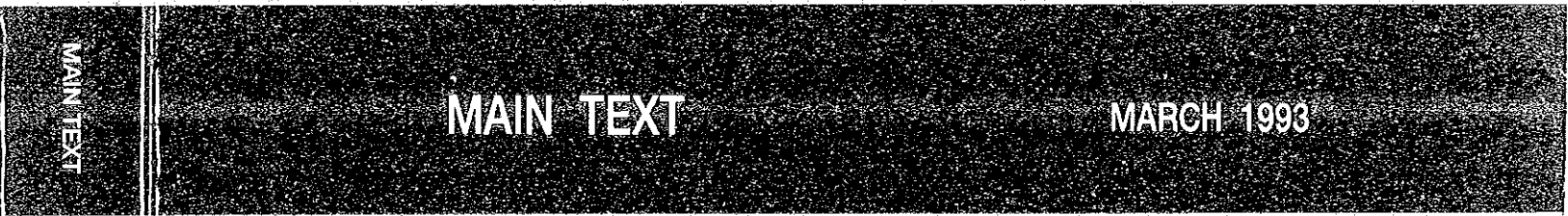


HIS MAJESTY'S GOVERNMENT OF NEPAL
MINISTRY OF WORKS AND TRANSPORT
DEPARTMENT OF ROADS

**THE STUDY
ON
KATHMANDU VALLEY
URBAN ROAD DEVELOPMENT**

**FINAL REPORT
PART A : MASTER PLAN STUDY**

JICA
THE STUDY ON KATHMANDU VALLEY
URBAN ROAD DEVELOPMENT
FINAL REPORT
PART A : MASTER PLAN STUDY



MAIN TEXT

MARCH 1993

JAPAN INTERNATIONAL COOPERATION AGENCY

116
71
SSF
LIBRARY
93-046 (2/5)

S	S	F
C	R	(3)
93-046 (2/5)		

HIS MAJESTY'S GOVERNMENT OF NEPAL
MINISTRY OF WORKS AND TRANSPORT
DEPARTMENT OF ROADS

**THE STUDY
ON
KATHMANDU VALLEY
URBAN ROAD DEVELOPMENT**

FINAL REPORT

PART A : MASTER PLAN STUDY

27329
JICA LIBRARY



1118620121

MAIN TEXT

MARCH 1993

JAPAN INTERNATIONAL COOPERATION AGENCY

国際協力事業団

27329

PREFACE

In response to a request from His Majesty's Government of Nepal, the Government of Japan decided to conduct the study on Kathmandu Valley Urban Road Development and entrusted the study to the Japan International Cooperation Agency (JICA).

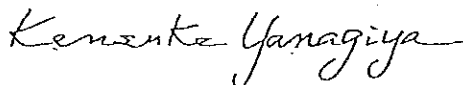
JICA sent to Nepal a study team headed by Mr. H. Shinkai, Nippon Koei Co., Ltd., 5 times between October 1991 and March 1993.

The team held discussions with the officials concerned of His Majesty's Government of Nepal, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

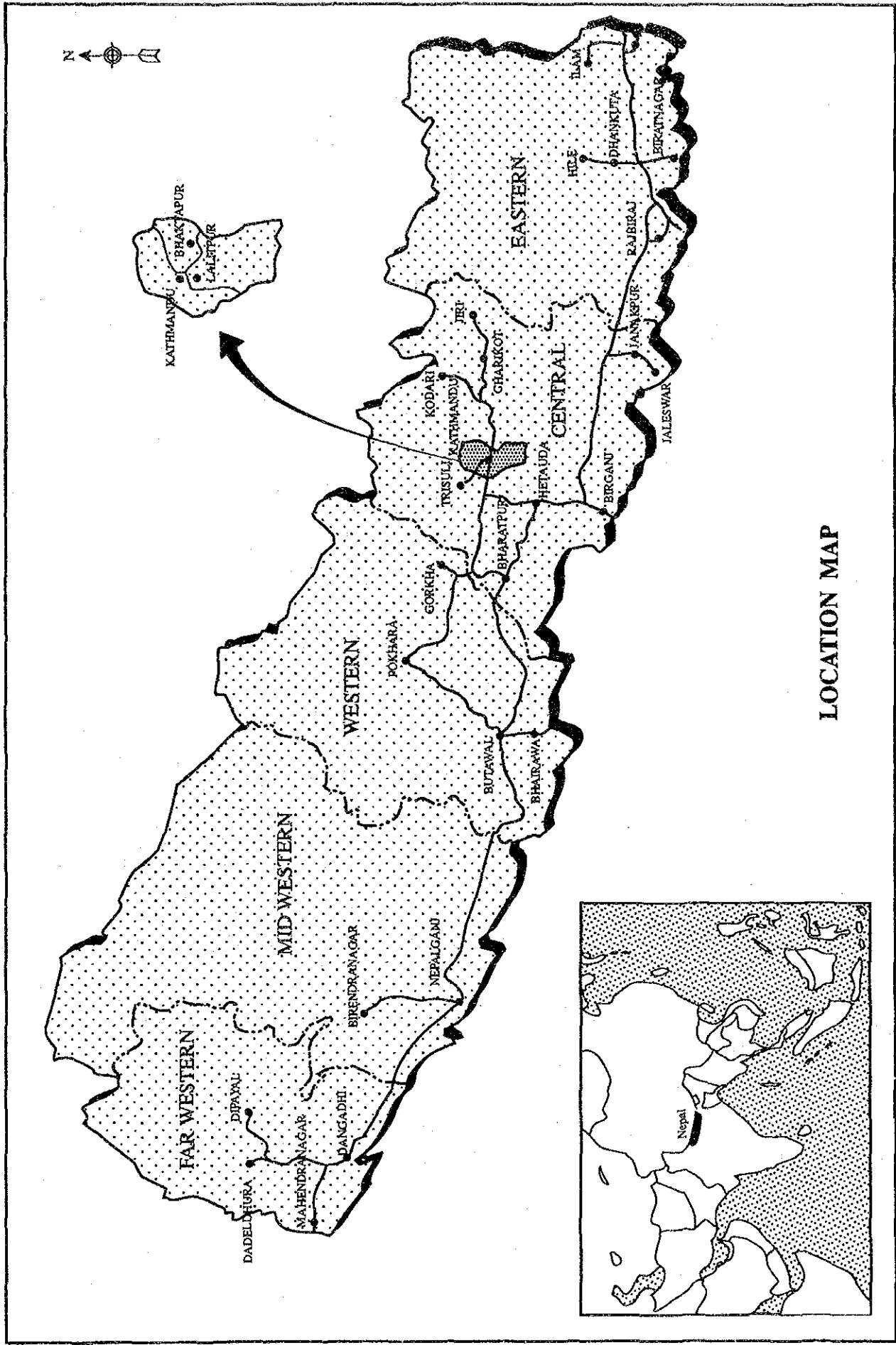
I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of His Majesty's Government of Nepal for their close cooperation extended to the team.

March 1993



Kensuke Yanagiya
President
Japan International Cooperation Agency



LOCATION MAP

Currency Equivalents

US\$1.00 = Yen 128 = NRs. 43.25 (As of January ,1992)

(or NRs. 1.00 = Yen 2.96)

VEHICLES IN KATHMANDU VALLEY(I)

Trolley Bus

Trolley buses are operated between Tripureswor in Kathmandu and Bhaktapur on Arniko Highway since early 1970's.
Operation in peak hour is done at about seven-minute intervals.
Charge is 2NRs/person.
Trolley bus sometimes stops because electric wires are out of joint.



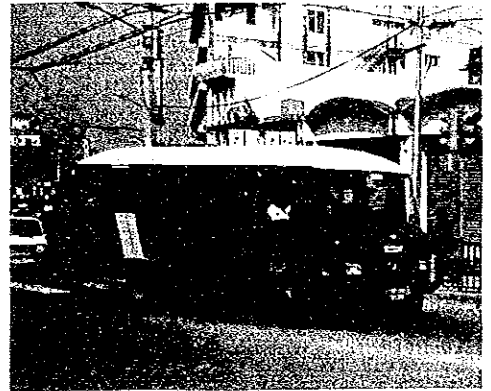
Bus

Sajha Yatayat operates 15 bus routes mainly between the core areas in Kathmandu and the suburban area in the Valley on district roads.
Many private companies operate on other 5 routes.
Charge is 1 - 2 NRs/person.
It's difficult to operate buses on narrow district roads by big buses.
Share of buses in all vehicles is about 5% in the core area.



Minibus

Minibuses are operated on 24 routes almost same as bus service routes.
Over-capacity is commonly seen in minibus operation.



VEHICLES IN KATHMANDU VALLEY(2)

Tempo

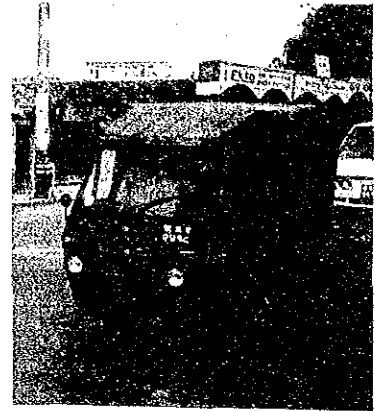
As the smallest classification of vehicle type in this study, three-wheeler motorcars are classified into two types, say tempo and autorickshaw.

Tempo is defined as the vehicle with 9-12 seats on fixed route.

Charge is a little less than that of bus.

Tempo traffic volume has rapidly increased, however the registration of tempo is restricted at present because tempos cause many traffic accidents.

Share of three-wheelers including autorickshaws is nearly 20% in the core area.



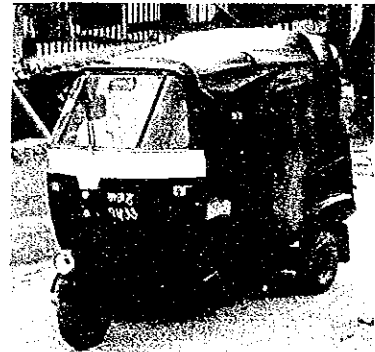
Autorickshaw

Three-wheeler motorcars other than tempos are called autorickshaws.

Most of 3 seated autorickshaws are used as taxi on non-fixed route.

Although the charge varies by trip length, average charge is about 20NRs.

Maximum speed and slope climbing ability is small.

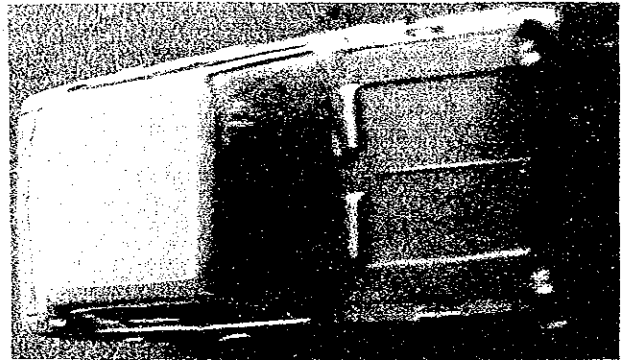


Taxi

Taxi is distinguished by yellow color on the roof.

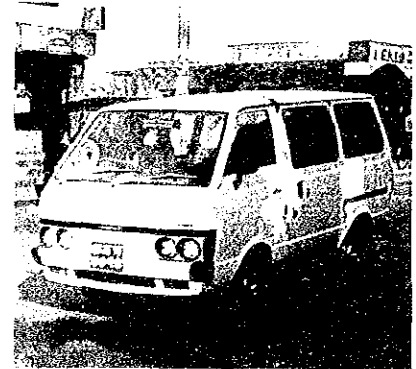
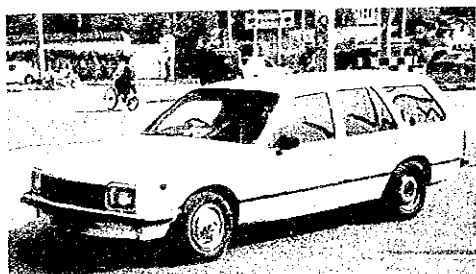
Average charge is a little less than 40NRs.

Share of taxis is about 10%.



Passenger Car

Share of passenger cars is 15 - 20% in the core area.



VEHICLES IN KATHMANDU VALLEY(3)

Light Truck

Heavy trucks are used for the inter-city cargo transportation while handcarts or bicycles are used for transportation for short distance. In this situation, light trucks are not main mode in this Valley.

Share of light trucks is less than 2% in the core area.



Heavy Truck

Heavy trucks are restricted to enter the area within the Ring Road during daytime.

Share of heavy trucks is less than 1% in the core area.



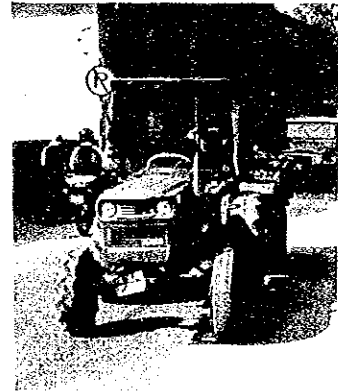
Motorcycle

Share of motorcycles is about 20% in the core area.



Others

(Tractor)



Bicycle

Share of bicycles is 20 - 35% in the core area. Cycle-rickshaws(tricycles) are mainly used for sightseeing and goods movement.



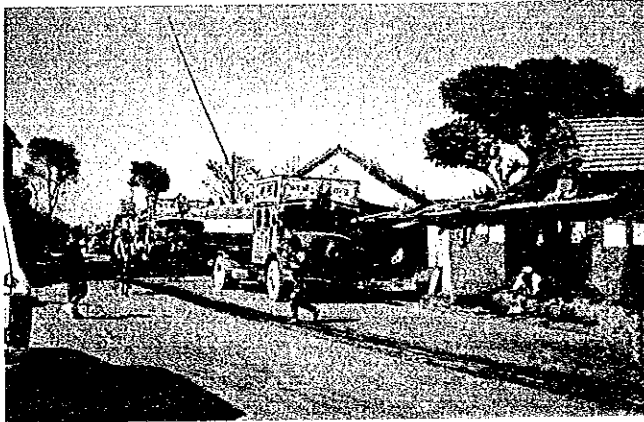
(Handcart)



PRESENT ROAD CONDITIONS(1)

Highways

Tribhuvan Highway is the important national highway which connects Kathmandu and the regions in the southern Nepal as well as India.



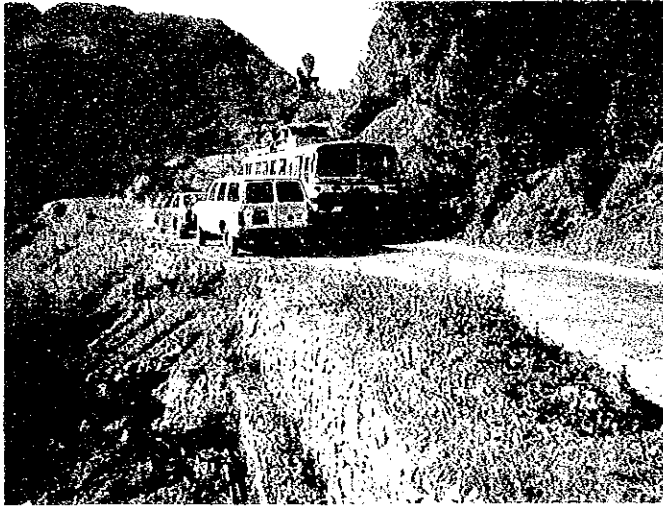
Arniko Highway is the main road running east from Kathmandu to the eastern Nepal up to Tibetan border. It is also the major connector between Kathmandu and Bhaktapur city.



PRESENT ROAD CONDITIONS(2)

Feeder Roads

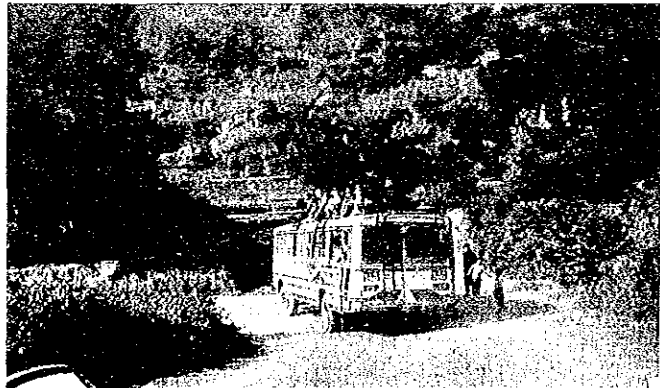
Thimi Road is a 4.0m wide road with a single lane and a low grade design standards. Thimi is going to become a vital intermediate town in between Kathmandu and Bhaktapur.



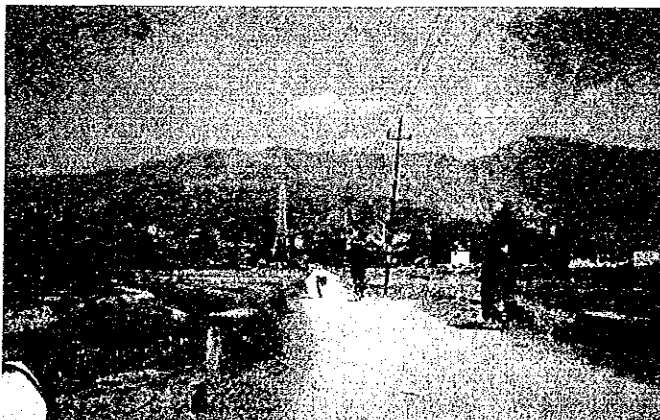
Trisuli Road is a connector between Kathmandu with Nuwakot and Rasuwa District. It is a 3.5m single lane road with poor geometric condition.

District Roads

The primary district roads are mostly radiating from the Ring Road. Most of these roads are narrow and in poor condition. Certain sections of primary district roads in the rural area are still gravelled and earthen roads.



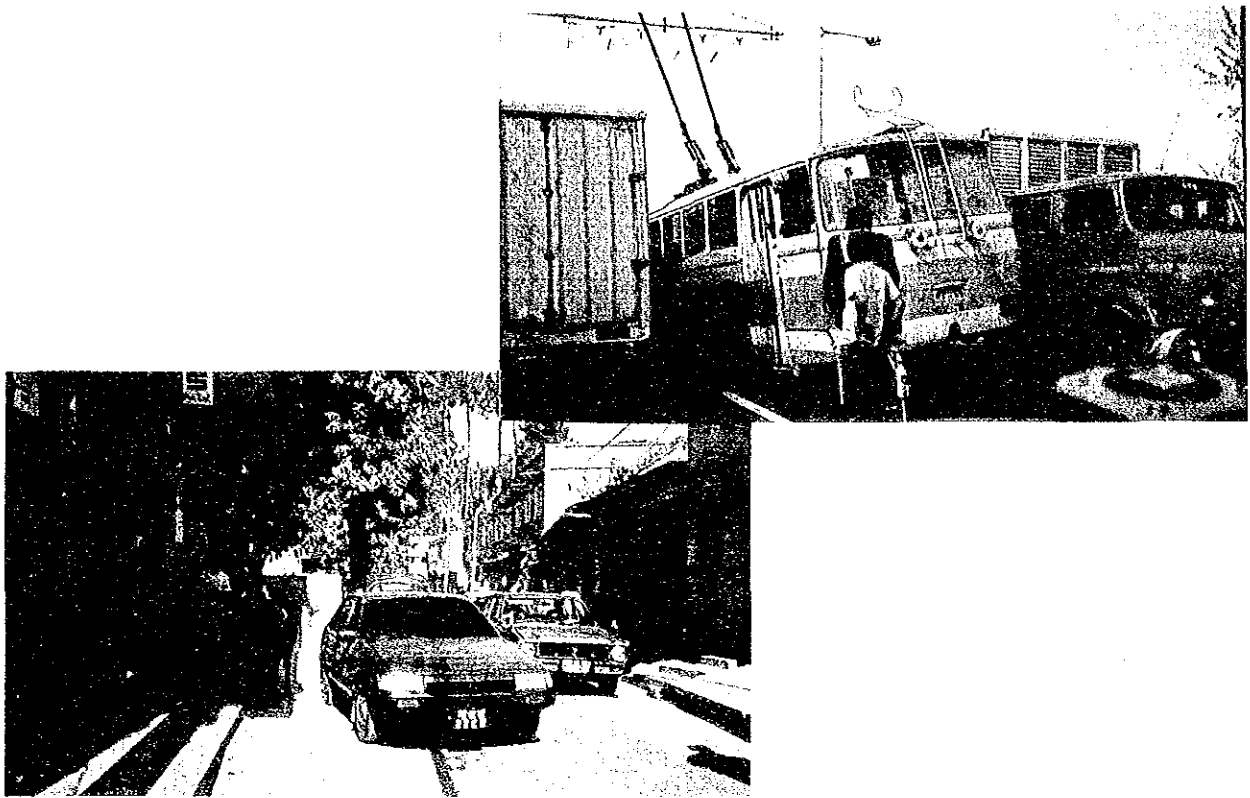
Daksinkali Road - low geometric design



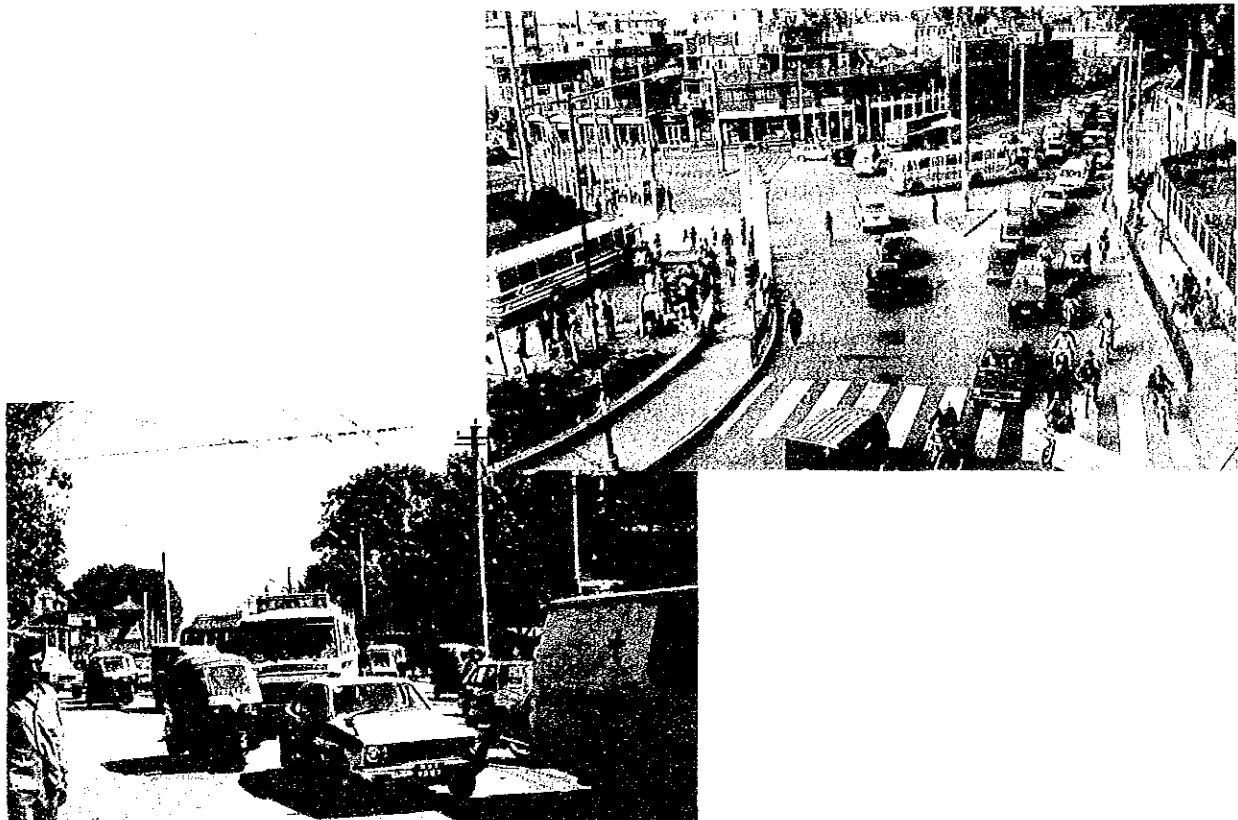
Tokha Road - earthen road

PRESENT TRAFFIC CONDITIONS(1)

Insufficient Carriageway Width of City Road



Insufficient Intersection Capacity

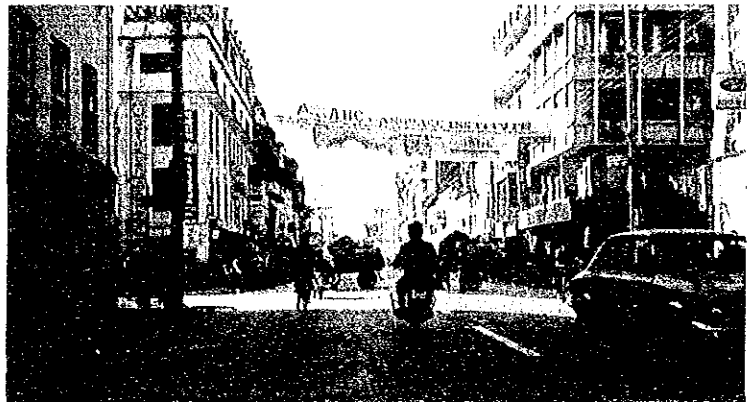


PRESENT TRAFFIC CONDITIONS(2)

Lack of Strict Enforcement of Regulation on Heavy Vehicles

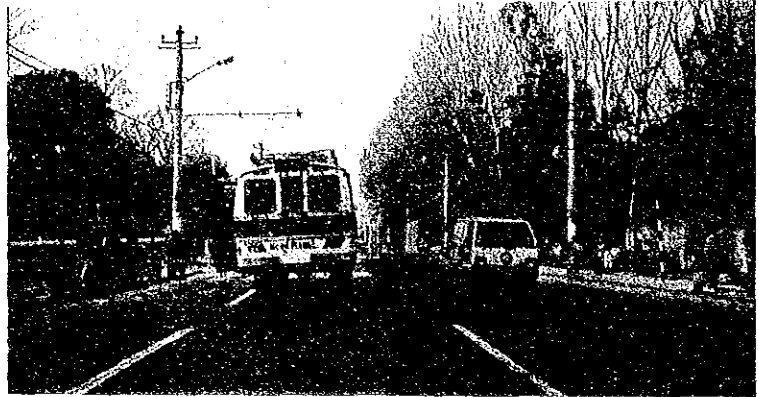


Mixing of Slow Vehicles

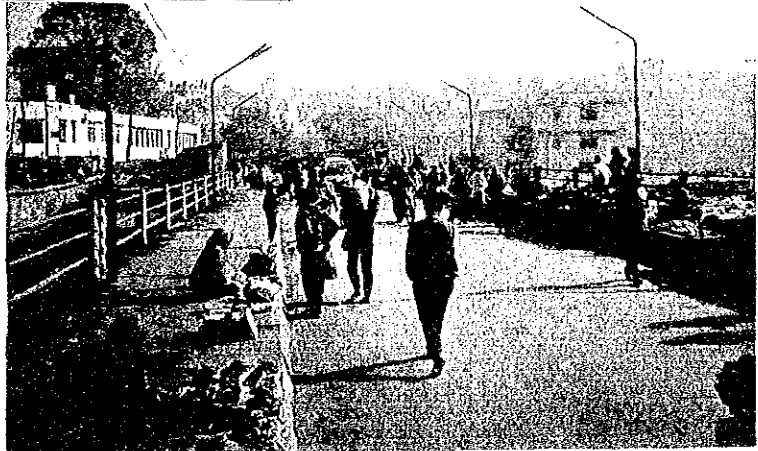
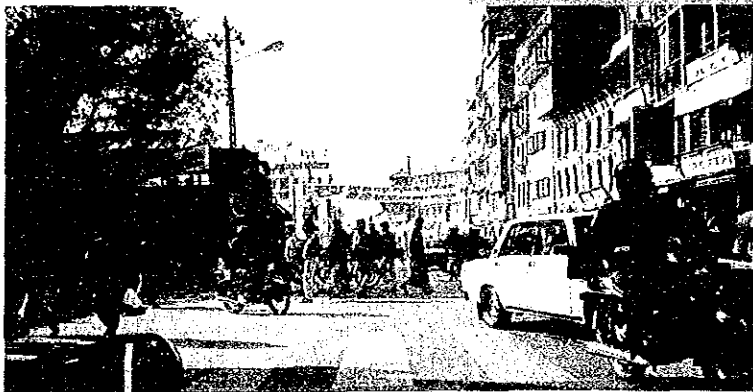
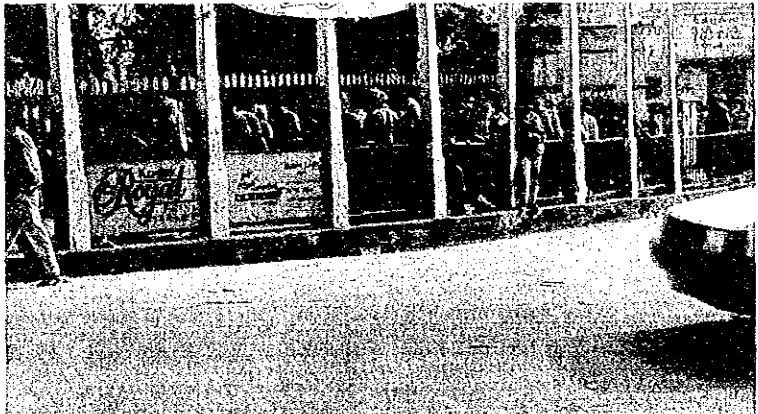


PRESENT TRAFFIC CONDITIONS(3)

Lack of Strict Enforcement of Regulation on Exhaust Gas



Intrusion of Pedestrian



PRESENT TRAFFIC CONDITIONS(4)

Increase in Roadside Parking on the Ring Road



Increase in Roadside Parking in the City Area



Shortage of Parking Space

Off-street parking space at the Supermarket



CONTENTS

	<u>Page</u>
CHAPTER 1 INTRODUCTION	1-1
1.1 Background of the Study	1-1
1.2 Objectives of the Study	1-2
1.3 Study Area.....	1-2
1.4 Work Schedule of the Study	1-4
1.5 Organization and Assignment of the Study Team.....	1-4
CHAPTER 2 SOCIO - ECONOMIC CONDITION	2-1
2.1 Economic Role of the Valley	2-1
2.2 Existing Urban Condition.....	2-4
2.2.1 Land - use Pattern.....	2-4
2.2.2 Population.....	2-11
2.2.3 Employment	2-19
2.3 Existing Urban Trend	2-21
CHAPTER 3 PRESENT TRANSPORTATION SYSTEM IN THE VALLEY	3-1
3.1 Outline of Transportation System.....	3-1
3.2 Road Classification and Network in the Valley	3-6
3.2.1 Highways and Feeder Roads	3-6
3.2.2 District Roads.....	3-6
3.2.3 Urban Roads.....	3-8
3.2.4 Summary of Road Network and Road Classification in Kathmandu Valley	3-9
3.3 Existing Road Condition.....	3-10
3.3.1 Present Road Conditions.....	3-10
3.3.2 Capacity of the Existing Roads.....	3-16
3.3.3 Road Density by Traffic Zone	3-19
3.4 Public Transport	3-22
3.5 On - going Traffic Management.....	3-28
3.6 Nature of Traffic Issue in the Study Area.....	3-36

	<u>Page</u>
CHAPTER 4 PRESENT TRAFFIC SITUATION.....	4-1
4.1 Traffic Survey.....	4-1
4.1.1 Outline of the Survey	4-1
4.1.2 Home Interview Survey (Person Trip Survey).....	4-2
4.1.3 Roadside OD Survey	4-4
4.1.4 Traffic Flow Survey	4-4
4.1.5 Public Transportation Survey/Firm Interview Survey.....	4-9
4.2 Characteristics of Person Trip.....	4-19
4.2.1 Introduction.....	4-19
4.2.2 Trip Characteristics	4-20
4.3 Characteristics of Road Traffic.....	4-39
4.3.1 Traffic Volume	4-39
4.3.2 Vehicle Composition.....	4-43
4.3.3 Traffic Fluctuation	4-46
4.3.4 Traffic Distribution.....	4-49
4.3.5 Intersection Traffic.....	4-53
4.3.6 Vehicle Speeds	4-60
 CHAPTER 5 FORMULATION OF URBAN AND TRANSPORTATION DEVELOPMENT STRATEGIES.....	 5-1
5.1 Urban Development Strategies	5-1
5.1.1 Urban Development Strategies	5-1
5.1.2 Future Urban Trend.....	5-2
5.1.3 Strategy for Urban Development.....	5-4
5.1.4 Identification of Land-use Potential.....	5-10
5.1.5 Population Projection.....	5-15
5.2 Transportation Development Strategy	5-17
5.2.1 Development Principle.....	5-17
5.2.2 Development Strategy	5-22
 CHAPTER 6 ROAD DEVELOPMENT PLAN.....	 6-1
6.1 Basic Orientation of Road Development Master Plan.....	6-1
6.1.1 Introduction.....	6-1
6.1.2 Present Road Development Proposal	6-4
6.1.3 Road Development Concept	6-9
6.2 Future Road Network in 2015	6-19
6.2.1 Concept for Future Road Network.....	6-19
6.2.2 Road Development Plan.....	6-19

	<u>Page</u>
6.2.3 Alternative of the Inner Ring Road.....	6-23
6.3 Lane Number of Proposed Road	6-31
6.4 Traffic Demand Forecast.....	6-33
6.4.1 Outline of Future Traffic Demand Forecast.....	6-33
6.4.2 Result of Future Traffic Demand Forecast.....	6-37
6.5 Road Network Master Plan for the Year 2015	6-49
6.6 Preliminary Cost Estimate	6-53
CHAPTER 7 PUBLIC TRANSPORT DEVELOPMENT PLAN.....	7-1
7.1 Basic Concept.....	7-1
7.1.1 Introduction.....	7-1
7.1.2 Review of Current Development Proposal.....	7-1
7.1.3 Development Concept	7-6
7.2 Description of Plan	7-9
7.2.1 Shuttle Bus Service at New Long-distance Bus Terminal.....	7-9
7.2.2 Improvement of City Bus Service on District Roads in Suburban Area.....	7-13
7.2.3 Improvement of Facilities at Major Bus Stops.....	7-21
7.2.4 Route Regulation on Three-wheeler Public Transport.....	7-24
7.2.5 Construction of East-bound Long-distance Bus Terminal	7-26
7.2.6 Introduction of Bus Priority Lane on the Inner Ring Road	7-26
7.3 Evaluation.....	7-27
7.4 Public Transport Development Master Plan	7-27
CHAPTER 8 TRAFFIC MANAGEMENT PLAN.....	8-1
8.1 Basic Concept.....	8-1
8.1.1 Introduction.....	8-1
8.1.2 Development Concept	8-1
8.2 Description of Plan	8-2
8.2.1 Reduction of Roadside Parking	8-2
8.2.2 Improvement of Intersection.....	8-9
8.2.3 Pedestrian Management	8-15
8.2.4 Traffic Engineering Institute	8-19
8.3 Formulation of Traffic Management Master Plan.....	8-20

	<u>Page</u>
CHAPTER 9 DEVELOPMENT PLAN AND IMPLEMENTATION	
SCHEDULE.....	9-1
9.1 Short-term Development Plan.....	9-1
9.1.1 Short-term Road Development Plan.....	9-1
9.1.2 Short-term Public Transport Development Plan.....	9-11
9.1.3 Short-term Traffic Management Plan.....	9-11
9.2 Implementation Schedule.....	9-12
9.2.1 Implementation Schedule of Short-term Development Plan.....	9-12
9.2.2 Implementation Schedule of Long-term Development Plan.....	9-12
9.2.3 Recommended Actions to be taken for Materializing the Short-term, Middle-term and Long-term Development Plan.....	9-21
9.3 High Priority Projects for Feasibility Study.....	9-24

LIST OF TABLES

	<u>Page</u>
Chapter 1 Introduction	
Chapter 2 Socio-Economic Condition	
Table 2.1 Economically Active Population by Employment Sector (1981)..	2-2
Table 2.2 Percentage Distribution of Motivation for Migration.....	2-4
Table 2.3 Land-use Pattern in the Valley.....	2-5
Table 2.4 Land-use in Greater Kathmandu (1971, 1981, and 1991).....	2-5
Table 2.5 Population Growth in Kathmandu Valley.....	2-12
Table 2.6 Population Density in Kathmandu Valley.....	2-13
Table 2.7 Population by Traffic Zone in 1991.....	2-14
Table 2.8 Population Growth and Population Density by Traffic Zone.....	2-16
Table 2.9 Employment by Sector and District in 1981.....	2-20
Chapter 3 Present Transportation System in the Valley	
Table 3.1 Total Number of Registered Vehicles in Nepal.....	3-4
Table 3.2 Total Number of Registered Vehicles in Bagmati Zone.....	3-4
Table 3.3 Aircraft and Passenger Movement at Tribhuvan International Airport Kathmandu.....	3-5
Table 3.4 Classification of Roads in Kathmandu Valley.....	3-6
Table 3.5 Primary District Roads Defined by the Study Team.....	3-8
Table 3.6 Classification of Urban Roads.....	3-8
Table 3.7 Road Network under the Study.....	3-9
Table 3.8 Nepal Design Standards.....	3-9
Table 3.9 Passenger Car Unit for Urban Roads.....	3-17
Table 3.10 Traffic Components Observed by the Study Team.....	3-17
Table 3.11 Road Density by Traffic Zone.....	3-21
Table 3.12 Vehicle Permit Issued by Zonal Transport Management Office.....	3-23
Table 3.13 Road Accident by Location, Time and Month in Greater Kathmandu.....	3-30
Table 3.14 Average Road Accident between Different Modes by Month in Greater Kathmandu.....	3-30
Table 3.15 Road Accident: Vehicle Involvement by Type in Greater Kathmandu.....	3-31
Table 3.16 Vehicle Fleet and Vehicle Involvement in Accident 1990/91.....	3-31
Table 3.17 Factors behind Present Traffic Issues and Probable Policies.....	3-38

	<u>Page</u>
Chapter 4 Present Traffic Situation	
Table 4.1 Comparative Chart Showing Total Households Sampled and Actual Number of Actual Households Surveyed.....	4-2
Table 4.2 Traffic Volume and Number of Vehicles Interviewed	4-6
Table 4.3 Designation of Direction by Survey Point.....	4-8
Table 4.4 List of Organizations Interviewed (Public Transportation Survey).....	4-17
Table 4.5 List of Organizations Interviewed (Firm Interview Survey)	4-18
Table 4.6 Characteristics in Trip Generation and Attraction - Trip Purpose (To Office/School)	4-30
Table 4.7 Access Modes to Buses	4-38
Table 4.8 Traffic Volume	4-42
Table 4.9 Traffic Volume by Vehicle Type	4-45
Table 4.10 Traffic Distribution – Total –	4-52
Table 4.11 Traffic Distribution – Public Transport –	4-52
Table 4.12 Degree of Saturation at Intersection.....	4-53
Table 4.13 Average Vehicle Speed.....	4-60

Chapter 5 Formulation of Urban and Transportation Development Strategies

Table 5.1 Size of Areas by Classification of Land-use and by Traffic Zone.....	5-11
Table 5.2 Comparison of Actual and Maximum Populations.....	5-12
Table 5.3 Identification of Land-use Potential.....	5-13
Table 5.4 Area-wise Population in 2015	5-15
Table 5.5 Population Distribution by Traffic Zone.....	5-16
Table 5.6 Strategies for Urban Transport Development (short-term).....	5-24
Table 5.7 Strategies for Urban Transport Development (middle-term).....	5-25
Table 5.8 Strategies for Urban Transport Development (long-term).....	5-26

Chapter 6 Road Development Plan

Table 6.1 Criteria for Evaluation of Various Options.....	6-29
Table 6.2 Evaluation of Each Option for Proposed Inner Ring Road.....	6-30
Table 6.3 Future Traffic Volume.....	6-33
Table 6.4 Traffic Growth Rate	6-34
Table 6.5 Future Composition by Vehicle Type.....	6-34
Table 6.6 Q-V Formula.....	6-36
Table 6.7 Traffic Demand on Highways	6-37
Table 6.8 Traffic Demand on District Roads.....	6-41

	<u>Page</u>
Table 6.8	Traffic Demand on District Roads..... 6-41
Table 6.9	Traffic Demand on Each Section of Outer Ring Road (2015) 6-42
Table 6.10	Traffic Demand on the Inner Ring Road and its Connection Roads (2015) 6-45
Table 6.11	Traffic Demand on Existing Bottleneck Sections..... 6-47
Table 6.12	Road Length in the Valley..... 6-49
Table 6.13	Preliminary Cost Estimate for Road Development Plan in Kathmandu Valley 6-52
 Chapter 7 Public Transport Development Plan	
Table 7.1	Proposed Operation Schedule for Long Distance Bus at New Terminal 7-11
Table 7.2	Share of Transit Passengers in Potential Service Areas by Route..... 7-12
Table 7.3	Shuttle Bus Operation Plan 7-13
Table 7.4	Characteristics of Routes 7-15
Table 7.5	Present City Bus Service Level – Peak Hour – 7-16
Table 7.6	Operation Plan and Number of Fleets to be Serviced – Peak Hour– . 7-18
Table 7.7	City Bus Operation Plan – Peak Hour – 7-19
Table 7.8	Estimation of Additionally Required Number of Fleets 7-20
Table 7.9	Identification of Bus Stops by Functional Classification..... 7-22
Table 7.10	Estimation of Cost for Public Transport Development 7-27
 Chapter 8 Traffic Management Plan	
Table 8.1	Outline of Proposed Public Parking Lots 8-3
Table 8.2	Capacity of Parking Lots..... 8-6
Table 8.3	Identification of Intersections to be Improved 8-10
Table 8.4	Estimation of Cost for Intersection Improvement..... 8-14
 Chapter 9 Development Plan and Implementation Schedule	
Table 9.1	Concept of Implementation Schedule for Road Development 9-14
Table 9.2	Proposed Implementation Schedule of Short-term Urban Road Development Plan in Kathmandu Valley..... 9-17
Table 9.3	Proposed Investment Programme of Short-term Urban Road Development Plan in Kathmandu Valley..... 9-18

	<u>Page</u>
Table 9.4	Proposed Implementation Schedule of Middle & Long-term Urban Road Development Plan in Kathmandu Valley 9-19
Table 9.5	Proposed Investment Programme of Middle & Long-term Urban Road Development Plan in Kathmandu Valley 9-20
Table 9.6	Total and Sectorial Investment Requirement 9-23
Table 9.7	Selection of High Priority Projects to be Conducted for Feasibility Study 9-26
Table 9.8	Proposed Investment Programme of High Priority Projects 9-27

LIST OF FIGURES

	<u>Page</u>
Chapter 1 Introduction	
Fig. 1.1 Study Area.....	1-3
Fig. 1.2 Work Flow Diagram.....	1-5
Fig. 1.3 Organization Chart.....	1-7
Chapter 2 Socio-economic Condition	
Fig. 2.1 Gross Domestic Product at Factor Cost (1981).....	2-3
Fig. 2.2 Land Use (1984).....	2-7
Fig. 2.3 Land Use (1991).....	2-8
Fig. 2.4 Land Use in Greater Kathmandu (1991).....	2-9
Fig. 2.5 Urban Expansion 1971 - 1989 in Greater Kathmandu.....	2-10
Fig. 2.6 Population Growth in Kathmandu Valley.....	2-12
Fig. 2.7 Traffic Zone in the Study Area.....	2-15
Fig. 2.8 Population Growth.....	2-17
Fig. 2.9 Population Density (1991).....	2-18
Fig. 2.10 Trend of Urban Expansion.....	2-22
Chapter 3 Present Transportation System in the Valley	
Fig. 3.1 Functional Classification of Road Network.....	3-7
Fig. 3.2 Road Classification by Lane Number.....	3-11
Fig. 3.3 Road Classification by Surface Condition.....	3-12
Fig. 3.4 Major Findings on Present Road Network.....	3-14
Fig. 3.5 Traffic Capacity of Existing Roads.....	3-18
Fig. 3.6 Road Density by Traffic Zone.....	3-20
Fig. 3.7 Sajha Yatayat Bus Route Network.....	3-24
Fig. 3.8 Bus Route Network (Except Sajha).....	3-25
Fig. 3.9 Minibus Route Network.....	3-26
Fig. 3.10 Tempo Route Network.....	3-27
Fig. 3.11 On-going Traffic Management.....	3-32
Fig. 3.12 One-way System (On-going).....	3-33
Fig. 3.13 Existing Parking Area.....	3-34
Fig. 3.14 Accident Locations.....	3-35

Chapter 4 Present Traffic Situation

	<u>Page</u>
Fig. 4.1	Location Map of Roadside OD Survey 4-5
Fig. 4.2	Location Map of Roadside Traffic Counts 4-7
Fig. 4.3	Location Map of Intersection Traffic Counts 4-10
Fig. 4.4	Direction of Traffic Flow in Intersection 4-11
Fig. 4.5	Vehicle Speed Survey Route (1) 4-13
Fig. 4.6	Vehicle Speed Survey Route (2) 4-14
Fig. 4.7	Vehicle Speed Survey Route (3) 4-15
Fig. 4.8	Vehicle Speed Survey Route (4) 4-16
Fig. 4.9	Processing of Person Trip (PT) Date 4-19
Fig. 4.10	Number of Person Trips 4-20
Fig. 4.11	Trip Composition by Purpose 4-21
Fig. 4.12	Trip Composition by Mode 4-22
Fig. 4.13	Modal Share by Purpose of Trip 4-23
Fig. 4.14	Modal Share by Travel Time..... 4-24
Fig. 4.15	Trip Production Rate by Sex..... 4-25
Fig. 4.16	Trip Production Rate by Age Group..... 4-26
Fig. 4.17	Trip Production Rate by Profession 4-26
Fig. 4.18	Trip Production Rate by Vehicle Ownership..... 4-27
Fig. 4.19	Trip Production Rate by Income Level 4-27
Fig. 4.20	Relationship between Vehicle Ownership and Income Level 4-28
Fig. 4.21	Trip Generation and Attraction by Purpose of Trip 4-29
Fig. 4.22	Trip Generation by Departure Time by Purpose of Trip..... 4-31
Fig. 4.23	Present Traffic Desire Line (Person) – All Purposes, All Modes – 4-33
Fig. 4.24	Present Traffic Desire Line (Person) – To Office, All Modes – 4-34
Fig. 4.25	Present Traffic Desire Line (Person) – To School, All Modes – 4-35
Fig. 4.26	Present Traffic Desire Line (Person) – All Purposes, By Taxi – 4-36
Fig. 4.27	Present Traffic Desire Line (Person) – All Purposes, By Bus – 4-37
Fig. 4.28	Traffic Volume on Major roads..... 4-41
Fig. 4.29	Vehicle Composition..... 4-44
Fig. 4.30	Hourly Fluctuation of Traffic (Kalankisthan, B8) 4-47

	<u>Page</u>
Fig. 4.31	Hourly Fluctuation of Traffic (Singh Durbar, B28) 4-47
Fig. 4.32	Daily Variation of Traffic in the Week (Singh Durbar, B28) 4-48
Fig. 4.33	Present Traffic Desire Line (Vehicle) – Total – 4-50
Fig. 4.34	Present Traffic Desire Line (Vehicle) – Public Transport – 4-51
Fig. 4.35	Traffic Volume by Direction (10:00 - 11:00) 4-54
Fig. 4.36	Traffic Volume by Direction (16:00 - 17:00) 4-56
Fig. 4.37	Traffic Volume in Core Area (10:00 - 11:00)..... 4-58
Fig. 4.38	Traffic Volume in Core Area (16:00 - 17:00)..... 4-59
Fig. 4.39	Vehicle Speed..... 4-61

Chapter 5 Formulation of Urban and Transportation Development Strategies

Fig. 5.1	Future Urban Trend..... 5-3
Fig. 5.2	Accelerated Development Areas 5-5
Fig. 5.3	Expansion of Urban Area 5-6
Fig. 5.4	Outline of Land-use in Urban Area 5-7
Fig. 5.5	Prospect of Land-use Density 5-8
Fig. 5.6	Land-use Plan for Rural Development..... 5-9
Fig. 5.7	Identification of Land-use Potential..... 5-14

Chapter 6 Road Development Plan

Fig. 6.1	Functional Linkage among three (3) Cities..... 6-2
Fig. 6.2	On-going Transport Projects..... 6-6
Fig. 6.3	Existing Highway Planning Proposals 6-7
Fig. 6.4	Road Widening and Extension Plan Proposed by Town Development Committee 6-8
Fig. 6.5	Concept of Strengthening Plan of East-West Corridor 6-9
Fig. 6.6	Concept of Road Development Plan in the Expansion of Urban Area..... 6-10
Fig. 6.7	Integration of Three (3) City Centers 6-11
Fig. 6.8	Traffic Distribution among Major Areas (Existing) 6-12
Fig. 6.9	Traffic Distribution among Major Areas (2015)..... 6-12
Fig. 6.10	Conceptual Plan of Road Improvement in Central Area..... 6-13
Fig. 6.11	Traffic Distribution in Greater Kathmandu (Existing) 6-14
Fig. 6.12	Traffic Distribution in Greater Kathmandu (2015)..... 6-14
Fig. 6.13	Corridors with Bottleneck Points 6-15
Fig. 6.14	Identification of Existing Bottleneck Points in Traffic..... 6-16
Fig. 6.15	Skeleton of Future Road Network 6-18

	<u>Page</u>
Fig. 6.16	Proposed Inner Ring Road..... 6-24
Fig. 6.17	North Section of Inner Ring Road 6-25
Fig. 6.18	Bishnumati Section of Inner Ring Road..... 6-26
Fig. 6.19	Bagmati Section of Inner Ring Road 6-27
Fig. 6.20	Dhobi Khola Section of Inner Ring Road..... 6-28
Fig. 6.21	Proposed Standard Cross Sections of Arterial Roads for the Recommended Road Network in 2015..... 6-32
Fig. 6.22	Q-V Formula..... 6-36
Fig. 6.23	Proposed Road Network by Lane Numbers in 2015 6-38
Fig. 6.24	Traffic Volume Assigned (2015 - Proposed Network)..... 6-39
Fig. 6.25	Congestion Rate (2015 -Proposed Network)..... 6-40
Fig. 6.26	Traffic Demand on the Outer Ring Road (2015) 6-43
Fig. 6.27	Traffic Demand between Kathmandu and Bhaktapur..... 6-44
Fig. 6.28	Traffic Demand on the Inner Ring Road (2015)..... 6-46
Fig. 6.29	Existing Bottleneck Sections..... 6-48
Fig. 6.30	Master Plan of Road Network in 2015 6-51

Chapter 7 Public Transport Development Plan

Fig. 7.1	Location Map of New Long-distance Bus Terminal 7-3
Fig. 7.2	Trolley Bus Route..... 7-5
Fig. 7.3	Public Transport Development Concept (Short-term) 7-7
Fig. 7.4	Public Transport Development Concept (Long-term)..... 7-8
Fig. 7.5	Proposed Shuttle Bus Service Route 7-10
Fig. 7.6	Service Area of Existing City Bus 7-17
Fig. 7.7	Identification of Bus Stops to be Improved..... 7-23
Fig. 7.8	Proposed Tempo Regulation Routes..... 7-25
Fig. 7.9	Traffic Volume Assigned – Bus – (2015 - Proposed Network)..... 7-28
Fig. 7.10	Public Transport Development Plan 7-29

Chapter 8 Traffic Management Plan

Fig. 8.1	Location of Proposed Public Parking Lots..... 8-4
Fig. 8.2	Layout of Parking Building..... 8-5
Fig. 8.3	Location of Proposed Truck Yard..... 8-7
Fig. 8.4	Layout Plan of Truck Yard..... 8-8
Fig. 8.5	Location of Intersections to be Improved 8-13
Fig. 8.6	Location of Pedestrian Control Device 8-17
Fig. 8.7	Plan of Pedestrian Intrusion Control Fence..... 8-18
Fig. 8.8	Traffic Management Plan..... 8-22

Chapter 9 Development Plan and Implementation Schedule

Fig. 9.1	Short-term Road Development Plan (1992 - 1997)	9-2
Fig. 9.2	Improvement of Bagmati Transport Corridor.....	9-4
Fig. 9.3	Improvement of Bishnumati Transport Corridor.....	9-6
Fig. 9.4	Construction of Access to the New Bus Terminal at Balaju	9-8
Fig. 9.5	Improvement of Patan Access	9-10
Fig. 9.6	Implementation Plan of Road Development.....	9-15
Fig. 9.7	High Priority Projects to be followed by F/S.....	9-28

APPENDIX

Chapter 3 Present Transportation System in the Valley

Appendix 3-1 Summary of Road Inventory

Appendix 3-2 Traffic Capacity of Existing Road

Chapter 4 Present Traffic Situation

Appendix 4-1 Present Traffic Desire Lines (Vehicle)

Appendix 4-2 Present Saturation Degrees at Intersections

Chapter 6 Road Development Plan

Appendix 6-1 Estimation of Present Vehicle OD Tables

Appendix 6-2 OD Matrices

Appendix 6-3 Road Network for Traffic Assignment

Appendix 6-4 Results of Traffic Assignment

Chapter 7 Public Transport Development Plan

Appendix 7-1 Ground Plan of Bus Stops

Chapter 8 Intersection Development Plan

Appendix 8-1 Traffic Management Plan

Appendix 8-2 Traffic Volumes at Intersections

Chapter 9 Development Plan and Implementation Schedule

Appendix 9-1 Basic Information for Economic Evaluation

Appendix 9-2 Result of Economic Evaluation (Master Plan)

ABBREVIATIONS

ADB	:	Asian Development Bank
ADT	:	Average Daily Traffic
BM	:	Bhaktapur Municipality
CBD	:	Central Business District
CBS	:	Central Bureau of Statistics
CTP	:	Central Traffic Police
DOR	:	Department of Roads
DOTM	:	Department of Transport Management
DHUD	:	Department of Housing and Urban Development
DR	:	District Road
FR	:	Feeder Road
GDP	:	Gross Domestic Product
GLD	:	Guided Land Development
HW	:	Highway
HMG/N	:	His Majesty's Government of Nepal
IDA	:	International Development Association
JICA	:	Japan International Cooperation Agency
KM	:	Kathmandu Municipality
KVUDPP	:	Kathmandu Valley Urban Development Plan and Programmes
LM	:	Lalitpur Municipality
MHPP	:	Ministry of Housing and Physical Planning
MOF	:	Ministry of Finance
MOWT	:	Ministry of Works and Transport
NPC	:	National Planning Commission
OD	:	Origin and Destination
P.C.U.	:	Passenger Car Unit
PT	:	Person Trip
ppha	:	person per hectare
Sq. m	:	Square Meter
TDC	:	Town Development Committee
USAID	:	United States Agency for International Development
VDC	:	Village Development Committee
VT	:	Vehicle Trip
vpd	:	vehicle per day

CHAPTER I
INTRODUCTION



1. INTRODUCTION

1.1 Background of the Study

Kathmandu Valley comprises of the city of Kathmandu, the capital of Nepal, the city of Lalitpur (Patan), third largest city in Nepal, and the city of Bhaktapur. The population in the Valley in 1991 is estimated at about 1 million. The population in this area is on the increase due to immigration of people from the other parts of Nepal and India. This fact along with inadequate provision of urban infrastructure, has given rise to a variety of urban problems including slumming inside the city, sprawling of urban area, traffic congestion on roads and poor facilities of public transport. To cope with the above issues, His Majesty's Government of Nepal has come up with some comprehensive development plans of the area including "Physical Development Plan for Kathmandu Valley in 1969" and "Kathmandu Valley Physical Development Concept in 1984". However, in spite of these plans, condition of urban area of the Valley has worsened day by day. This fact seems to come from, among other things, following reasons:

- Inability to implement the plan due to administrative, financial and legislative difficulties,
- Fragmental implementation of improvement works mainly done with foreign aids for the solution of impending issues on the spot, and
- Lack of data base for scientific planning.

In these circumstances, His Majesty's Government of Nepal, under the financial assistance from Asian Development Bank, has conducted a study named "Kathmandu Valley Urban Development Plans & Programmes" with the aim of formulating more concrete and implementation plans and programmes for the realization of the concepts proposed in the 1984 plan.

The issues of the transportation in the Valley are getting worse day by day as seen below:

- Traffic congestion on certain sections of roads in the central area,
- Mixing of traffic on major roads and resultant decrease in efficiency of road usage and increase in traffic accidents, and
- Poor condition of public transport and creation of the transportation-poor who are unable to use any means of transport.

It is high time now to formulate more comprehensive and implementable urban transportation development strategies for the Valley in conjunction with other ongoing development plans for urban infrastructure such as "Kathmandu Valley Urban Development Plans & Programmes" and so on.

1.2 Objectives of the Study

The major objectives of the Study are:

- (1) To formulate master plan for Kathmandu Valley Urban Road Development for the period up to the year as shown below:
 - Long-term plan; Target year of 2015
 - Short-term plan; Target year of 1997
- (2) To conduct feasibility study on the high priority projects proposed in the short-term master plan (~ 1997).

1.3 Study Area

The study area covers the area of Kathmandu Valley including Kathmandu District, a Part of Lalitpur District and Bhaktapur District as shown in Fig. 1.1.

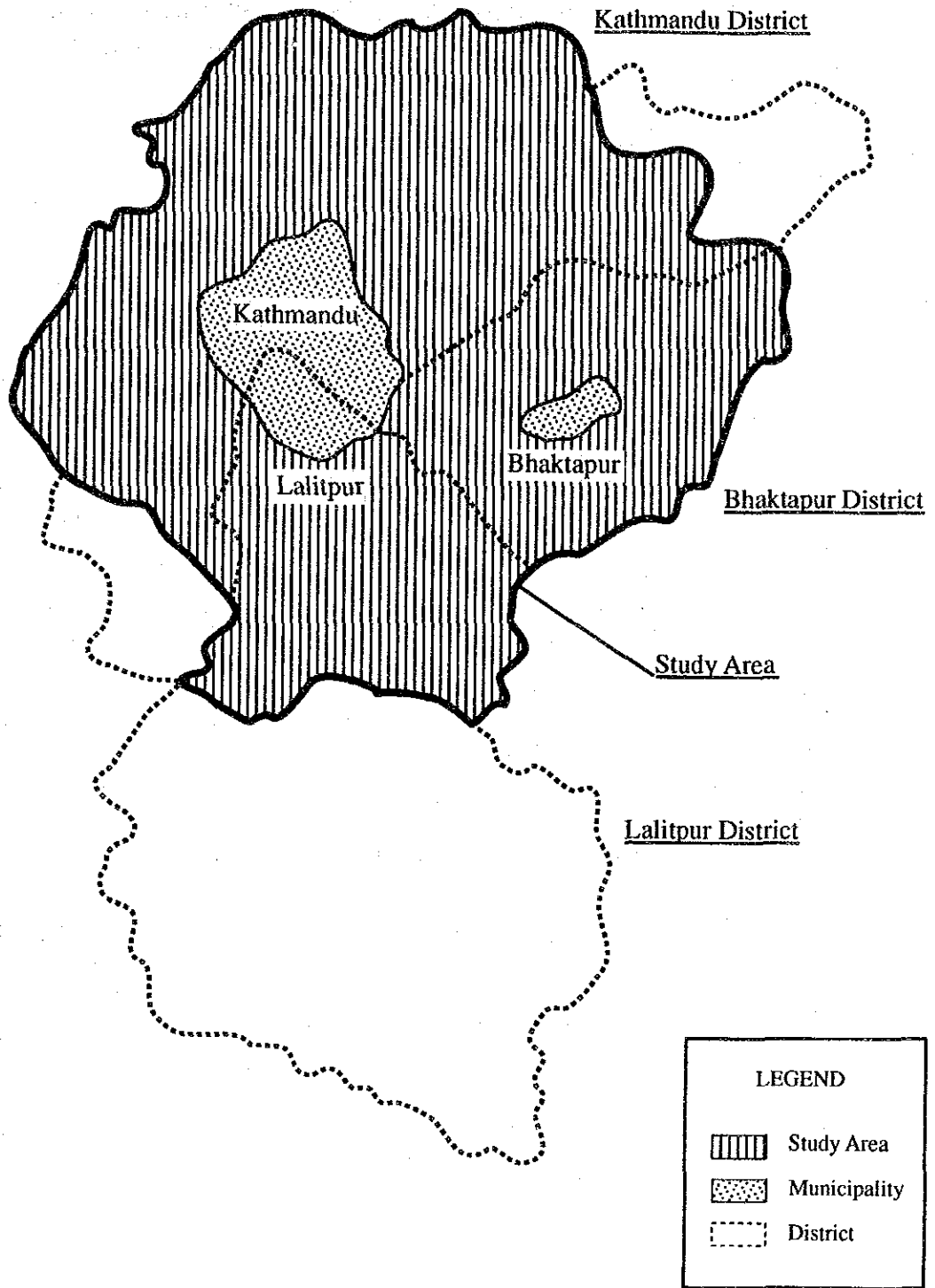


FIG. 1.1 STUDY AREA

1.4 Work Schedule of the Study

The Study has started from the middle of November 1991 and continued till the end of March 1993. An overall work flow illustrating the inter-relationship of each activity in the Study is presented in Fig. 1.2.

1.5 Organization and Assignment of the Study Team

The Study has been carried out by the Study Team under the guidance of the Advisory Committee, which was organized by JICA.

Department of Roads (hereinafter referred to as DOR), Ministry of Works and Transport, His Majesty's Government of Nepal, was the counterpart agency to the Study Team.

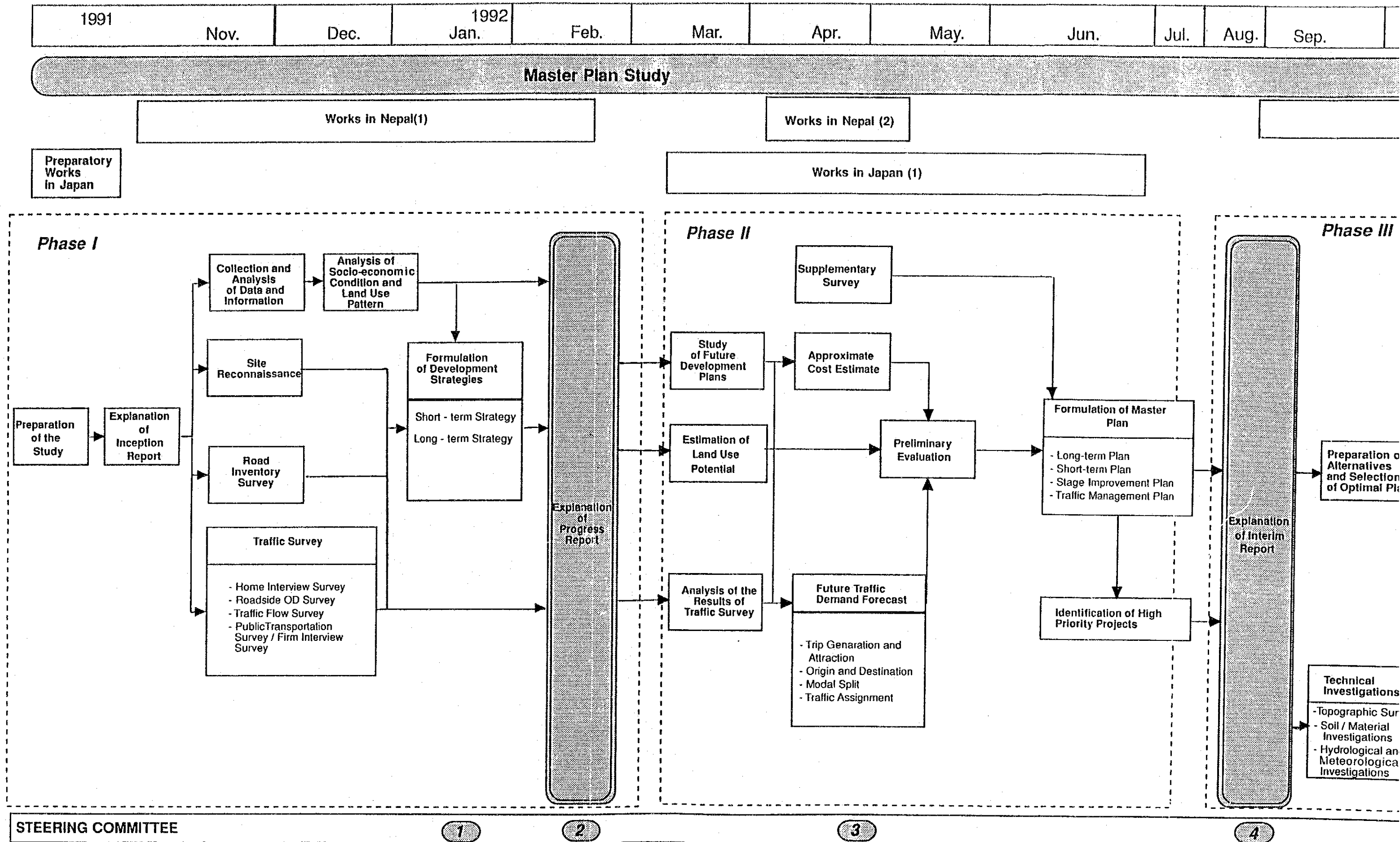
His Majesty's Government of Nepal has established a Steering Committee consisting of the following organizations under the chairmanship of the Director General of DOR for the smooth implementation of the Study.

- (1) Ministry of Works and Transport
- (2) Ministry of Finance
- (3) Ministry of Housing and Physical Planning
- (4) National Planning Commission
- (5) Department of Roads
- (6) Department of Transport Management
- (7) Central Traffic Police
- (8) Municipalities of Kathmandu, Lalitpur and Bhaktapur

In carrying out the Study, the Study Team has worked with the counterpart personnel assigned by the counterpart agency.

The organization chart of the Study Team is presented in Fig. 1.3.

FIG. 1.2 WORK FLOW DIAGRAM



1.2 WORK FLOW DIAGRAM

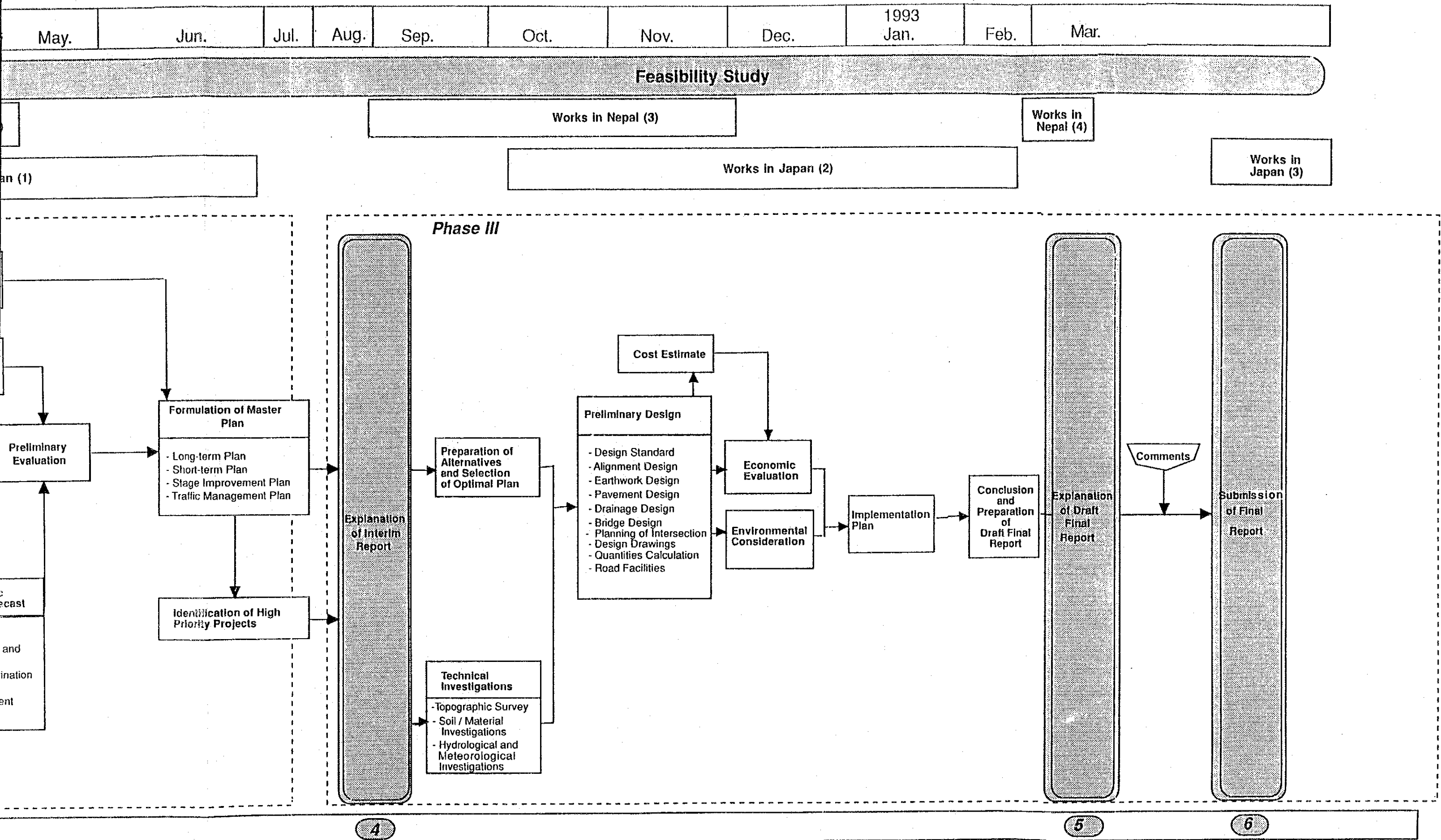
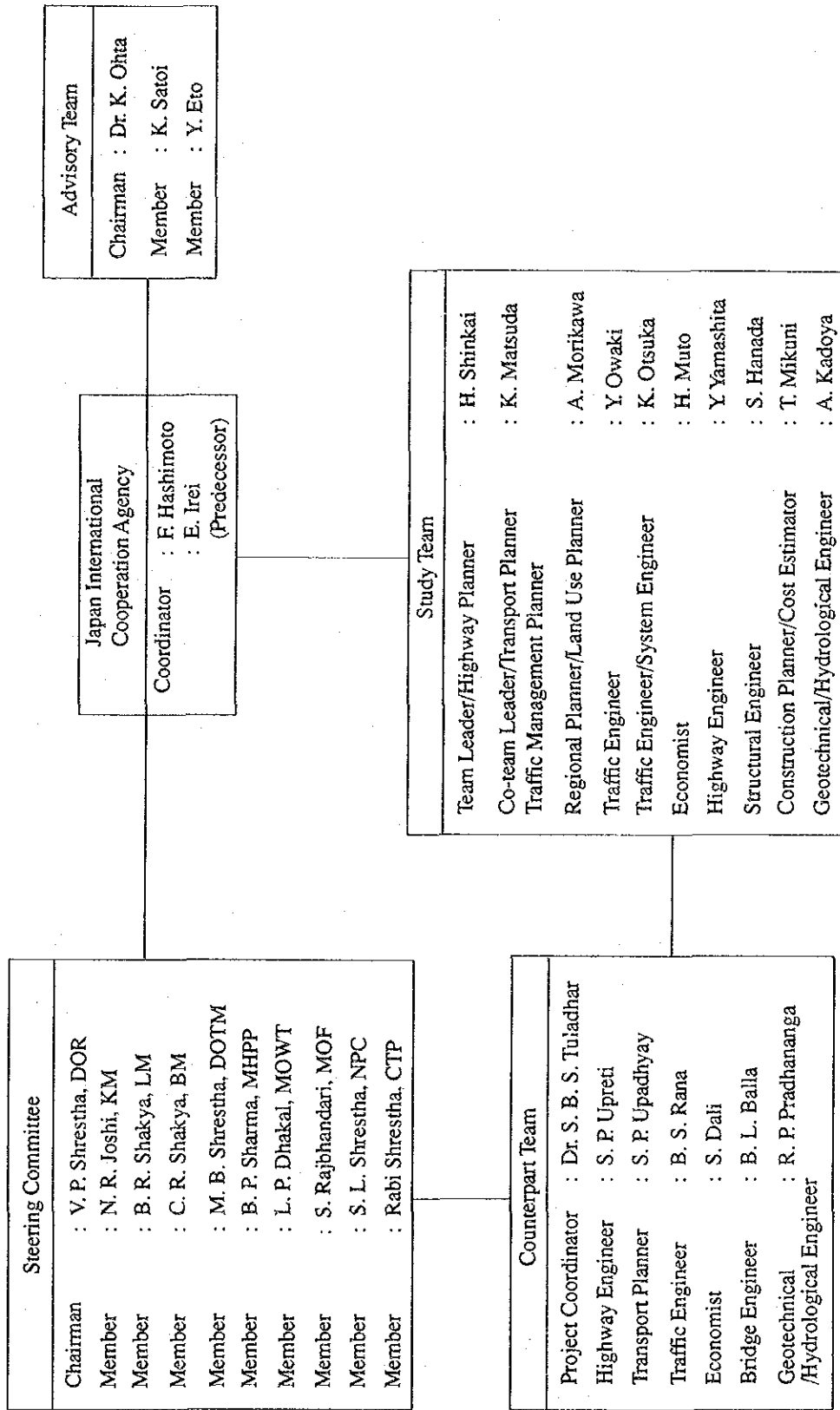
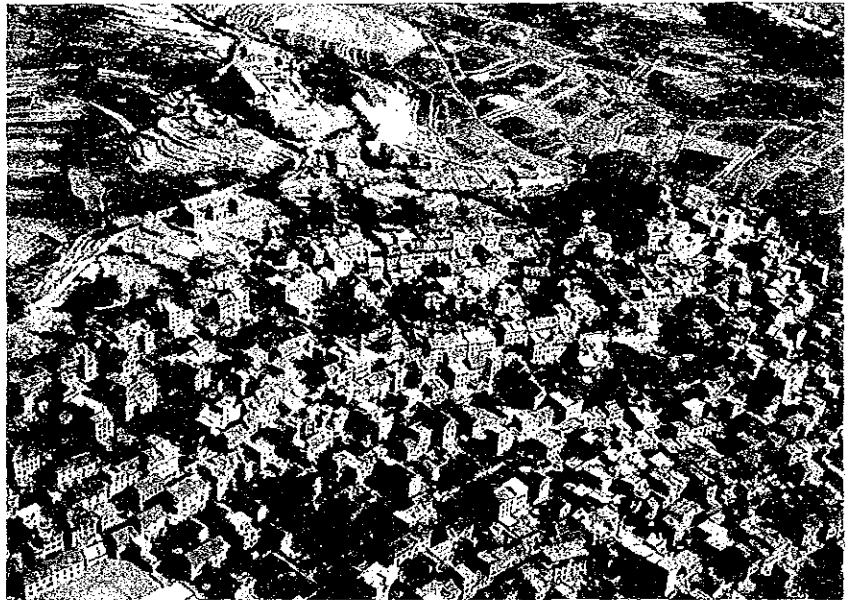


FIG. 1.3 ORGANIZATION CHART



CHAPTER 2
SOCIO-ECONOMIC CONDITION



2 SOCIO - ECONOMIC CONDITION

2.1 Economic Role of the Valley

The industrial structure of Kathmandu Valley, Central Dev. Region and whole of the nation in terms of the number of employment are shown in Table 2.1. The main activity in the Valley is so called primary industry which includes agriculture, forestry and fishing which accounts for 75% of employment. Other sectors account for very small percentages in which percentages of commerce and manufacturing are 5% and 2% respectively. However, when these shares are compared to Central Dev. Region and whole of the nation, it is noticed that the Valley has considerably diversified nature in their industrial structure.

Although the share of the agricultural, forestry and fishery industries is as low as only 4%, the shares of the other industries are very high: 20.6% for mining, 18.8% for manufacture, 28.7% for construction, 17.3% for commercial, 27% for transport and communication, and 35% for financial services. From these figures, it could be pointed out that the Valley has strong concentration in industrial and business functions in the nation. Furthermore these figures suggest that the Valley has rather advanced economic structure compared with other parts of Nepal.

Manufacturing and other tertiary industries have shown 17.5% increase in output during the period 1984/85 to 1987/88 for the entire nation. It is apparent that these great achievements have been led by those industries located in the Valley or about 13% of employment in these industries in the nation. This fact is justified by higher gross output per worker in urban area as shown in Fig. 2.1.

Urban areas are the "engine" for the promotion of national economy and Kathmandu Valley plays an incentive role and it is expected that this role would become more vital throughout foreseeable future. Continuous inflow of migrators and population increase in the Valley is interpreted as the result of expanding economy due to economic advantage of the Valley in the national economy.

TABLE 2.1 ECONOMICALLY ACTIVE POPULATION BY EMPLOYMENT SECTOR (1981)

Area (1)	Agriculture, Forestry and Fishing	Mining and Quarrying	Manufacturing	Electric Gas and Water	Construction	Commerce	Transport and Communication	Finance and Business Service	Personal and Community Service	Industry not stated	Total Employment	Total Non-agricultural Employt.	% of Total Non agric. Employt.
Kathmandu Valley													
Districts :-													
Number	249,671	200	6,195	847	580	18,972	2,006	3,452	39,815	8,975	330,713	81,042	13.4%
Percentage	75.5	0.1	1.9	0.3	0.2	5.7	0.6	1.0	12.0	2.7	100.0	24.5	
Central													
Dev. Region :-													
Number	1,886,258	437	15,043	1,834	907	47,607	3,981	5,839	130,996	41,097	2,133,999	247,741	40.8%
Percentage	88.4	0.0	0.7	0.1	0.0	2.2	0.2	0.3	6.1	1.9	100.0	11.6	
Nepal :-													
Number	6,244,289	971	33,029	3,013	2,022	109,446	7,424	9,850	313,570	127,272	6,850,886	606,597	100%
Percentage	91.1	0.0	0.5	0.0	0.0	1.6	0.1	0.1	4.6	1.9	100.0	8.9	
Districts' Employment as a % of													
Nepal total	4.0	20.6	18.8	28.1	28.7	17.3	27.0	35.0	12.7	7.1	4.8		
Ratio of													
Employment % to economically active %	0.8	4.3	3.9	5.8	5.9	3.6	5.6	7.3	2.6	1.5	1.0		

Source : Statistical Yearbook of Nepal 1989, Central Bureau of Statistics, KVUDPP, DHUD, 1991

Note : (1) Data is not available for the Valley. The data shown relates to the three districts which cover a slightly larger area than the Valley.

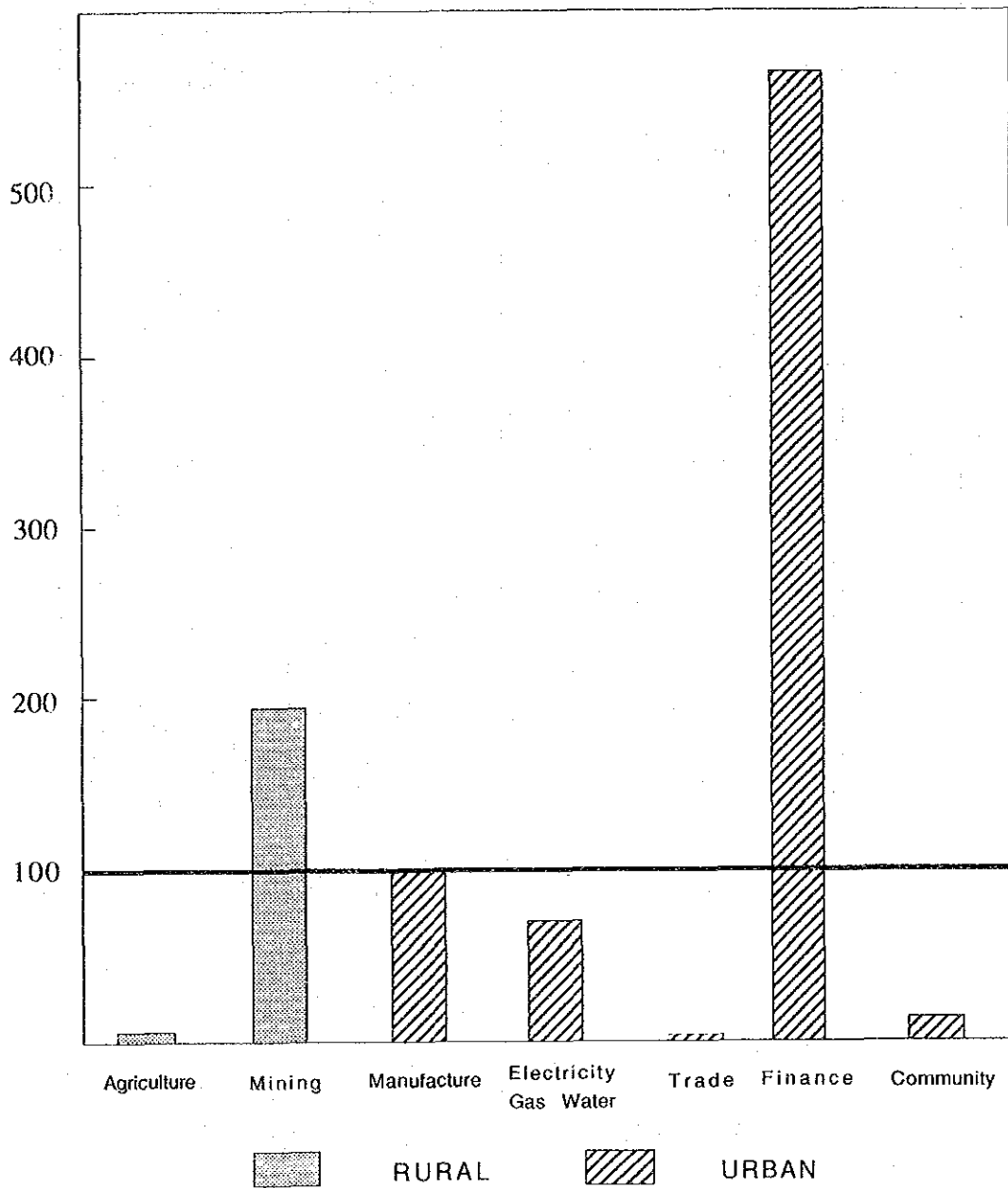


FIG. 2.1 GROSS DOMESTIC PRODUCT AT FACTOR COST 1981

SOURCE: The Urban Contribution to National Economic Growth in Nepal/Nigel Harris, MSUD Project / MHPP / DHUD, January 1991 / KVUDPP, DHUD, 1991

TABLE 2.2 PERCENTAGE DISTRIBUTION OF MOTIVATION FOR MIGRATION

Sex	Motivation for Migration	Migration Stream	
		Other areas to urban places	Other areas to Kathmandu Valley
Male	Trade/Commerce	14.9	22.1
	Agriculture	17.8	4.2
	Service	26.1	28.8
	Education/Training	8.1	10.3
	Marriage	1.2	1.9
	Others and Not-stated	31.9	32.7
	Total	100.0	100.0
Female	Trade/Commerce	9.5	20.4
	Agriculture	10.5	2.5
	Service	3.3	7.0
	Education/Training	4.2	5.3
	Marriage	30.6	25.6
	Others and Not-stated	41.9	39.2
	Total	100.0	100.0

Source: Central Bureau of Statistics, Population Census 1981.

2.2 Existing Urban Condition

2.2.1 Land-use Pattern

The existing land-use within the Valley are shown in Fig. 2.2 prepared by KVUDPP based on interpretation of 1 : 25,000 aerial photographs (1989) and their field observation. Fig. 2.3 shows land-use in 1984 made by Land Resource Mapping Project, HMG/Government of Canada.

Table 2.3 shows comparison of the two maps prepared by KVUDPP. Urban land has increased from 5% to 11% of the Valley due to the expansion of Kathmandu city to the north and north-west. Along radial roads extending from core area, especially along the roads to Bhaktapur, Thankot and Godawari, urban area has expanded to a great extent.

TABLE 2.3 LAND-USE PATTERN IN THE VALLEY

	1984		1991	
	ha	%	ha	%
Urban Area	2,850	4.8	7,195	10.9
Rivers	825	1.4	927	1.4
Agriculture (Low, Slope, Upland)	37,650	63.1	37,420	56.4
Grazing	75	0.1	-	-
Forest	18,275	30.6	5,840	8.8
Brickwork	-	-	577	0.9
Quarries	-	-	34	0.1
Shrubs/Grass	-	-	14,257	21.5
Total	59,675	100.0	66,250	100.0

Source : KVUDPP, DHUD, 1991

In the Study area, the existing land-use in Kathmandu and Lalitpur urban areas (Greater Kathmandu) was surveyed by KVUDPP in 1991 as shown in Fig. 2.4. Comparing with similar surveys conducted by Kathmandu Urban Land Use Policy Study (DHUD), residential area has increased from 13.7% in 1971 to 30.6% in 1981 and to 45.9% in 1991 rapidly as shown in Table 2.4. On the other hand, agricultural area has decreased from 68.2% in 1971 to 43.2% in 1981 and to 26.8% in 1991.








TABLE 2.4 LAND-USE IN GREATER KATHMANDU (1971, 1981 AND 1991)

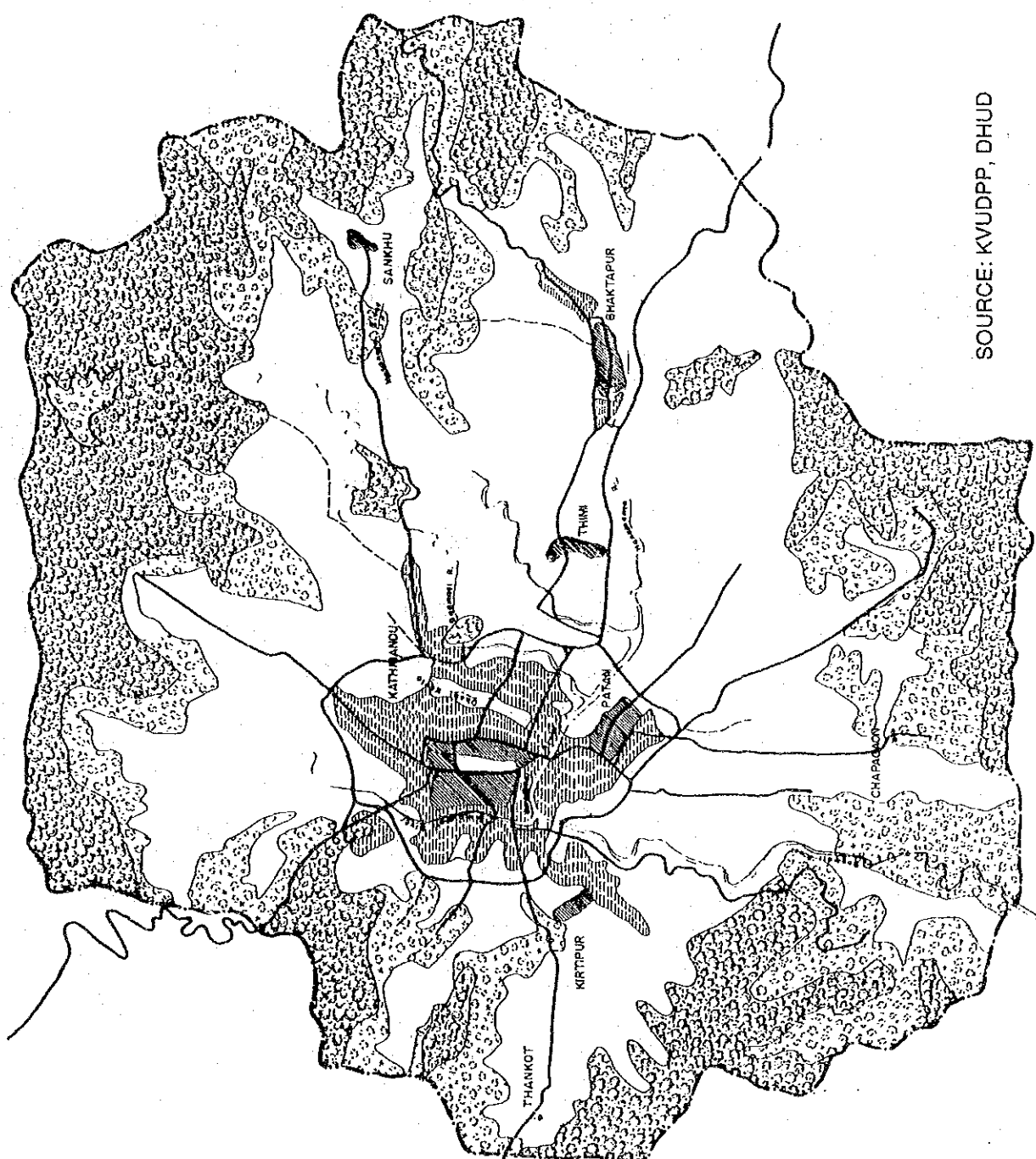
	1971		1981		1991	
	ha	%	ha	%	ha	%
Residential	861	13.7	1,936	30.5	2,971	46.0
Institutional	285	4.5	413	6.5	413	6.4
Residential/Commercial	7	0.1	11	0.2	20	0.3
Service/Commercial	23	0.4	54	0.8	46	0.7
Open Space/Recreational	255	4.1	245	3.9	143	2.2
Industrial Use	26	0.4	99	1.6	112	1.7
Police/Military	49	0.8	144	2.3	184	2.8
Road	112	1.8	275	4.4	330	5.1
Airport	75	1.2	115	1.8	216	3.3
Forest	61	1.0	61	1.0	63	1.0
Agricultural Land	4,269	68.2	2,730	43.2	1,734	26.8
River	241	3.8	241	3.8	241	3.7
Total	6,264	100.0	6,324	100.0	6,473	100.0

Source : KVUDPP, DHUD

Fig. 2.5 illustrates urban expansion during the period 1971-1991 studied by KVUDPP. Substantial amount of land has developed for the urban use in the period 1971-1981. Construction of the Ring Road in the mid 1970's induced development in surrounding areas, especially Balaju, Maharajgunj, Bansbari and Jawalakhel while the areas along the radial roads and Dhobi Khola, Bishnumati and Bagmati flood plains have been greatly developed since 1981. An area between the Greater Kathmandu and Bhaktapur has been developed recently. In rural area, some old settlements such as Thimi, Kirtipur, Chapagaon, Lubhu have been exposed to urbanization in which a great number of agricultural lands have been converted into residential use.

LEGEND

-  Study Area Boundary
-  Roads (Surfaced)
-  Roads (Unsurfaced)
-  Rivers & Stream
-  Urban & Compact Villages
-  Sub Urban / Scattered Housing
-  Forest / Scrub



SOURCE: KVUDPP, DHUD

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

KATHMANDU VALLEY
URBAN ROAD DEVELOPMENT
LAND USE (1984)

FIG. 2.2

JAPAN INTERNATIONAL COOPERATION
AGENCY (JICA)

LEGEND

- Study Area Boundary
- Roads (Surfaced)
- Roads (Unsurfaced)
- Rivers & Stream
- Predominantly Residential (Urban and Compact Village)
- Residential with Some Agriculture
- Agriculture with Some Residential
- Recreation
- Institutional
- Military And Police
- Public Utilities
- Industry
- Brick Works
- Brick Factories
- Quarries
- Forests
- Shrub



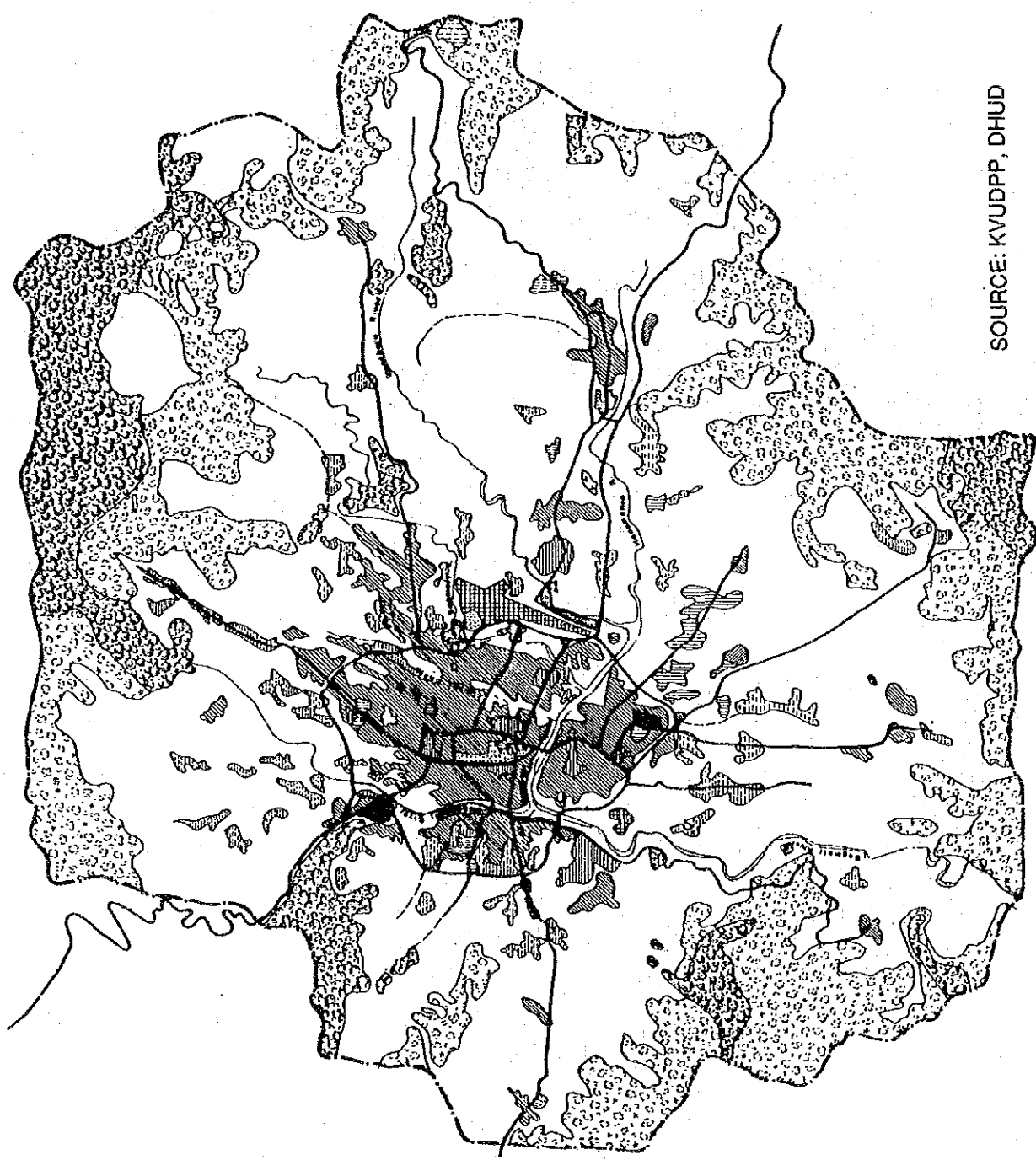
HIS MAJESTY'S GOVERNMENT OF NEPAL
(H.M.G.)

KATHMANDU VALLEY
URBAN ROAD DEVELOPMENT

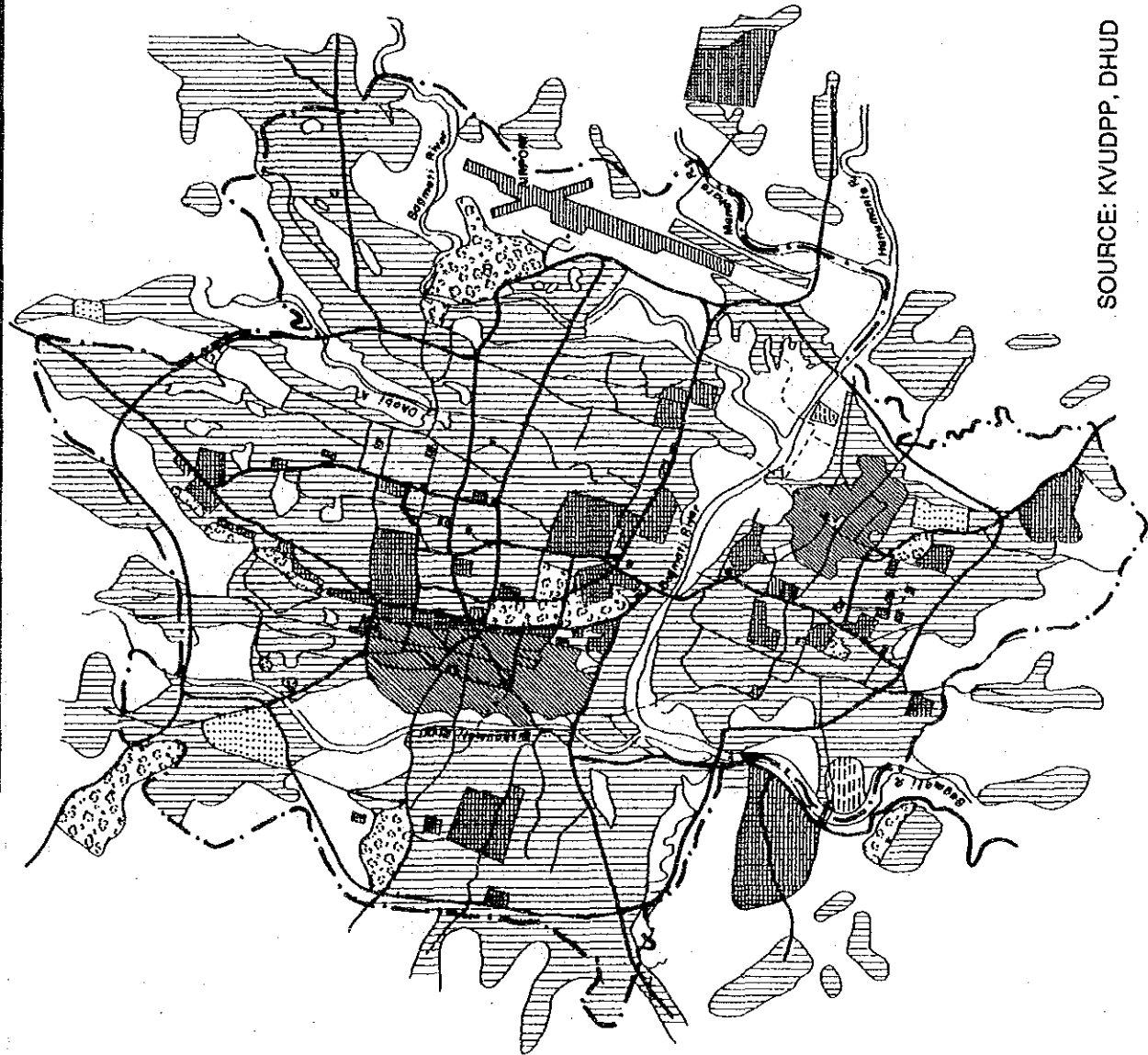
LAND USE (1991)

FIG. 2.3

JAPAN INTERNATIONAL COOPERATION
AGENCY (JICA)



SOURCE: KVUDPP, DHUD



SOURCE: KVUDPP, DHUD

LEGEND

- Municipal Boundary
- Major Roads
- Minor Roads
- River & Stream
- Core Area
- Residential Area
- Vacant Land
- Transport
- Industrial
- Institutions
- Woods and Open Space
- Utilities



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

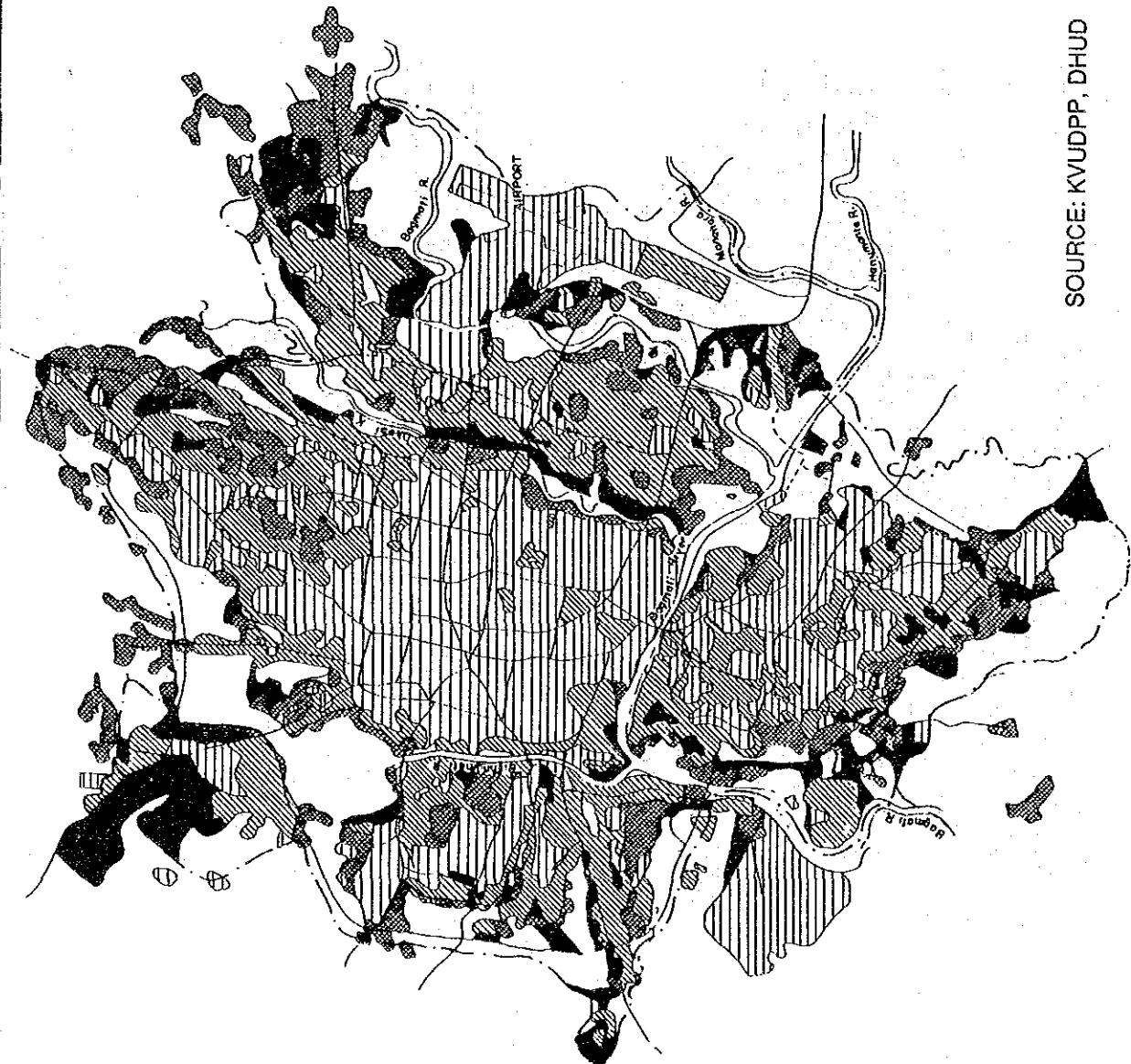
KATHMANDU VALLEY
URBAN ROAD DEVELOPMENT
LAND USE IN THE GREATER
KATHMANDU (1991)

FIG. 2.4

JAPAN INTERNATIONAL COOPERATION
AGENCY (JICA)

LEGEND

- Municipal Boundary
- Major Roads
- Minor Roads
- River & Stream
- Built up Area 1971
- Built up Area 1981
- Built up Area 1987
- Built up Area 1989



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

KATHMANDU VALLEY
URBAN ROAD DEVELOPMENT
URBAN EXPANSION 1971-1989 IN
GREATERKATHMANDU

FIG. 2.5

JAPAN INTERNATIONAL COOPERATION
AGENCY (JICA)

SOURCE: KVUDPP, DHUD

2.2.2 Population

(1) Trend in Population Growth

According to the Prompt Report of 1991 Census, the Valley's population in 1991 is 1,063,222. The average annual growth rate increased from 2.3% in the period between 1971 and 1981 to 3.7% in the period between 1981 and 1991 as shown in Table 2.5.

Urban population in 1991 accounts for 592,589 which is 56% of the Valley's population. Urban population increased at 4.9% annually during the period 1981 - 91 due to rapid urban expansion in this period.

Urban population in Kathmandu District in 1991 is 414,264 which is about 70% of the Valley's urban population. Annual growth rate during the period 1981 - 91 is 5.7% while the urban population in Lalitpur and Bhaktapur Districts are 117,203 and 61,122 respectively. Annual growth rates of these districts are 3.9% and 2.3% in the period 1981 - 91 respectively. Rural population increased from 369,847 in 1981 to 470,633 in 1991 at the annual growth rate of 2.4%.

Table 2.6 shows population density in Kathmandu Valley. The population density in the Valley in 1971 was 9.2 ppha which has increased to 11.5 ppha in 1981 and to 16.6 ppha in 1991. The urban population density increased from 43.7 ppha in 1971 to 55.0 ppha in 1981 and to 88.9 ppha in 1991, while the rural population density is still low at 8.2 ppha in 1991.

TABLE 2.5 POPULATION GROWTH IN KATHMANDU VALLEY

	1971 *1	1981 *2	1991 *3	Annual Growth Rate (%)	
				1971-81	1981-91
Kathmandu District	353,756	427,100	668,605	1.9	4.6
Urban	191,445	238,265	414,264	2.2	5.7
(Municipalities)	54%	56%	62%		
Rural	162,311	188,835	254,341	1.5	3.0
	46%	44%	38%		
Lalitpur District	121,875	164,939	221,520	3.1	3.0
Urban	59,049	79,875	117,203	3.1	3.9
(Municipalities)	48%	48%	53%		
*4 Rural	62,826	85,064	104,317	3.1	2.1
	52%	52%	47%		
Bhaktapur District	110,157	144,420	173,097	2.7	1.8
Urban	40,993	48,472	61,122	1.7	2.3
(Municipalities)	37%	34%	35%		
Rural	69,164	95,948	111,975	3.3	1.6
	63%	66%	65%		
Total	585,788	736,459	1,063,222	2.3	3.7
Urban	291,487	366,612	592,589	2.3	4.9
(Municipalities)	50%	50%	56%		
Rural *4	294,301	369,847	470,633	2.3	2.4
	50%	50%	44%		

*1 : Study Team Estimation based on 1991 Administration Boundary

*2 : Study Team Estimation based on 1991 Administration Boundary

*3 : 1991 Census (Prompt Report of 1991 Census)

*4 : Excluding VDC outside the Valley

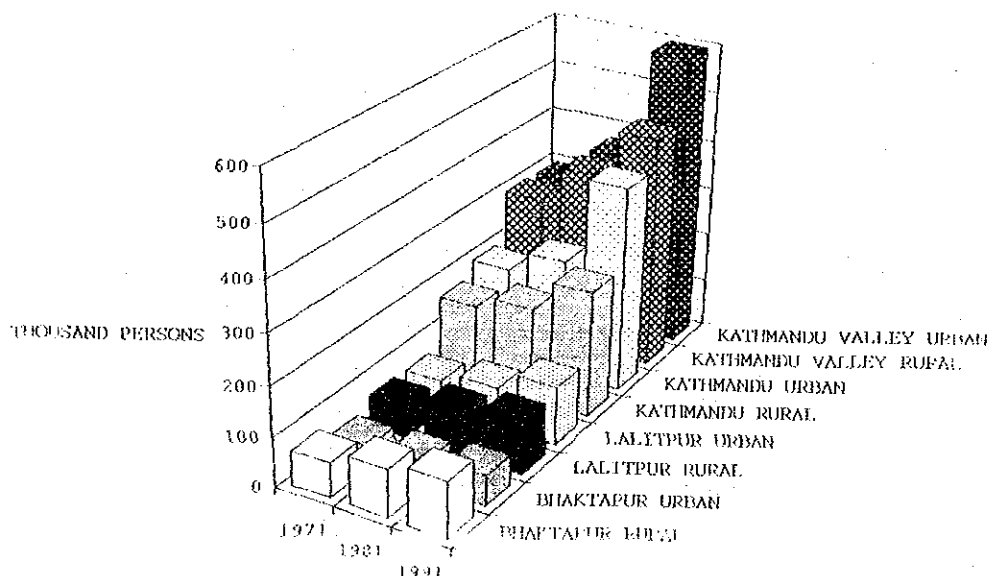


Fig. 2.6 POPULATION GROWTH IN KATHMANDU VALLEY

TABLE 2.6 POPULATION DENSITY IN KATHMANDU VALLEY

(Unit : ppha)

	1971	1981	1991
Kathmandu District	9.0	10.8	16.9
Urban	41.9	52.1	90.6
Rural	4.6	5.4	7.3
Lalitpur District	9.7	13.1	17.6
Urban	39.3	53.2	78.0
Rural	5.7	7.7	9.4
Bhaktapur District	1.7	2.2	2.7
Urban	69.2	81.9	103.2
Rural	6.1	8.5	9.9
Total	9.2	11.5	16.6
Urban	43.7	55.0	88.9
Rural	5.1	6.5	8.2

(2) Population Distribution by Traffic Zone

Fig. 2.7 shows the traffic zone set up by the Study Team. (Zones 101 to 118 include Kathmandu Urban area while Zones 201 to 206 for Lalitpur Urban and Zones 301 to 304 for Bhaktapur Urban. Zones 401 to 410 are in Kathmandu rural area. Zones 501 to 504 are in Lalitpur rural, and Zones 601 to 604 are in Bhaktapur rural area.) Population by traffic zone is given in Table 2.7 which indicates high population concentration in urban area.

Population growth and density by traffic zones are shown in Table 2.8, and presented in Fig. 2.8 and 2.9. Zone 107 (Baneswor in Kathmandu Urban) shows the highest growth of 10.9% per annum and followed by Zone 103 (Maharajgunj in Kathmandu Urban) of 9.4%. Zone 115 (Asan Tole in Kathmandu Urban) shows the highest population density of 652.6 ppha and Zone 403 (Sakhu in Kathmandu Rural) shows the lowest population density of 3.9 ppha.

TABLE 2.7 POPULATION BY TRAFFIC ZONE IN 1991

(Kathmandu, Lalitpur and Bhaktapur Urban Area)

Zone	Ward No.	Population
101	1	6,691
102	2	8,288
103	3	15,341
	4	14,408
	Total	29,749
104	5	8,592
105	6	17,579
	7	19,801
	Total	37,380
106	8	8,063
	9	16,768
	Total	24,831
107	10	41,213
108	11	9,883
109	12	9,816
	21	10,383
	Total	20,329
110	13	14,258
	14	15,816
	Total	30,074
111	15	19,491
112	16	20,281
113	17	11,654
	18	7,850
	26	4,230
	28	5,079
	Total	28,813
114	19	7,556
	20	8,609
	22	7,077
	23	10,001
	24	6,234
	25	5,853
	Total	45,330
115	27	8,152
	30	11,038
	Total	19,190
116	29	19,208
117	31	12,753
118	32	14,208
	33	17,860
	Total	32,068
100	1	414,264
201	1	9,661
	2	7,500
	3	8,764
	Total	25,925

Zone	Ward No.	Population
202	4	11,757
203	5	15,300
204	6	8,119
	7	5,132
	8	3,720
	9	5,471
	22	5,577
	Total	28,019
205	10	2,464
	11	4,122
	12	3,931
	13	2,386
	14	2,953
	Total	15,856
206	15	2,751
	16	2,732
	17	2,435
	18	1,652
	19	2,728
	20	3,984
	21	4,064
	Total	20,346
200		117,203
301	1	4,547
	3	2,844
	4	5,073
	5	3,635
	Total	16,099
302	2	2,937
	6	2,585
	7	4,272
	Total	9,794
303	11	3,308
	12	3,435
	14	4,169
	16	2,992
	17	4,848
	Total	18,752
304	8	3,540
	9	2,685
	10	3,648
	13	2,886
	15	3,718
	Total	16,477
300		61,122
100 - 300 Total		592,589

(Kathmandu Rural Area)

Zone	V.D.C. Name	Population
401	GOTHATAR	6,176
	KOTESWOR	4,809
	TOTAL	10,985
402	ALAPOT	2,507
	BHADRBAS	1,895
	DANCHHI	5,891
	MULPANI	4,722
	TOTAL	15,015
403	BAJRAYOGINI	3,813
	GAGALPHEDI	4,657
	JNDRAYANI	2,640
	LAPSE PHEDI	5,006
	MANGLE BHARE	4,040
	PUKHULACHHU	2,618
	SUNTOLE	4,104
	TOTAL	26,878
404	BALUWA	3,933
	GOKARNA	3,407
	JORPATI	11,762
	KAPAN	4,445
	NAYANPATI	4,193
	SUNDARIJAL	1,951
	TOTAL	29,291
405	BUDANILKANTHA	5,998
	CHAPALI BHADRA KALI	2,977
	CHUNIKHEL	3,133
	DHAPASI	4,311
	GONGABU	5,410
	JHOR MAHAKAL	3,667
	KHADKA BHADRA KALI	2,543
	TOKHA CHANDESWARI	2,893
	TOKHA SARSWATI	2,109
	MAHANKAL	3,766
	TOTAL	36,807
406	DHARMATHALI	4,069
	FUTUNG	2,475
	GOLDHUNGA	5,137
	JITPUR PHEDI	4,006
	KABHRETHALI	3,040
	MANA MAJU	4,452
	SANGLA	2,707
	TOTAL	25,886

Zone	V.D.C. Name	Population
407	BHIM DHUNGA	2,400
	ICHANGHU NARAYAN	4,436
	NAIKAP PURANO BHANJYANG	3,011
	RAMKOT	5,406
	SIUCHATAR	4,453
	SITAPAILA	5,162
	TOTAL	24,868
408	BAD BHANJYANG	2,706
	BALAMBU	3,234
	CHOUKEFAR DAHACHOK	3,208
	MAHADEVSTHAN	4,718
	MATATIRTHA	2,801
	NAIKAP NAYA BHANJYANG	3,262
	SATUNGAL	2,734
	THANKOT	5,777
	TINTHANA	3,193
	TOTAL	31,633
409	BAHIRIGAON	5,092
	CHANPA DEVI	3,519
	CHOBHAR	5,631
	MACHICHE GAON	2,448
	PALIPHAL	3,132
	PANGA BALKUMARI	3,329
	PANGA BISHNUDEVI	2,746
	KIRTIPUR CHITHU BHAR	4,497
	LAYAKU	3,280
	TOTAL	33,674
410	CHALNAKHEL	2,980
	CHHAMALE	3,608
	DAKSINKALI	3,452
	SISEHNARAYAN	2,917
	SORHEK	3,928
	TALKUDE CHOUR	2,419
	TOTAL	19,304
400		254,341

(Lalitpur and Bhaktapur Rural Area)

Zone	V.D.C. Name	Population
501	BUNGAMATI	4,618
	CHHAMPI	5,138
	DUKUCHHAP	2,325
	KHOKANA	4,225
	SAINBU	4,717
	TOTAL	21,373
502	BADIKHEL	2,715
	CHAPA GAON	9,626
	DHAPAKHEL	4,568
	JHARUWARASI	3,185
	SUNAKOTHI	5,032
	THECHO	7,144
	TOTAL	32,276
503	BISANKHUNARAYAN	3,878
	GODAM CHAUR	3,881
	GODAWARI	4,753
	HARISIDDHI	4,108
	THAIBA	4,528
	TOTAL	21,148
504	IMADOL	6,503
	LAMATAR	6,333
	LUBHU	7,574
	TIKATHALI	3,942
	SIDDHIPUR	5,284
	TOTAL	29,626
500		104,317

Zone	V.D.C. Name	Population
601	BALKUMARI	8,694
	BODE	6,263
	CHAPACHO	7,754
	LOKANTHALI	4,956
	NAGADESH	4,252
	TOTAL	31,919
602	BALKOT	4,816
	DADHKOT	5,811
	GUNDU	4,775
	KATUNJE	6,127
	SPADOE	4,563
	SIRUTAR	3,899
	TOTAL	29,991
603	BAGESWORI	4,442
	CHIT POL	4,686
	NANKHEL	4,556
	SUDAL	6,065
	TATHALI	4,533
	TOTAL	24,382
604	CHANGUNARAYAN	4,915
	CHHALING	6,782
	DUWAKOT	5,161
	JHAUKHEL	5,424
	NAGARKOT	3,501
	TOTAL	25,783
600		111,975
400 - 600 Total		470,633

LEGEND

--- District Boundary
--- 101 to 604 Traffic Zone

0 500 1000 2000 4000 K.M.

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

KATHMANDU VALLEY
URBAN ROAD DEVELOPMENT
TRAFFIC ZONE IN THE STUDY
AREA

FIG. 2.7

JAPAN INTERNATIONAL COOPERATION
AGENCY (JICA)

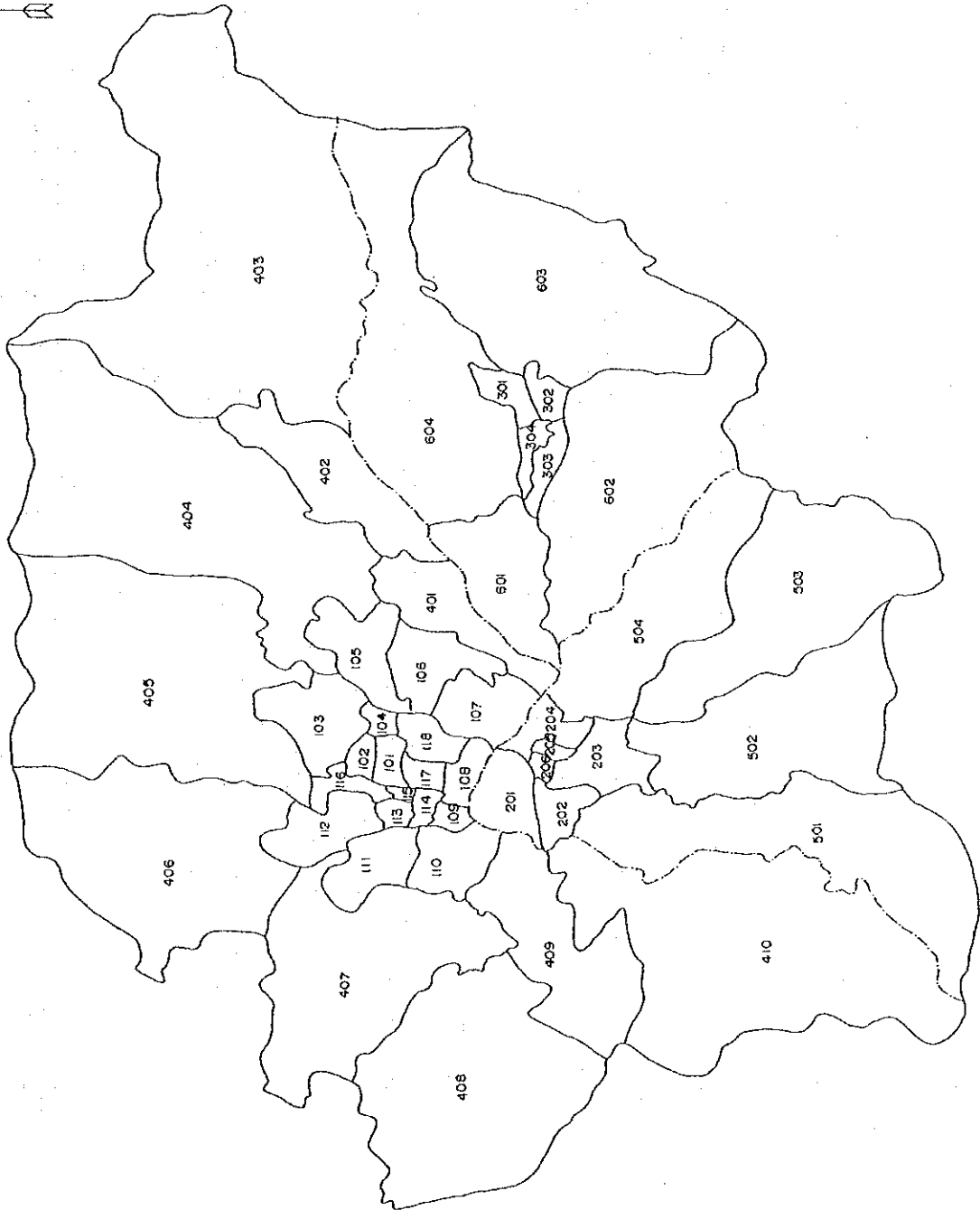
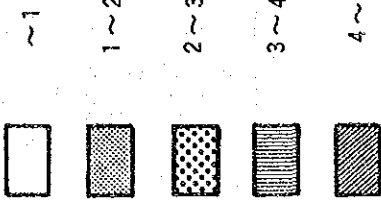


TABLE 2.8 POPULATION GROWTH AND POPULATION DENSITY BY TRAFFIC ZONE

Zone No.	Population		Population Growth (% per Annum)	Area (ha)	Density in 1991 (Persons/ha)
	1981	1991	1981 - 91		
101	7,975	6,691	-1.7	116	57.90
102	5,223	8,288	4.7	82	101.50
103	12,140	29,749	9.4	631	47.10
104	4,317	8,592	7.1	75	114.30
105	18,840	37,380	7.1	578	64.60
106	11,701	24,831	7.8	498	49.90
107	14,657	41,213	10.9	360	114.40
108	5,170	9,983	6.8	173	57.80
109	15,219	20,329	2.9	67	301.40
110	13,520	30,074	8.3	409	73.60
111	8,186	19,491	9.1	435	44.80
112	11,631	20,281	5.7	469	43.20
113	26,211	28,813	1	80	360.40
114	33,910	45,330	2.9	76	599.50
115	16,391	19,190	1.6	29	652.60
116	9,006	19,208	7.9	175	109.70
117	8,787	12,753	3.8	102	125.20
118	15,381	32,068	7.6	216	148.70
201	13,999	25,925	6.4	421	61.60
202	6,533	11,757	6.1	267	44.10
203	7,577	15,300	7.3	474	32.30
204	19,932	28,019	3.5	248	113.20
205	12,454	15,856	2.4	44	357.90
206	19,380	20,346	0.5	48	421.80
301	12,807	16,099	2.3	182	88.50
302	8,036	9,794	2	126	77.60
303	13,921	18,752	3	178	105.60
304	13,708	16,477	1.9	106	155.40
401	6,943	10,985	4.7	752	14.60
402	12,152	15,015	2.1	1,174	12.80
403	23,222	26,878	1.5	6,974	3.90
404	16,069	29,291	6.2	5,252	5.60
405	23,628	36,807	4.5	4,634	7.90
406	21,121	25,886	2.1	3,358	7.70
407	14,228	24,868	5.7	2,812	8.80
408	26,530	31,633	1.8	3,486	9.10
409	24,607	33,674	3.2	1,636	20.60
410	20,335	19,304	-0.5	4,851	4.00
501	18,240	21,273	1.6	3,226	6.60
502	25,550	32,270	2.4	2,663	12.10
503	16,399	21,148	2.6	2,955	7.20
504	24,875	29,626	1.8	2,244	13.20
601	26,076	31,919	2	1,011	31.60
602	25,022	29,991	1.8	3,108	9.60
603	21,639	24,282	1.2	3,628	6.70
604	23,211	25,783	1.1	3,561	7.20
Total	736,459	1,063,222	3.7	63,990	16.60

LEGEND

(Unit = % Per Annum in 1981 - 1991)



0 5000 10000 20000 40000 K.M.

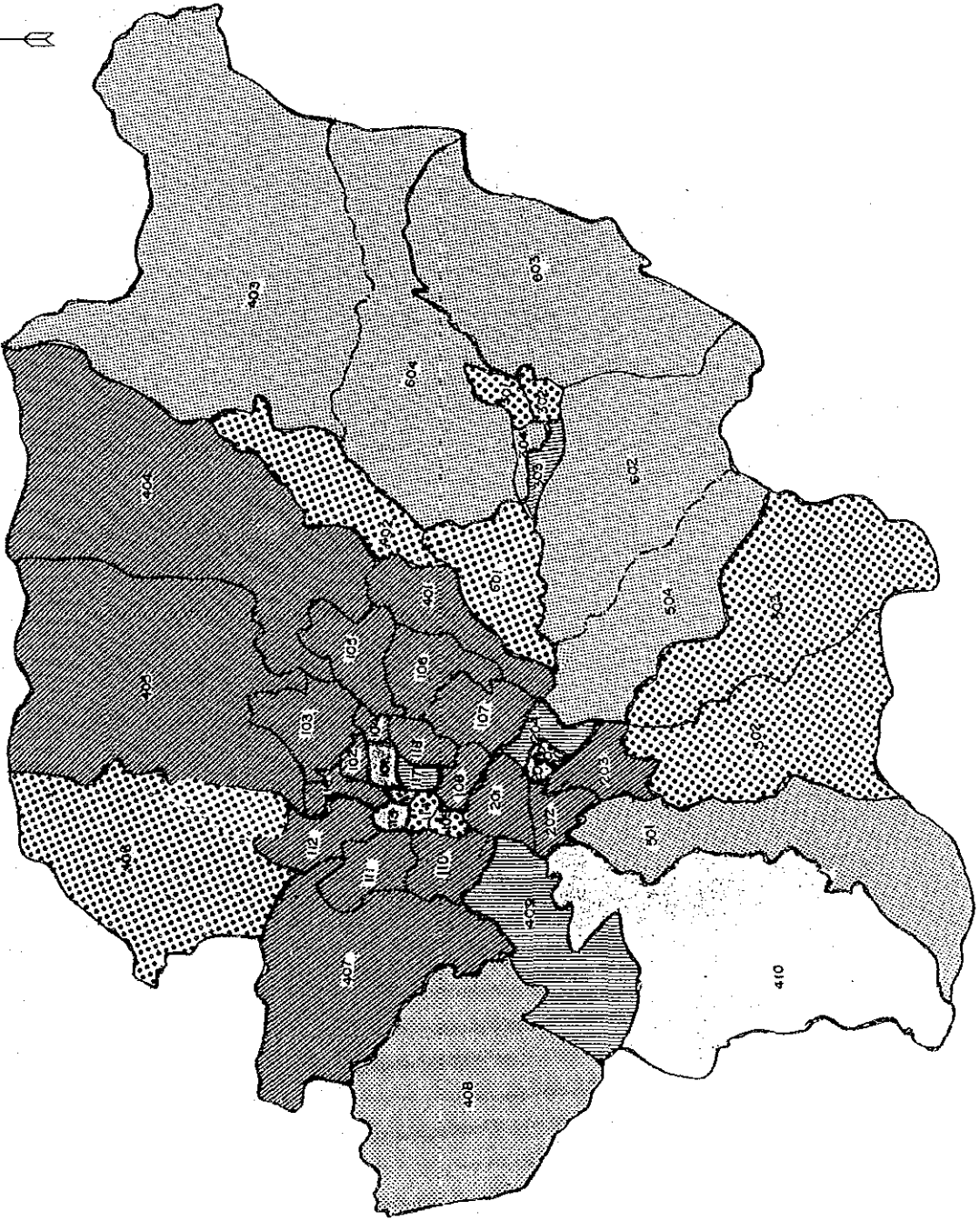
HIS MAJESTYS GOVERNMENT OF NEPAL
(H.M.G)

KATHMANDU VALLEY
URBAN ROAD DEVELOPMENT

POPULATION GROWTH

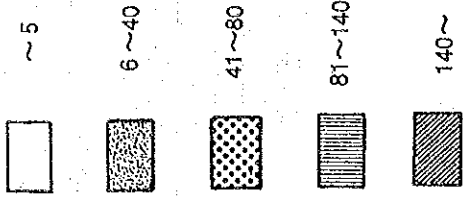
FIG. 2.8

JAPAN INTERNATIONAL COOPERATION
AGENCY (JICA)



LEGEND

(Unit : Persons Per Hectare)



0 200000 300000 400000 M.

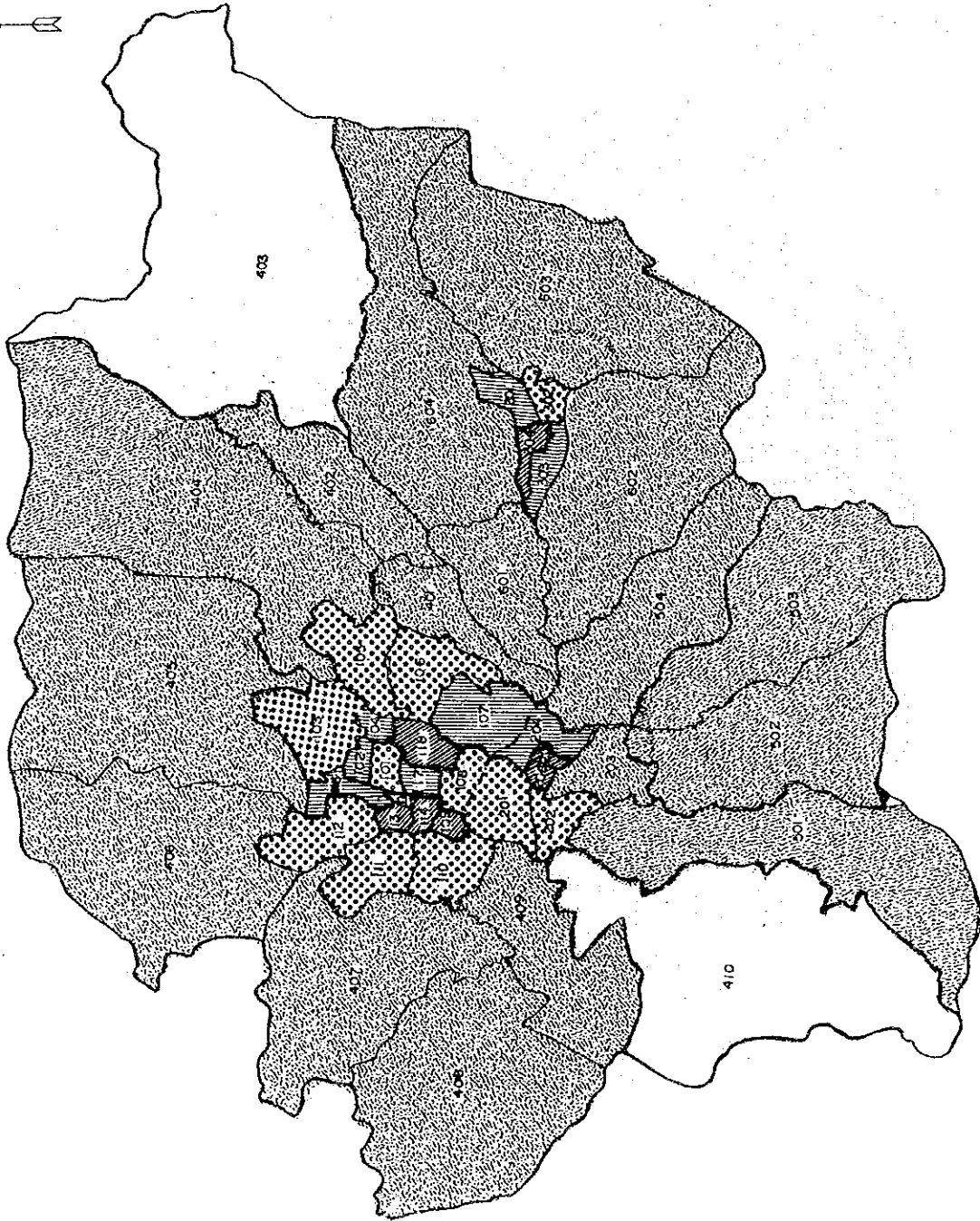
HIS MAJESTY'S GOVERNMENT OF NEPAL
(H.M.G.)

KATHMANDU VALLEY
URBAN ROAD DEVELOPMENT

POPULATION DENSITY (1991)

FIG. 2.9

JAPAN INTERNATIONAL COOPERATION
AGENCY (JICA)



2.2.3 Employment

Table 2.9 shows the employment by sector in 1981. Total employment in the three districts of Kathmandu, Lalitpur and Bhaktapur, which cover a slightly larger area than the Valley, accounts for 330,713. The employment/population ratio is 43.2%. Agriculture sector shares 75.5% of the total employment and followed by personal and business service at 12.0%. The employment in the urban area accounts for 159,633 in 1981 while agriculture sector accounts for 66.6% of the total urban employment.

No sufficient data and information about employment by small area is available. However, according to the socio-economic survey conducted by KVUDPP, 84% of respondents interviewed in urban core areas are engaged in business, service or professional activities while only 8% are in agriculture. In rural area, 37% are engaged in farming. In Bhaktapur urban area, 23% of respondents are engaged in agriculture.

TABLE 2.9 EMPLOYMENT BY SECTOR AND DISTRICT IN 1981

	Agriculture		Mining and		Manufacturing		Electricity		Commerce		Transport		Finance and		Personal and		Industry not		Total
	Forestry and Fishery	Quarrying	Manufacturing	Gas and water	Construction	Commerce	and Commu- nication	Business	Service	Business	Service	Business	Service	Business	Service	Business	Service	Stated	
Kathmandu District *1	132,154	147	3,272	541	426	11,910	1,421	2,471	26,243	5,480	184,065								
Urban *2	71.8 %	0.1 %	1.8 %	0.3 %	0.2 %	6.5 %	0.8 %	1.3 %	14.3 %	3.0 %	100.0 %								
Rural	65,391	14	1,777	309	186	10,151	1,036	2,004	19,403	3,693	103,964								
Lalitpur District *2	66,763	133	1,495	232	240	1,759	385	467	6,840	1,787	80,101								
Urban *2	83.3 %	0.2 %	1.9 %	0.3 %	0.3 %	2.2 %	0.5 %	0.6 %	8.5 %	2.2 %	100.0 %								
Rural	61,163	42	1,511	230	114	3,233	328	707	8,198	1,877	77,423								
Bhaktapur District *1	79.0 %	0.1 %	2.0 %	0.3 %	0.1 %	4.2 %	0.4 %	0.9 %	10.6 %	2.4 %	100.0 %								
Urban *2	25,929	7	750	77	72	2,419	185	467	5,480	858	36,244								
Rural	71.5 %	0.0 %	2.1 %	0.2 %	0.2 %	6.7 %	0.5 %	1.3 %	15.1 %	2.4 %	100.0 %								
Total Kathmandu Valley *1	35,234	35	761	153	42	834	143	240	2,718	1,019	41,179								
Urban *2	85.6 %	0.1 %	1.8 %	0.4 %	0.1 %	2.0 %	0.3 %	0.6 %	6.6 %	2.5 %	100.0 %								
Rural	56,354	11	1,412	76	40	3,809	257	274	5,374	1,618	69,225								
Total Kathmandu Valley *1	81.4 %	0.0 %	2.0 %	0.1 %	0.1 %	5.5 %	0.4 %	0.4 %	7.8 %	2.3 %	100.0 %								
Urban *2	14,988	3	581	14	20	1,634	88	101	1,525	471	19,425								
Rural	77.2 %	0.0 %	3.0 %	0.1 %	0.1 %	8.4 %	0.5 %	0.5 %	7.9 %	2.4 %	100.0 %								
Total Kathmandu Valley *1	41,366	8	831	62	20	2,175	169	173	3,849	1,147	49,800								
Urban *2	83.1 %	0.0 %	1.7 %	0.1 %	0.0 %	4.4 %	0.3 %	0.3 %	7.7 %	2.3 %	100.0 %								
Rural	249,671	200	6,195	847	580	18,972	2,006	3,452	39,815	8,975	330,713								
Total Kathmandu Valley *1	75.5 %	0.1 %	1.9 %	0.3 %	0.2 %	5.7 %	0.6 %	1.0 %	12.0 %	2.7 %	100.0 %								
Urban *2	106,308	24	3,108	400	278	14,204	1,309	2,572	26,408	5,022	159,633								
Rural	66.6 %	0.0 %	1.9 %	0.3 %	0.2 %	8.9 %	0.8 %	1.6 %	16.5 %	3.1 %	100.0 %								
Total Kathmandu Valley *1	143,363	176	3,087	447	302	4,768	697	880	13,407	3,953	171,080								
Urban *2	83.8 %	0.1 %	1.8 %	0.3 %	0.2 %	2.8 %	0.4 %	0.5 %	7.8 %	2.3 %	100.0 %								

*1 : Statistical Year Book of Nepal, 1991