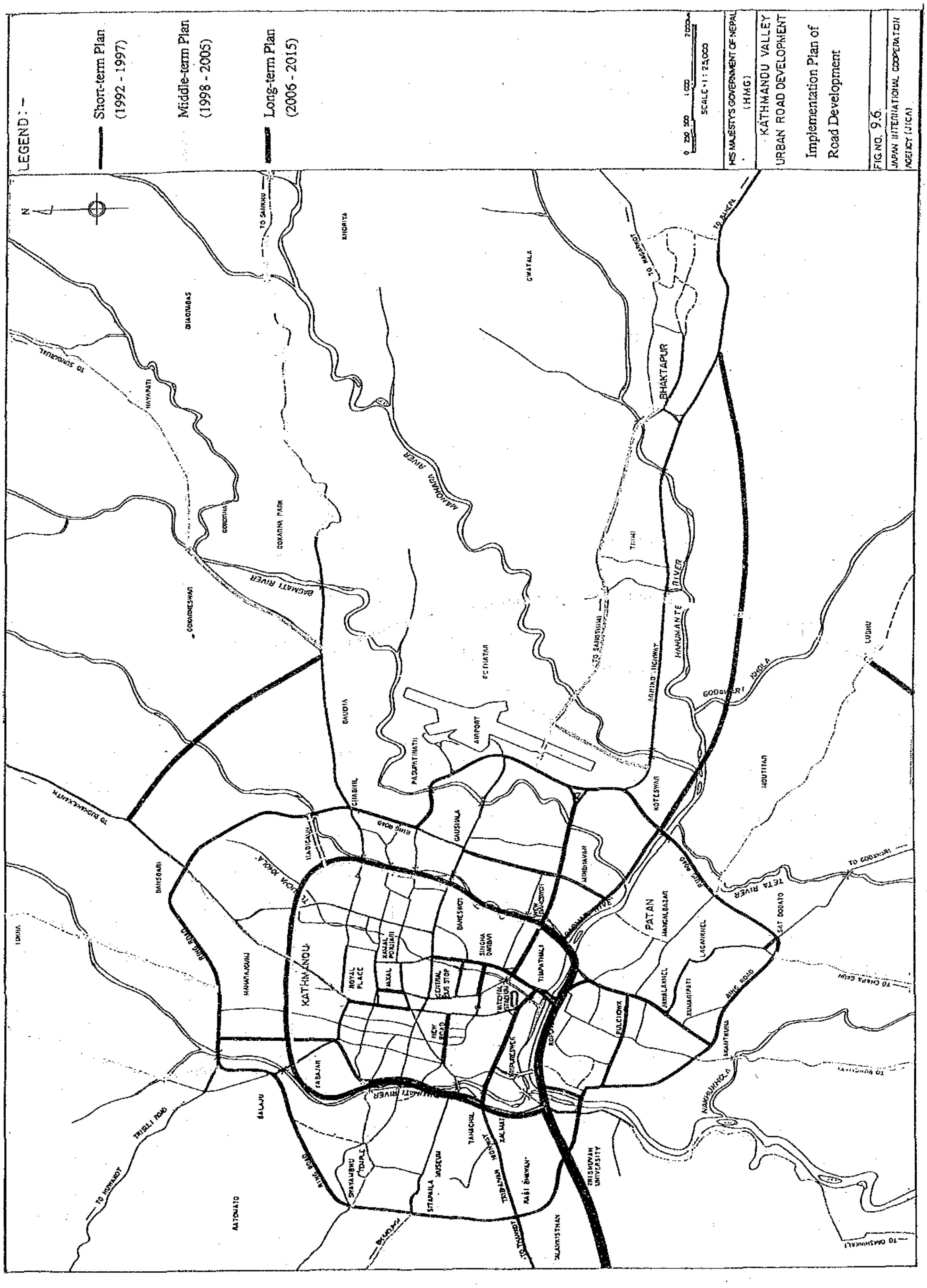

LEGEND : -
Short-term Plan (1992 - 1997)
Middle-term Plan (1998 - 2005)
Long-term Plan (2006 - 2015)
SCALE 1 : 25,000
HIS MAJESTY'S GOVERNMENT OF NEPAL (H.M.G)
KATHMANDU VALLEY URBAN ROAD DEVELOPMENT
Implementation Plan of Road Development
FIG.NO. 9.6
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
KATHMANDU
PATAN
BHAKTAPUR
BAGMATI RIVER
MANOHARA RIVER
HANUMANTE RIVER
AIRPORT
RING ROAD
TRISULI ROAD
ROYAL PLACE
NEW ROAD
CENTRAL BUS STOP
SINGHA DARBAR
TRIBHUVAN UNIVERSITY
SWAYAMBHU TEMPLE
PASUPATINATH
KOTESWAR
GOKARNA PARK

Table 9.2 Proposed Implementation Schedule of Short -term Urban Road Development Plan in Kathmandu Valley

Programme No.	Target for Development:	Short-term Development Plan (1993 - 1997) (1) Improvement of Bottlenecks in Urban Traffic Conditions (2) Improvement of Transportation-Poor Area					Remarks
	Development Programme	1993	1994	1995	1996	1997	
[Supporting Actions Required for Road Development Projects in the Short-term Plan]							
A. Traffic management							
A-1	Legal/Administrative Measures						
	(1) Introduction of Parking Code into Building Code and Introduction of Penalty System						
	(2) Enforcement of Vehicle Inspection System						
	(3) Enforcement of Motor Vehicle Act						
	(4) Coordination of Policies among the Concerned Agencies						
	(5) Regulation on Slow Vehicles on Major Arterial Roads						
A-2	Institutional Measures						
	(1) Control on Road-side Parking						
	(2) Control on On/Off Loading on the Major Road						
	(3) Control on Illegal Activities on Right-of-Way						
D. Land-use Development Plan							
D-1	(1) Enforcement of Zoning Act and Introduction of Penalty System						
[Proposed Projects to be Implemented in the Short-term Plan]							
Category A	Traffic Management Plan:						
AS-1	(1) Construction of Public Parking Spaces (multi-storied)				XXXXXXXXX	XXXXXXXXX	
AS-2	(2) Improvement of Intersection Facilities		XXXXXXXXX	XXXXXXXXX			
AS-3	(3) Improvement of Crossing Facilities for Pedestrians on Busy Roads	XXXXXXXXX					
AS-4	(4) Establishment of Traffic Engineering Institute in DOR			XXXXXXXXX			
AS-5	(5) Construction of Truck Yards along the Ring Road				XXXXXXXXX		
Category B	Public Transport Development Plan : Improvement of Bus Transportion-poor						
BS-1	Shuttle Bus Services at New Long-distance Bus Terminal at Balaju	XXX	XXX				
BS-2	Improvement of Bus Service Route on Primary District Roads:						
	(1) Improvement of Bus Services	XXX	XXX				
	(2) Pavement of Primary District Roads of Bhimdhunga, Tokha and Phutung Roads		XXXXXXXXX				
	(3) Widening of Sundarijal Road			XXXXXXXXX			
	(4) Overlay and Rehabilitation of Pavement for Sankhu, Lubhu, Chapagaun and Bungamati District Roads				XXXXXXXXX	XXXXXXXXX	
BS-3	Improvement of Bus Stop Facilities at Major Junctions		XXXXXXXXX	XXXXXXXXX			
BS-4	Route Regulation on Three-Wheeler Public Transport Services				XXXXXXXXX	XXXXXXXXX	
Category C	Road Development Plan :						
CS-1	Improvement of Bagmati Transport Corridor						
	(1) Construction of South Link of the Inner Ring Road		XXXXXXXXX	XXXXXXXXX	XXXXXXXXX	XXXXXXXXX	
	(2) Construction of Linkage L-2 (Teku Bridge - Ring Road)			XXXXXXXXX			
	(3) Construction of Linkage L-3 (Riverside Road on North Bank of Bagmati)				XXXXXXXXX	XXXXXXXXX	
	(4) Expansion of Bagmati Bridge from 2 to 4 lanes	XXXXXXXXX	XXXXXXXXX				
	(5) Access from Inner Ring Road to Lalitpur					XXXXXXXXX	
CS-2	Improvement of Access to New Bus Terminal at Balaju						
	(1) Construction of Access (Nayabazar- Ring Road at Balaju)	XXXXXXXXX	XXXXXXXXX				
CS-3	Improvement of Bishnumati Transport Corridor						
	(1) Construction of West Link of the Inner Ring Road		XXXXXXXXX	XXXXXXXXX			
CS-4	Widening of Old Baneswor- New Baneswor Road		XXXXXXXXX	XXXXXXXXX			
CS-5	Improvement of Lalitpur Access						
	(1) Construction of Jhamsikhel - Ring Road			XXXXXXXXX			
	(2) Widening of Jawalakhel - Ring Road				XXXXXXXXX		
	(3) Widening of Sat Dobato - Ring Road					XXXXXXXXX	

Table 9.3 Proposed Investment Programme of Short -term Urban Road Development Plan in Kathmandu Valley

Unit : NRs. x Million

Programme No.	Development Programme	Target for Development:	Short-term Development Plan (1993 - 1997) (1) Improvement of Bottlenecks in Urban Traffic Conditions (2) Improvement of Transportion-poor Area										Remarks
		Year:	1993		1994		1995		1996		1997		
		Cost Required:	Construction	Land/House	Construction	Land/House	Construction	Land/House	Construction	Land/House	Construction	Land/House	
[Supporting Actions Required for Road Development Projects in the Short-term Plan]													
A. Traffic management													
A-1	Legal/Administrative Measures												
	(1) Introduction of Parking Code into Building Code and Introduction of Penalty System												
	(2) Enforcement of Vehicle Inspection System												
	(3) Enforcement of Motor Vehicle Act												
	(4) Coordination of Policies among the Concened Agencies												
	(5) Regulation on Slow Vehicles on Major Arterial Roads												
A-2	Institutional Measures												
	(1) Control on Road-side Parking												
	(2) Control on On/Off Loading on the Major Road												
	(3) Control on Illegal Activities on Right-of-Way												
D. Land-use Development Plan													
D-1	(1) Enforcement of Zoning Act and Introduction of Penalty System												
[Proposed Projects to be Implemented in the Short-term Plan]													
Category A	Traffic Management Plan:												
AS-1	(1) Construction of Public Parking Spaces (multi-storied)								60	0	55	0	
AS-2	(2) Improvement of Intersection Facilities				25	0	35	0					
AS-3	(3) Improvement of Crossing Facilities for Pedestrians on Busy Roads		30	0									
AS-4	(4) Establishment of Traffic Engineering Institute						10	0					
AS-5	(5) Construction of Truck Yards along the Ring Road								40	0			
		Subtotal (A)	30	0	25	0	45	0	100	0	55	0	
Category B	Public Transpon Development Plan : Improvement of Bus Transport Poor												
BS-1	Shuttle Bus Services at new Long-distance Bus Terminal at Balaju		20	0	15	0							
BS-2	Improvement of Bus Service Route on Primary District Roads:												
	(1) Improvement of Bus Services		20	0	15	0							
	(2) Pavement of Primary District Roads of Bhimdhunga, Tokha and Phutung Roads				210	30							
	(3) Widening of Sundarijal Road						80	40					
	(4) Overlay and Rehabilitation of Pavement for Sankhu, Lubhu, Chapagaun and Bungamati District Roads								80	0	75	0	
BS-3	Improvement of Bus Stop Facilities at Major Junctions				10	0	10	0					
BS-4	Route Regulation on Three-wheeler Public Transport Services												
		Subtotal (B)	40	0	250	30	90	40	80	0	75	0	
Category C	Road Development Plan :												
CS-1	Improvement of Bagmati Transport Corridor												
	(1) Construction of South Link of the Inner Ring Road		0	200	150	0	280	150	230	0	140	0	
	(2) Construction of Linkage L-2 (Teku Bridge - Ring Road)						80	20					
	(3) Construction of Riverside Road on North Bank of Bagmati								120	0	120	0	
	(4) Expansion of Bagmati Bridge from 2 to 4 lanes		250	10	180	0							
	(5) Access from Inner Ring Road to Lalitpur										80	0	
CS-2	Improvement of Access to New Bus Terminal at Balaju												
	(1) Construction of Access (Nayabazar- Ring Road at Balaju)		60	80	40	0							
CS-3	Improvement of Bishnumati Transport Corridor												Under negotiation with ADB
	(1) Construction of West Link of the Inner Ring Road				160	180	160	180					
CS-4	Widening of Old Baneswor- New Baneswor Road				60	100	50	70					
CS-5	Improvement of Lalitpur Access												
	(1) Construction of Jhamsikhel - Ring Road						100	80					
	(2) Widening of Jawalakhel - Ring Road								60	40			
	(3) Widening of Sat Dobato - Ring Road										40	70	
		Subtotal (C)	310	290	590	280	670	500	410	40	380	70	
		Total (A) + (B) + (C)	380	290	865	310	805	540	590	40	510	70	
			Construction cost total			3,150							
			Land/House Acquisition cost			1,250							

TABLE 9. 4 Proposed Implementation Schedule of Middle & Long -term Urban Road Development Project in Kathmandu Valley

Programme No.	Development Programme	Proposed Implementation Schedule (1997 - 2015)	
		Middle-term Plan (1997 - 2005)	Long-term Plan (2005 - 2015)
	Target of Development:	(1) Formation of Skeleton for Long-term Plan (2) Minimization of Concentration to Central Area	(1) Establishment of Well-Balanced Road Network System (2) Homogeneous Development of the Valley
	[Supporting Actions Required for Road Development Projects in the Long-term Plan]		
	A. Traffic Management		
	A-1. Legal/Administrative Measures		
	(1) Revision of Traffic Law to cope with changing Traffic Demand and Pattern		
	(2) Introduction of Scientific Traffic Accidents Data Base		
	A-2. Institutional Measures		
	(1) Control on Road-side Parking in Fringe Areas		
	(2) Regulation on Heavy Vehicle Operation in the Central Area		
	D. Land-use Development Plan		
	(1) Promotion of New Location of Urban Facilities in Sub-urban Areas		
	(2) Dispersion of Commercial Facilities to Urban Fringes		
	(3) Relocation of Government /Educational Facilities to Sub-urban Areas		
	(4) Creation of Commercial Sub-centres at Urban Fringes		
	[Proposed Projects to be Implemented in the Middle-term and Long-term Plan]		
	Category A Traffic Management Plan:		
	Category B Public Transport Development Plan :		
	B-1 Introduction of Bus Terminal for East-bound Long-distance Bus Terminal		XXXXXXXXXXXXXXXXXXX
	B-2 Introduction of Bus Priority Lane on the Inner Ring Road		XXXXXXXXXXXXXXXXXX
	Category C Road Development Plan :		
	[Midldle-term]		
	CM-1 Construction of North Section of Inner Ring Road	XXXXXXXXXXXXXXXXXX	
	CM-2 Construction of East Section of Inner Ring Road (Dhobi Khola Transport Corridor)	XXXXXXXXXXXXXXXXXX	
	CM-3 Widening of Bhaktapur Ring Road to 2 lanes	XXXXXXXXXXXXXXXXXX	
	CM-4 Improvement of Thimi Transport Corridor		
	(1) Widening of Existing Thimi Feeder Road	XXXXXXXXXXXXXXXXXX	
	(2) Construction of Thimi North-South Roads	XXXXXXXXXXXXXXXXXX	
	CM-5 Construction of Gothatar Service Road	XXXXXXXXXXXXXXXXXX	
	CM-6 Construction of Baneswor - Thimi Short-cut Road	XXXXXXXXXXXXXXXXXX	
	CM-7 Widening of Primary District Roads to 2 lanes-road		
	- Bhimdhunga, Tokha, Phuntung, Sundarijal, Sankhu, Lubhu, Chapagaun, Bungamati	XXXXXXXXXXXXXXXXXX	
	CM-8 Wideing of Kantipath from 2 to 4 lanes	XXXXXXXXXXXXXXXXXX	
	CM-9 Widening of Linkage L-3 (Bijeswari - Swayambhu)	XXXXXXXXXXXXXXXXXX	
	CM-10 Construction of Linkage L-4 (Hadigaun - Ring Road)	XXXXXXXXXXXXXXXXXX	
	[Long-term Plan]		
	CL-1 Widening of Inner Ring Road		XXXXXXXXXXXXXXXXXX
	CL-2 Construction of Outer Ring Road	XXXXXXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXX
	CL-3 Construction of Arniko Bypass		XXXXXXXXXXXXXXXXXX
	CL-4 Construction of 2nd Tribhuban Highway		XXXXXXXXXXXXXXXXXX

Table 9. 5 Proposed Investment Programme of Middle & Long -term Urban Road Development Project in Kathmandu Valley

Unit : NRs. x Million

Programme No.	Development Programme	Implementation Schedule:	Proposed Implementation Schedule (1997 - 2015)				Remarks
			Middle-term Plan (1997 - 2005)		Long-term Plan (2006 - 2015)		
		Target of Development:	(1) Formation of Skeleton for Long-term Plan (2) Minimization of Concentration to Central Area		(1) Establishment of Well-Balanced Road Network System (2) Homogeneous Development of the Valley		
		Cost Required (NRs. Million):	Construction Cost	Lnad/House Acquisition Cost	Construction Cost	Lnad/House Acquisition Cost	
[Supporting Actions Required for Road Development Projects in the Long-term Plan]							
A. Traffic Management							
A-1. Legal/Administrative Measures							
(1) Revision of Traffic Law to cope up with changing Traffic Demand and Pattern							
(2) Introduction of Scientific Traffic Accidents Data Base							
A-2. Institutional Measures							
(1) Control on Road-side Parking in Fringe Areas							
(2) Regulation on Heavy Vehicle Operation in the Central Area							
D. Land-use Development Plan							
(1) Promotion of New Location of Urban Facilities in Sub-urban Areas							
(2) Dispersion of Commercial Facilities to Urban Fringes							
(3) Relocation of Government /Educational Facilities to Sub-urban Areas							
(4) Creation of Commercial Sub-centres at Urban Fringes							
[Proposed Projects to be Implemented in the Middle-term and Long-term Plan]							
Category A	Traffic Management Plan:		-	-	-	-	
Category B	Public Transport Development Plan :						
B-1	Construction of East-bound Long-distance Bus Terminal		-	-	200	100	
B-2	Introduction of Bus Priority Lane on the Inner Ring Road		-	-	10	0	
		Subtotal (A+B)			210	100	
Category C	Road Development Plan :						
[Middle-term Plan]							
CM-1	Construction of North Section of Inner Ring Road (Nayabazar - Hadigaun - Ring Road)		300	240			
CM-2	Construction of East Section of Inner Ring Road (Dhobhi Khola Corridor)		400	320			
CM-3	Widening of Bhaktapur Ring Road to 2 lanes		120	220			
CM-4	Improvement of Thimi Transport Corridor						
	(1) Widening of Existing Thimi Feeder Road		290	260			
	(2) Construction of Thimi North-South Roads		70	40			
CM-5	Construction of Gothatar Service Road		180	60			
CM-6	Construction of Baneswor - Thimi Short-cut Road		520	20			
CM-7	Widening of Primary District Roads						
	- Bhimdhunga, Tokha, Phuntung, Sundarijal, Sankhu, Lubhu, Chapagaun, Bungamati		870	230			
CM-8	Widening of Kantipath from 2 to 4 lanes		350	390			
CM-9	Widening of Linkage L-1 (Bijeswari - Swayambhu)		140	70			
CM-10	Construction of Linkage L-4 (Hadiguan to Ring Road)		100	50			
[Long-term Plan]							
CL-1	Widening of Inner Ring Road to 4 lanes				1,500	1,500	
CL-2	Construction of Outer Ring Road		550	300	820	400	
CL-3	Construction of Amiko Bypass				750	450	
CL-4	Construction of 2nd Tribhuban Highway				1,280	510	
		Subtotal (C)	3,890	2,200	4,350	2,360	
		Grand Total	3,890	2,200	4,560	2,960	

9.2.3 Recommended Actions to be taken for Materializing the Short-term, Middle-term and Long-term Development Plan

(1) Financial Arrangement for the Short-term Development Plan

Table 9.6 shows the total and sectoral investment requirement for Seventh Plan (1986 - 90) and Eighth Plan (1993 - 97) respectively. The proposed investment to the transport sector in the Eighth Plan is NRs.26,016 million for over five years, which is 13.7% of the total gross fixed investment of NRs. 189,537 million.

According to the draft paper of "The Eighth Plan (1992 -1997) prepared by National Planning Commission in November, 1991, about 60% of the total gross investment of NRs. 189,537 million will be financed through native saving. Of the remaining 40% (NRs.75,815 million), about 25% (NRs.18,950 million) will be financed by means of grants and 75% (NRs.56,815 million) by external borrowing.

The required amount for implementing the projects proposed in the short-term development plan in this Study is estimated to be NRs.3,080 million as shown in Table 9.3. It is about 12% of the proposed investment to the transport sector in the Eighth Plan.

Out of the projects proposed in the short-term plan, the following projects are recommended to be implemented by means of grants and by external borrowing taking into consideration the required amount of construction cost, ease of implementation from the view point of land/house acquisition and required construction technology:

1) Shuttle Bus Services at New Long-Distance Bus Terminal at Balaju (BS-1)
2) Construction of Inner Ring Road (south and west sections) with the Linkages, namely;
   - Improvement of Bagmati Transport Corridor (CS-1)
   - Improvement of Bishnumati Transport Corridor (CS-3)
3) Construction of Access to the New Bus Terminal at Balaju (CS-2)

The required amount of NRs. 3,080 million for the short-term development plan is expected to be financed mainly from the following:

Financial Source	Amount	Projects in Short-term Plan
- Local source	1,075	AS-1,AS-2,AS-3,AS-4,AS-5, BS-2,BS-3,BS-4,CS-4,CS-5
- Loan from external agency	320	CS-3
- Grants from donor countries	1,685	BS-1,CS-1,CS-2,
Total	3,080	(NRs. million)

(2) Financial Arrangement for the Middle-term and Long-term Development Plan

Amounts of investment required for implementing the long-term development plans including middle-term plan are NRs.8,450 million (as of 1992 price) in total as shown in Table 9.5.

The Inner Ring Road as well as the Outer Ring Road are recommended to be implemented by means of either grants or by external borrowing and the rest by native saving.

The following is tentative plan of financial source for implementing the projects proposed in the middle-term and long-term plan:

Financial Source	Amount	Projects in Middle/Long-term Plan
- Local source	3,810	BL-2,CM-3,CM-4,CM-5,CM-6, CM-8,CM-9,CM-10,CL-3,CL-4
- Loan from external agency or Grants from donor countries	4,640	CM-7,BL-1,CM-1,CM-2,CL-1, CL-2
Total	8,450	(NRs. million)

(3) Land/House Acquisition Programme

Problem on land and house compensation and acquisition sometime becomes critical issue for implementing the road development projects, especially in the urban areas.

The land/house acquisition costs required for implementing short-term plan and long-term plans are estimated in Table 9.3 and Table 9.5 respectively, and the following action programme for land/house acquisition are recommended in order to materialize these road development plan.

1) Inner Ring Road

- The Inner Ring Road is planned to be 4 lane road in the long-term, however, it is recommended to construct 2 lane road in the short-term until middle-term taking into consideration the traffic demand. Since the Inner Ring Road will play a very important role for the urban road network in the city, sufficient width of right-of-way should be reserved for future widening to 4 lane road.

- South link (Bagmati Corridor) and West link (Bishnumati Corridor) are proposed to be implemented in the short-term plan (1992 - 1997), so that the land and house acquisition in this section should be commenced soon after confirming the financial source. The alignment of the south