Federal Democratic Republic of Nepal
Department of Roads (DOR)
Kathmandu Valley Development Authority (KVDA)

FEDERAL DEMOCRATIC REPUBLIC OF NEPAL
THE PROJECT ON URBAN TRANSPORT IMPROVEMENT FOR KATHMANDU VALLEY

FINAL REPORT

VOLUME I
PRESENT CONDITIONS

MAY 2017

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

EIGHT-JAPAN ENGINEERING CONSULTANTS INC.
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Volume 1 PRESENT CONDITIONS

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATION

AASHTO-LRFD	American Association of State Highway and Transportation Officials Load and Resistance Factor Design
ADB	Asian Development Bank
ADT	Average Daily Traffic
AGT	Automated Guideway Transit
B/C	Benefit/Cost Ratio
BMC	Bhaktapur Municipality
BRT	Bus Rapid Transit
CAAN	Civil Aviation Authority of Nepal
CBD	Central Business District
CBS	Central Bureau of Statistics
CCNN	Climate Change Network Nepal
CDRC	Central Disaster Relief Committee
CDRMP	Comprehensive Disaster Risk Management Program
CEN	Clean Energy Nepal
CO2	Carbon Dioxide
CWG	Collective Working Group
DDC	District Development Committee
DDG	Deputy Director General
DDMP	District Disaster Management Plan
DDRC	District Disaster Relief Committee
DFID	Department of International Development, UK
DG	Director General
DLRM	Department of Land Reform and Management
DMA	Disaster Management Act
DMA	Disaster Management Act.
DMG	Department of Mines and Geology, MOI
DOA	Department of Agriculture, MOAD
DOE	Department of Environment, MOSTE
DOF	Department of Forest, MOFSC
DOLIDAR	Department of Local Infrastructure Development & Agricultural Roads, MOFALD
DOR	Department of Roads, MOPIT
DORW	Department of Railways, MOPIT
DOTM	Department of Transport Management, MOPIT
DPR	Department of Plant Resource, MOFSC
DPR Plan	Disaster Preparedness and Response Plan
DTMP	District Transport Master Plan
DUDBC	Department of Urban Development and Building Construction, MOUD
DWSS	Department of Water Supply and Sewerage, MOUD
EIA	Environmental Impact Assessment

EIRR	Economic Internal Rate of Returno
ENPHO	Environment and Public Health Organization
EOJ	Embassy of Japan
ESCAP	Economic and Social Commission for Asia and Pacific
ETRN	Emergency Transport Network
F/S	Feasibility Study
FCB	Foreign Co-operation Branch, DOR
FIRR	Financial Rate of Return
FNNTE	Federation of Nepalese National Transport Entrepreneurs
FR	Feeder Road
FRN	Feeder Road Major
FRO	Feeder Road Minor
FS	Feasibility Study
FY	Fiscal Year
GDP	Gross Domestic Product
GESU	Geo-Environmental and Social Unit, DOR
GIS	Geographic Information System
GLD	Guided Land Development
GNDPRP	Guidance Note Disaster Preparedness and Response Planning
GOC	Government of China
GOJ	Government of Japan
GON	Government of Nepal
HCM	Highway Capacity Manual
HDM	Highway Development and Management Model
HGV	Heavy Goods Vehicle
ICD	Inland Clearance Depot
ICIMOD	International Center for Integrated Mountain Development
ICR	Inception Report
IDP	Internally Displaced Person
IEE	Initial Environmental Examination
IMF	International Monetary Fund
IRC	Indian Road Congress
IRR	Inner Ring Road
JICA	Japan International Cooperation Agency
JST	JICA Study Team
KMC	Kathmandu Metropolitan City
KMRTC	Kathmandu Mass Rapid Transit Consortium
KSUTP	Kathmandu Sustainable Urban Transport Project
KUKL	Kathmandu Upatyaka Khanepani Limited
KUTMP	The Project on Urban Transport Improvement for Kathmandu Valley in Federal Democratic Republic of Nepal
KV	Kathmandu Valley
KVBB	Kathmandu Valley Building By-laws

KVDA	Kathmandu Valley Development Authority
KVRIP	Kathmandu Valley Road Improvement Project
KVTDC	Kathmandu Valley Town Development Committee
KVUDPP	Kathmandu Valley Urban Development Plan & Programs
KVWSMB	Kathmandu Valley Water Supply Management Board
LDRMPG	Local Disaster Risk Management Planning Guideline
LHS	Left Hand Side
LP	Land Pooling Program
LRN	Local Road Network
LRT	Light Rail Transit
LSGA	Local Self Governance Act.
LSMC	Lalitpur Sub-metropolitan City
M/P	Master Plan
MGV	Medium Goods Vehicle
MLIT	Ministry of Land, Infrastructure, Transport and Tourism (Japan)
MMI	Modified Mercalli Intensity Scale
MOAD	Ministry of Agricultural Development
MOCTCA	Ministry of Culture, Tourism and Civil Aviation
MOFALD	Ministry of Federal Affairs and Local Development
MOFSC	Ministry of Forest and Soil Conservation
MOHA	Ministry of Home Affairs
MOI	Ministry of Industry
MOLD	Ministry of Local Development (currently under MOFALD)
MOLE	Ministry of Labor and Employment
MOLRM	Ministry of Land Reform and Management
MOMG	Ministry of Mines and Geology (currently under MOI)
MOPE	Ministry of Population and Environment
MOPIT	Ministry of Physical Infrastructure and Transport
MOPPW	Ministry of Physical Planning and Works (currently under MOPIT)
MOSTE	Ministry of Science, Technology and Environment (currently under MOPE)
MOUD	Ministry of Urban Development
MRT	Mass Rapid Transit
MTPD	Metropolitan Traffic Police Department
MWSDB	Melamchi Water Supply Development Board
N.A.C.	Nepal Airline Corporation
N.P.	*Nagar Palica* (Municipality Office)
NAAQS	National Ambient Air Quality Standard
NDC	Nepal Disaster Council
NDRF	National Disaster Response Framework
NEA	Nepal Electricity Authority
NEA	Nepal Engineer's Association
NEFEJ	Nepal Forum of Environmental Journalists
NEOC	National Emergency Operation Center

NESC	Nepal Water Supply Corporation
NH	National Highway
NH	National Highway
NHRA	Nepal Hazard Risk Assessment
NIETTP	Nepal-India Electricity Transmission and Trade Project
NLUP	National Land Use Project
NMP	Non-motorized Transport
NOx	Nitrogen Oxide
NPC	National Planning Commission
NPCS	Nutrition Promotion and Consultancy Services
NPR	Nepal Rupee
NPV	Net Present Value
NRRC	Nepal Risk Reduction Consortium
NRS	Nepal Road Standards
NSC	National Seismological Centre
NSDRM	National Strategy for Disaster Risk Management
NSET	National Society for Earthquake Technology
O&M	Operation and Maintenence
OD	Origin and Destination
ORR	Outer Ring Road
pcu	Passenger Car Unit
PD	Planned Development
PHPDT	Peak Hour Peak Direction Traffic
PID	Project Implementation Directorate, MOUD
PIP	Priority Investment Plan
PIU	Project Implementation Unit
PM10	Particulate Matter 10μm
PRA	Public Road Act.
PT	Person Trip
Pre-FS	Pre-Feasibility Study
QV	Quantity - Velocity
R & D	Research and Development
RBA	Road Board Act.
RBN	Road Board Nepal
RC	Reinforced Concrete
RD	Record of Discussion
RHS	Right Hand Side
ROW	Right of Way
RR	Ring Road
RSA	Road Safety Audit
RSLUP	Risk Sensitive Land Use Planning
RTA	Road Traffic Accidentts
RUC	Road User Cost

RUPSON	Regional and Urban Planner's Society of Nepal
S/C	Steering Committee
SAARC	South Asian Association for Regional Cooperation
SCAEF	Society of Consulting Agricultural and Engineering Firms, Nepal
SCF	Standard Conversion Factor
SEA	Strategic Environment Assessment
SHM	Stakeholder Meeting
SONA	Society of Nepalese Architects
SRN	Strategic Road Network
SSRN	Statistics of Strategic Road Network
T-M Flyover	Tripreshwor Maitighar Flyover
TDA	Town Development Act.
TDC	Town Development Committee
TDF	Town Development Fund
TDPIC	Town Development Plan Implementation Comittee
TIA	Tribhuvan International Airport of Nepal
TOD	Transit Oriented Development
TP	Trend Pattern
TTC	Travel Time Cost
TYIP	Three Years Interim Plan
UNDP	United Nations Development Programme
UNRSC	UN Road Safety Collaboration
VDC	Village Development Committee
VOC	Vehicle Operating Cost
VT	Vehicle Trip
VTMA	Vehicle and Transportation Management Act.
VTMR	Vehicle and Transportation Management Regulations
W/G	Working Group
WB	World Bank

SYNOPSIS

1. Country: Federal Democratic Republic of Nepal

2. Name of the Study: The Project on Urban Transport Improvement for Kathmandu Valley in Federal Democratic Republic of Nepal

3. Counterpart Agency:
   Department of Roads, Ministry of Physical Infrastructure and Transport: DOR
   Kathmandu Valley Development Authority: KVDA

4. Objective of Study : The objective of the study is to contribute to improvement of urban transportation in Kathmandu Valley through establishing Comprehensive Urban Transport Master Plan (Target year: for Short-term; 2020, for Mid-term; 2025, and for Long-term; 2030) and implementation of the pilot project.

5. Scope of Study :

(1) Collection and analysis of related documents and information
(2) Implementation of traffic survey to supplement the 2011 survey
(3) Establishment of comprehensive urban transport master plan with sector programs
(4) Establishment of priority action plan
(5) Implementation of Pilot Project

6. Conclusions and Recommendations

(1) Conclusions
   1) Population in Kathmandu Valley was 2.47 million in 2011 and is projected to be 3.74 million in 2030.
   2) Urbanization is observed concentrically from the city center. The urban area inside the Ring Road is highly populated, while the outskirts are characterized by urban sprawl without sufficient infrastructure.
   3) Vehicle traffic is concentrated in the city center and causes heavy traffic congestion due to the concentric urban structure as well as the radial road network centered in the city center,
   4) The primary public transport means is busses operated by minor entrepreneurs. The existing public transport system is too frail to cope with the ever increasing traffic demand.

(2) Recommendations
   1) There shall be planned and high-density urban area with administrative, industrial, and residential functions developed in the west, south and east of the existing urban area in order to improve the present mono-centric urban structure.
   2) Road network shall be converted into radial-circumferential network by developing Inner Ring Road which serves as detour of the city center and Outer Ring Road which connects newly developed urban areas together with the existing Ring Road.
   3) Radial roads shall be strengthened to connect the existing urban area and the new urban areas.
   4) Public transport system shall also be strengthened since the reinforcement of road network alone cannot meet the increasing traffic demand. To this end, introduction of AGT (Automated Guideway Transit) and BRT (Bus Rapid Transit) which accommodate large amount of passengers is recommended.
   5) The proposed route for AGT is in the north-south axis and west-east axis where the traffic demand is high. BRT shall be developed as the feeder route of AGT.
   6) Commercial and business function shall be developed as well as transfer facility at major terminals of public transport to realize TOD (Transit Oriented Development).
   7) T-M flyover (Tripreshwor-Maitighar Flyover) shall be developed as a short term project to alleviate traffic congestion at the intersections in the city center.

EXECUTIVE SUMMARY

1. BACKGROUND OF THE STUDY

Kathmandu is the capital city and the largest city of Nepal. Kathmandu and surrounding area are called Kathmandu Valley which constitutes the most important political, economic and social center of Nepal. The population of Kathmandu Valley accounts for 9.3% of the entire Nepal's population and is increasing year by year. In 2011, the population of Kathmandu Valley was 2,453,000 and is expected to increase to more than 4 million by the year 2035.

Along with the population increase, the number of registered vehicles including motorcycles increased from 150,000 to 570,000 in the last 10 years, resulting into traffic congestion in the city. Although the government of Nepal is striving to relieve traffic congestion through improvement of the road network including widening of the Ring Road, the traffic infrastructure is still insufficient to cope with the ever increasing traffic volume.

In 1993, Japan International Cooperation Agency (hereinafter referred to as "JICA") conducted a master plan study and formulated a report on "The Study on Kathmandu Valley Urban Road Development" (hereinafter referred to as "1993 M/P"). In accordance with the recommendations in the report, several projects were implemented and this contributed to the improvement of traffic condition in Kathmandu Valley. However, as almost 20 years have passed since 1993 M/P was prepared, the updated urban transport master plan is necessary as a consequence of rapid urbanization and increased traffic volume caused by rapid population growth. In response to the request by the government of Nepal, the Project on Urban Transport Improvement for Kathmandu Valley has been conducted to establish a comprehensive urban transport master plan with a target year 2030 for long term, 2025 for middle term, and 2020 for short term.

2. VISION AND TARGET

The vision of the master plan is envisaged as "establishment of sustainable transport with high mobility, safety, and comfort" with six targets as follows:

[Target 1] Strategic Approach to TOD: Development of urban transport integrated with land use

[Target 2] Sustainability: Decongestion and decreasing travel time to improve the sustainable economic vitality

[Target 3] Impartiality and Universal Design: Ensuring reliable and comfortable public transport which everyone can use

[Target 4] Safety: Reduction of risk by earthquake disaster and traffic accident

[Target 5] Environment: Decreasing environmental burden such as sir pollution

[Target 6] Culture: Preservation and utilization of the heritage

3. URBAN STRUCTURE PLAN ALTERNATIVES

3.1. Future Framework

The estimated future population of Kathmandu Valley is shown in Table 1 below, which was estimated based on "National Population and Housing Census 2011 (Population Projection 2011-2031)", Central Bureau of Statistics, 2014.

Table 1 Future Population Framework of Kathmandu Valley by District

	2011	2020	2025	2030
Lalitpur	424,627	530,000	581,000	627,000
Bhaktapur	304,651	370,000	402,000	431,000
Kathmandu	1,744,240	2,240,000	2,476,000	2,686,000
Total	2,473,518	3,140,000	3,459,000	3,744,000

Source: JICA Study Team (JST)

3.2. Issues in Present Urban Structure

Major issues originated by the present urban structure are described as follows:

1) Mono-centric concentration to existing city center

Major function of Kathmandu Valley is concentrating to city center. As a result, person's movement and vehicle movement are concentrating to city center area and causing heavy traffic jam.

2) High population concentration inside the Ring Road

Most of the areas inside the Ring Road have very high density and population is still increasing. Considering the vulnerability to disaster, control for population increase is required.

3) Disorderly sprawling built-up area

Built-up areas crawled over a large area outside the Ring Road without plans for certain road network expansions because development of infrastructure cannot catch up extensive low density urbanization.

4) Serious inroads to conservation area

Due to the uncontrolled urban sprawl, urban area is making inroad into old settlements, forest, agricultural land and river bank.

5) Mono-centric radial road network

Existing road network system in Kathmandu Valley is basically radial road network system. This system accelerates the congestion in city center and traffic passing through city center cannot divert city center.

6) Unorganized public transport system

Existing public transport is operated by small entities haphazardly. Improvement of operation control

3.3. Basic Policy for Structure Plan

Based on the vision and the target, and considering the existing issues, the basic policy for structure plan is illustrated as follows:

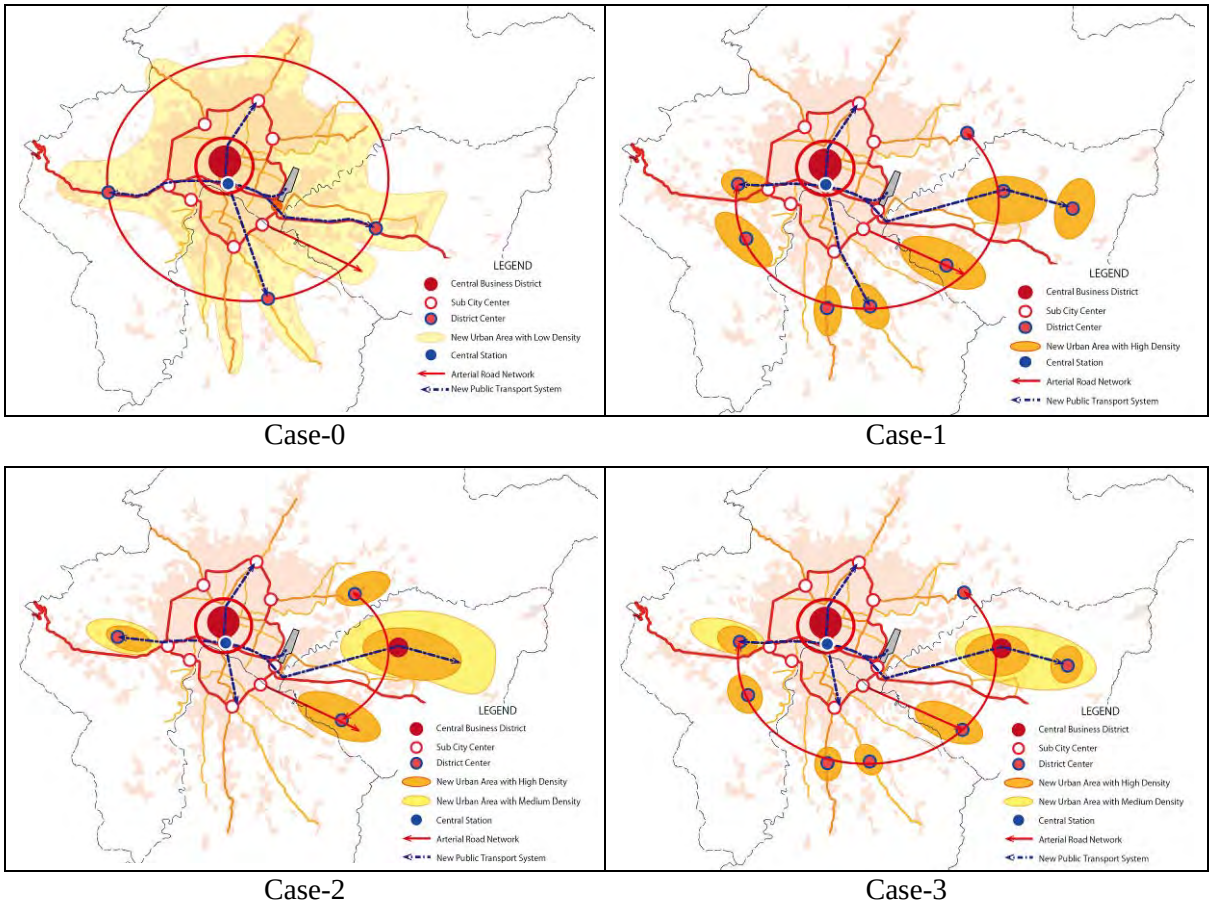
1) Clear demarcation between urban and agricultural land, and protection of conservation area
2) Development of planned high density new urban areas and prevention of low density expansion
3) Decentralization of urban function in the Valley
4) Creation of sub-centers in new developed urban area
5) Transit Oriented Development (TOD)
6) Strengthening Disaster Preventive Development
7) Strengthening transportation network with public transport system
8) Diversion of radial road network system to radial-circumferential road network system
9) Development of arterial corridor connecting urban areas

3.4. Urban Structure Alternatives and Evaluation

Four urban structure alternatives have been established considering socio-economic framework, land use trend, and land constraints. Case 3 was selected as the definitive urban structure through a number of discussions.

Table 2 Urban Structure Alternatives

	Urban Structure	Road Network	Public Transport
CASE 0	1 Central Business District 7 Sub City Centers 3 District Centers	Develop the whole outer ring road	Develop north-south and east-west direction
CASE 1	1 Central Business District 8 Sub City Centers 8 District Centers	Develop the outer ring road except the northern part	Develop north-south and east-west direction Extend to the east district center
CASE 2	2 Central Business District 8 Sub City Centers 3 District Centers	Develop the outer ring road only the eastern part	Develop north-south and east-west direction Extend to the east district center
CASE 3	2 Central Business District 8 Sub City Centers 7 District Centers	Develop the outer ring road except the northern part	Develop north-south and east-west direction Extend to the east district center



Case-0 Case-1

Case-2 Case-3

Figure 1 Urban Structure Alternatives

4. COMPREHENSIVE URBAN TRANSPORT MASTER PLAN

The comprehensive urban transport master plan comprises eight sector programs, namely 1) Land Use Plan, 2) Road Plan, 3) Public Transport Plan, 4) Traffic Demand Management, 5) Logistic Plan, 6)

Traffic Safety Plan, 7) Non-Motorized Traffic Plan, and 8) Disaster Management Plan. Outline of Land Use Plan, Road Plan, Public Transport Plan and Disaster Management Plan is shown below.

4.1. Land Use Plan

The commercial and administrative functions in the existing city centre shall be strengthened along with improvement of public transport system. New urban areas shall be developed in constraint free area along the Outer Ring Road to accommodate increasing population in the Valley. Besides, certain urban functions shall be relocated from the city centre to the new urban areas to ease congestion in the centre. Figure 2 below illustrates the proposed new urban areas.

The land use plan in new urban areas has been formulated based on the following policy:

1) Layout new municipality offices at each new urban area;
2) Conservation of water course and the buffer area;
3) Arrangement of large-scale green parks;
4) Arrangement of commercial and business areas, and high-density residential areas along main road; and
5) Adoption of TOD concept with AGT and BRT.

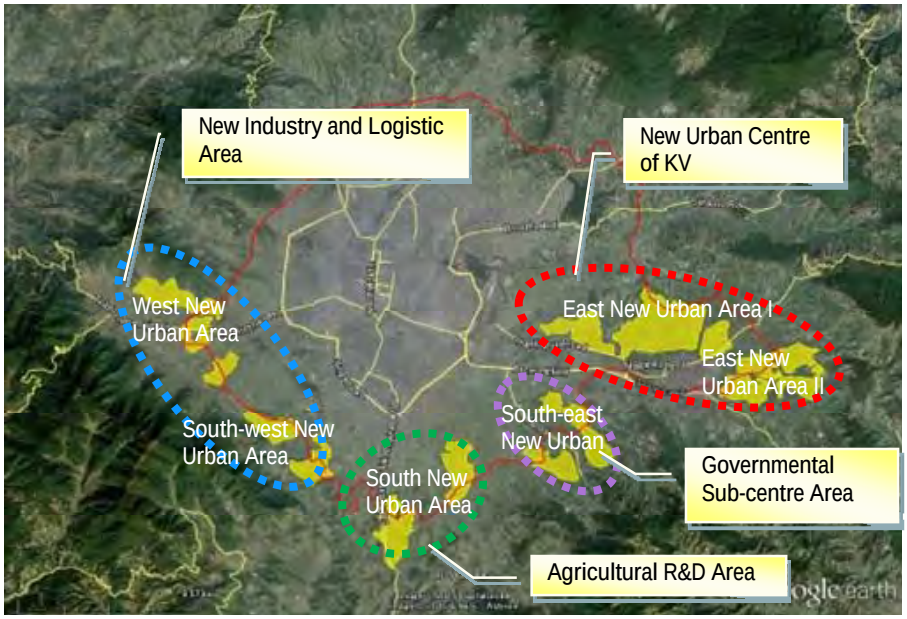


Figure 2 Proposed New Urban Areas

4.2. Road Plan

Since further road development such as new construction inside the densely built-up CBD area will be quite difficult, the concept is to change the current traffic flow to the decentralized traffic flow by diverting the traffic demand to the newly proposed sub-centers. Figure 3 below shows the proposed road network based on the definitive urban structure.

The overall policy for road plan is set as follows:

1) Coordination with Urban Land Use Plan
- Systematic road distribution to new urban area.
- Securement of road space for primary public transport route

2) Improvement of Network System
- Conversion to radial-circumferential system from radial system
- Development of Inner Ring Road

3) Reinforcement of Road Capacity
- Widening of roads where capacity is required.

- Development of off road parking, bus and truck depot.

4) Improvement of bottle-neck
- Installation of bridges.
- Improvement of intersections.
- Improvement of river crossing

5) Provision of appropriate road facilities including cross section
- Signals
- Pedestrian signals/pedestrian bridges
- Road cross section with appropriate pedestrian way/bike lane and motorcycle lane.

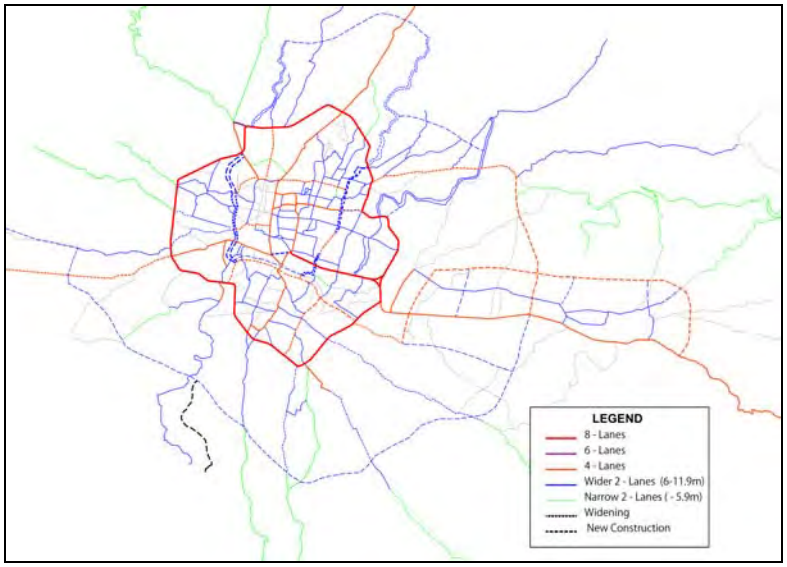


Figure 3 Proposed Road Network

4.3. Public Transport Plan

Public Transport Plan has been formulated based on five strategies that are:

1) Reorganization of bus operation,
2) Installation of new public transport with high capacity and exclusive space such as BRT and AGT,
3) Improvement of road network for bus route,
4) Promotion of TOD, and
5) Promotion of NMT.

The figure below presents the conceptual plan of future public transport network.

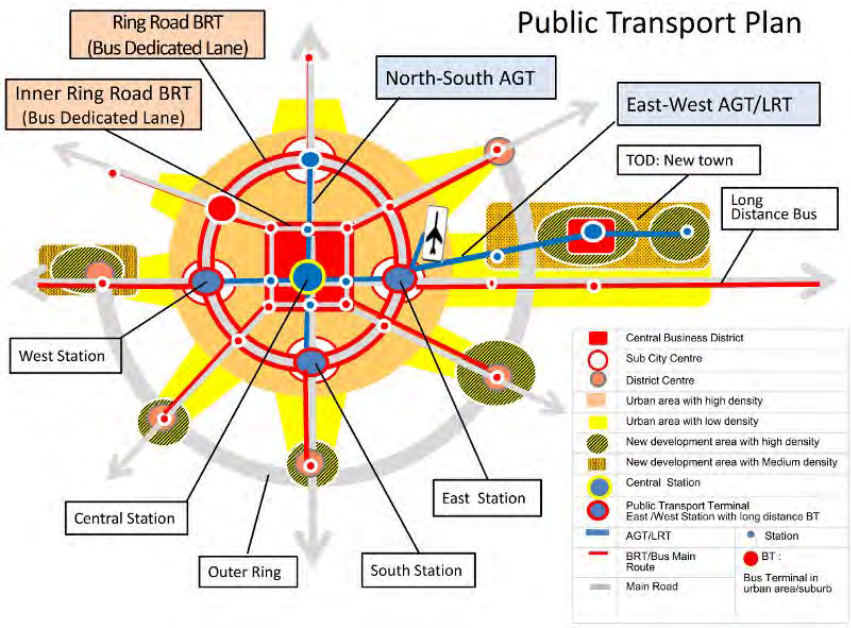


Figure 4 Future Public Transort Network

JST proposes AGT and BRT to be introduced as a new public transport on the routes as shown in Table 3 below.

Table 3 Proposed AGT and BRT Lines

Line No.	Mode	Structure	Length	Nos. of Station	Caracteristic	Route
Line 1	AGT	Viaduct	11.9	12	North South Corridor	Narayan Gopal Chowk – Lainchaur – Thamel – KTM Central Station – Trispreswar – Thapathali – Jawarkhel – Satdobato
Line-2	AGT	Viaduct	13.8	13	East West Corridor Airport Rail Link	Kalanki – Kalimati – Trispreswor – KTM Central Station – New Baneswar – Tinkune – Tribuban International Airport
Line-3	BRT	At Grade	27.4		Ring Road	Tinkune – Koteshwor – Satdobato – Kalanki – Swayanbu – Gonbabu – Narayan Gopal Chowk – Airport – Tinkune
Line-4	BRT	At Grade Viaduct	13.2		Inner Ring Road	Lainchaur – Biuli Bazar – Thapathali – Thankeshwor – Lainchaur
Line-5	BRT	At Grade	8.6		Proposed New South-East Road	Dobi Khola – Amarbati Marg – Anantalingeshwor Sub Center
Total			74.9			

4.4. Disaster Management Plan

Figure 5 below presents the Emergency Transport Road Network (ETRN) proposed based on the existing plans and facilities.

The emergency transport road is classified as follows:

1) National Emergency Road (NER: Ring Road, Arniko Highway, Tribhuvan Highway)
- Over 20 m width
- Even if a big earthquake occurs, two or more lanes are secured.
- Big hospitals and heavy equipment base are located along National Emergency Road

2) First Emergency Transportation Road (FER)
- First Emergency Transportation Roads are connected with big hospitals, government offices, collages (universities), open spaces, warehouses and airport.
- At the large earthquake, maximum 2 lane spaces are secured.
- Over 12m width is proposed.
- Big hospitals, open space, fire stations are connected to NER and FER network.

3) Second Emergency Transportation Road
- The function of Second Emergency Transportation Road is to complement First Emergency Transportation Road.
- Recommended Road width of Second Emergency Transportation Road is 8m.

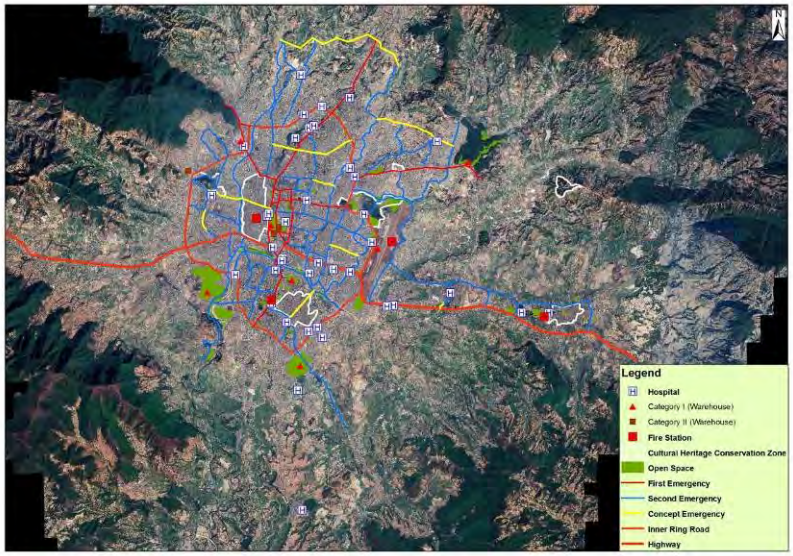


Figure 5 Emergency Transport Road Network

5. STAGING PLAN

Staging plan is divided into three phases, namely short term (-2020), middle term (2021-2025), and long term (2026-2030) as shown in the figure below.

	Short Term (-2020)	Middle Term (2021-2025)	Long Term (2026-2030)
Target	・ Strengthening of institutional framework for planned development ・ Solving urgent issues ・ Commencement of disaster prevention measures	・ Implementation of priority projects. ・ Establishment of all the systems necessary for achieving the long term target	・ Establishment of sustainable transport with high mobility, safety and comfort
Land Use	・ Selection of pilot urban development area and Implementation. ・ Enforcement and diffusion of land pooling system. ・ Establishment of strict building and development control system.	・ Development of priority urban area with land use control and building control. ・ Implementation of land pooling system by PPP scheme.	・ Development of all the new urban area. ・ Equipping necessary roads and open spaces in urbanized area.
Road	・ Implementation of emergency projects including improvement of Bottlenecks. ・ Establishment of system for land acquisition in densely inhabited areas.	・ Development of priority arterial roads. ・ Development of roads by established land acquisition system.	・ Development of all the roads proposed by MP
Public Transport	・ Institutional reinforcement of public transport management ・ Restructuring of bus routes including pilot route project.	・ Introduction of BRT to primary corridor. ・ Establishment of organization for operation of new public transport system.	・ Introduction of rail transit system. ・ Development of area around terminals of rail transit system.

Figure 6 Outline of Staging Plan

6. FINANCIAL AND ECONOMIC ANALYSIS

The result of the economic evaluation is shown in Table 4 below. Case 1 indicates implementation of road development and Case 2 indicates implementation of both road and public transport development. The result shows the both cases are economically feasible with a value of EIRR higher than the opportunity cost of capital (>12%), B/C ratio higher than 1.0, and positive value of NPV (>0).

Table 4 Result of Economic Analysis

	Case 1	Case 2
1) Economic Internal Rate of Return (EIRR)	14.7%	17.4 %
2) Benefit/Cost Ratio (B/C)	1.26	1.35
3) Net Present Value (NPV), in million NRs	11,058.6	27,119.4

Note: Case 1: implementation of road development
Case 2: implementation of road and public transport development

Financial analysis is conducted for public transport project (AGT and BRT) which generates revenues. The Financial Internal Rate of Return (FIRR) is not computed (lower than 0%) since investment cost is high, but the yearly Operation and Maintenance (O&M) cost is covered by the revenue. Thus Government of Nepal needs financial assistance for investment cost. However the result of economic evaluation for installation of new public transport indicates it is feasible, and there is benefit by installation of new public transport system.

7. STRATEGIC ENVIRONMENTAL ASSESSMENT

Four urban structure alternatives have been evaluated by SEA method considering physical environment, natural environment and social environment, based on JICA Guidelines for Environmental and Social Considerations, 2010.

Table 5 Assessment of Urban Structure Alternatives

Case	Physical Environment		Natural Environment		Social Environment	
CASE 0	B-	The air pollution, noise pollution and vibration in urban area may become more serious. The emission of greenhouse gas can increase due to traffic congestion, urbanizing farmlands.	A-	Due to outer ring road development, Shivapuri-Nagarjun National Park will be altered. The function of watershed in north-west and west area may deteriorate due to sprawl of urban area.	B-	The scale of involuntary resettlement due to the development of the outer ring road will be relatively large. Involuntary resettlement will occur due to the development of arterial road network.
CASE 3	B+	The air pollution, noise pollution and vibration in urban area may be alleviated. The smoother traffic and introduction of public transport will contribute to reduction of greenhouse gas emissions.	D	There is no alternation to Shivapuri-Nagarjun National Park No development at rich watershed will be observed.	B-	Involuntary resettlement will occur due to the development of the outer ring road, arterial road network and new public transport system.

A+/-: Significant positive/negative impact is expected.
B+/-: Positive/negative impact is expected to some extent.
C+/-: Extent of positive/negative impact is unknown.
(A further examination is needed, and the impact could be clarified as the study progresses)
D: No impact is expected.
Source: JST

8. PILOT PROJECT

8.1. Background

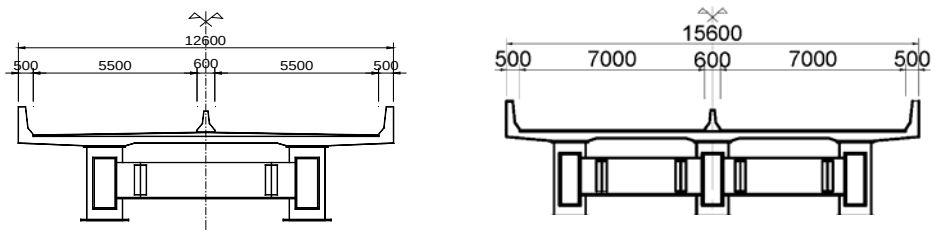
Thapathali intersection is one of the most saturated intersections in Kathmandu Valley since most of the traffic with north-south direction and east-west direction is forced to pass through the intersection. Moreover, connection of Arniko Highway (National Road H03) and Tribhuvan Highway (National Road H02) is missing between Maitighar intersection and Tripureshwor intersection. Hence, connecting Tripureshwor intersection and Maitighar intersection is proposed in the Master Plan, and Pre-Feasibility Study (Pre-FS) on Tripureshwor - Maitighar Flyover (T-M Flyover) is selected as a Pilot Project of the Study.

8.2. Preliminary Design

(1) Number of Lanes

Flyover is semi-permanent structure with service life more than 50 years. Although number of lanes by future traffic demand in 2030 is two, considering the traffic increase during service life, Pre-FS for two-lane flyover and four-lane flyover are conducted.

(2) Typical Cross Section



(Two lanes) **(Four lanes)**

Source: JST

Figure 7 Typical Cross Section of Flyover

(3) Horizontal Alignment

Source: JST

Figure 8 Horizontal Alignment of T-M Flyover (Two-lane Case)

(4) Project Cost

Figure 9 Project Cost of T-M Flyover

Million NRS

	Two lane flyover	For-lane flyover
Construction cost	5,319	6,508
Physical Contingency	532	651
Administration cost	27	33
Land acquisition Cost	884	1,102
Building Compensation Cost	481	917
Engineering Services	532	651
VAT	1,011	1,282
Project Cost	8,785	11,142

Source: JST

CHAPTER 1 INTRODUCTION

1.1 Background of the Study

Kathmandu is the capital city and largest city of Nepal. Kathmandu and surrounding area are called Kathmandu Valley which constitutes the most important political, economic and social center of Nepal. The population of Kathmandu Valley accounts for 9.3% of the entire Nepal population and is increasing year by year. In 2011, the population of Kathmandu Valley was 2,453,000. The population is expected to increase to more than 4 million by the year 2035.

Along with the population increase, the number of registered vehicles including motorcycles increased from 150,000 to 570,000 in the last 10 years, resulting into traffic congestion in the city. Although the government of Nepal is striving to avoid traffic congestion through improvement of the road network including widening of the Ring Road, the traffic infrastructure is still insufficient to cope with the ever increasing traffic volume.

In 1993, Japan International Cooperation Agency (hereinafter referred to as "JICA") conducted the Master Plan study and formulated "The Study on Kathmandu Valley Urban Road Development" (hereinafter referred to as "1993 M/P"). In accordance with the recommendations in the report, several projects were implemented and this contributed to the improvement of traffic condition in Kathmandu Valley. However, as almost 20 years have passed since the Master Plan was prepared in 1993, the updated Urban Transport Master Plan is necessary as a consequence of rapid urbanization and increased traffic volume caused by rapid population growth.

The Government of Nepal (hereinafter referred to as "GON") requested the Government of Japan (hereinafter referred to as "GOJ") to implement "Data Collection Survey on Traffic Improvement in Kathmandu Valley (hereinafter referred to as "Data Collection Survey") in 2012. Subsequently "The Detailed Planning Survey on Traffic Improvement in Kathmandu Valley (hereinafter referred to as "Detailed Planning Survey") was conducted in 2013 followed by the Record of Discussion (RD) agreed upon between Department of Roads (DOR), Kathmandu Valley Development Authority (KVDA) and JICA on 6 August, 2013 for the implementation of the project.

1.2 Outline of the Study

(1) Objectives of the Project

The objective of the project is to establish a comprehensive urban transport master plan in Kathmandu Valley that shall be approved and implemented by the GON.

(2) Expected Outcomes

- Establishment of a comprehensive urban transport master plan. (Target year: long term – 2030, Mid-term – 2025 and Short term – 2020).
- Implementation of a pilot project.
- Capacity development of relevant agencies to monitor, maintain and update the Master Plan.

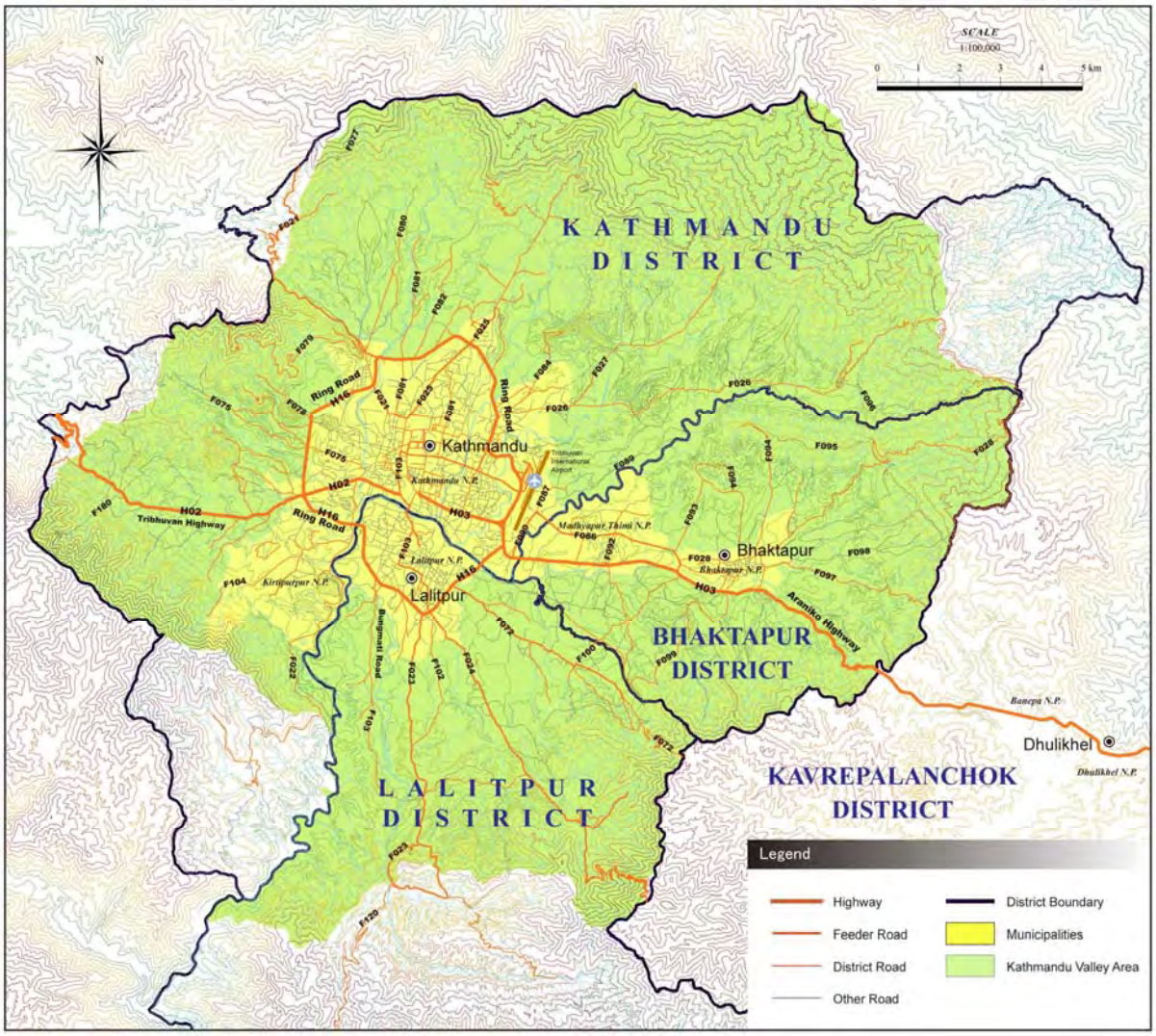
(3) Abbreviation of the Project

The abbreviation of The Project on Urban Transport Improvement for Kathmandu Valley in Federal Democratic Republic of Nepal is **KUTMP**.

1.3 Project Area

The project area, Kathmandu Valley, is shown in Figure 1.3.1. Kathmandu Valley comprises three districts including five municipalities as follows:

1) Greater part of Kathmandu District including Kathmandu Metropolitan City and Kirtipur Municipality,
2) About a third of Lalitpur District including Lalitpur Sub-metropolitan City, and
3) All of Bhaktapur District including Bhaktapur Municipality and Madiyapur Thimi Municipality.



Source: JICA Study Team (JST)

Figure 1.3.1 Study Area

1.4 Organizational Arrangements

For the implementation of the Project, the following organizational setting is established.

(1) Overall Organizational Arrangements

The major counterparts of the Project are Department of Roads (DOR), Ministry of Physical Infrastructure and Transport (MOPIT) and Kathmandu Valley Development Authority (KVDA), Ministry of Urban Development (MOUD). Figure 1.4.1 shows the organization structure of the study.

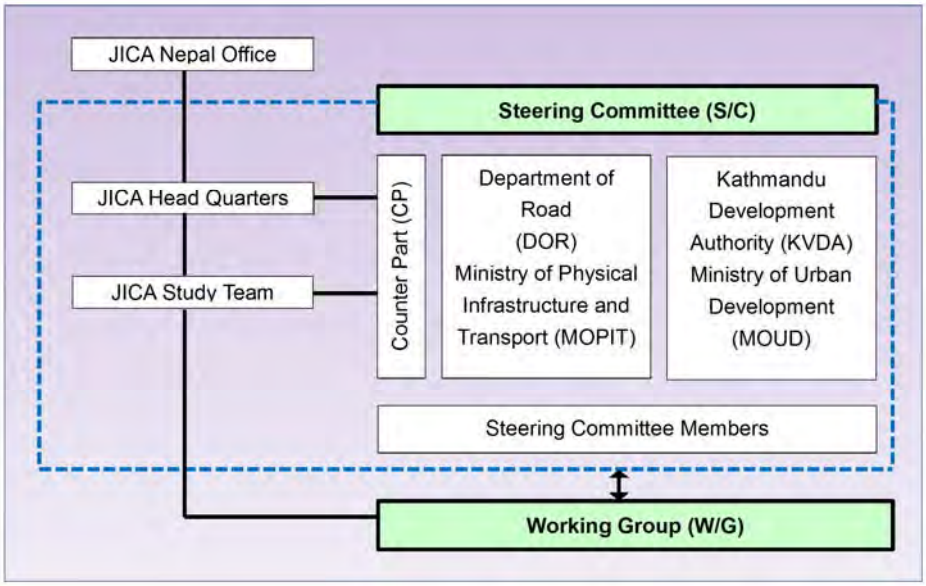


Figure 1.4.1 Organization of the Project

1) Steering Committee (S/C)

S/C is the high level decision making body composed of relevant government agencies represented by Joint Secretary Level. Members of S/C are as follows:

Chairperson	Secretary, Ministry of Physical Infrastructure and Transport (MOPIT)
Co-chairperson	Development Commissioner, Kathmandu Valley Development Authority (KVDA), Ministry of Urban Development (MOUD)
Members	MOUD Ministry of Science, Technology and Environment (MOSTE) Ministry of Federal Affairs and Local Development (MOFALD) Ministry of Land Reform and Management (MOLRM) Kathmandu Valley Development Authority (KVDA), MOUD Department of Road (DOR), MOPIT Department of Railways (DORW), MOPIT Department of Transport Management (DOTM), MOPIT Department of Urban Development and Building Construction (DUDBC), MOUD Metropolitan Traffic Police Division (MTPD) Japan International Cooperation Agency (JICA) Embassy of Japan (EOJ) (Observer)

In total, seven Steering Committee meetings were held for the discussion of the project. Outline of Steering Committee meeting is shown in Table 1.4.1.

Table 1.4.1 S/C Meeting Record

Date	Agenda	Participants
August 29, 2014 MOPIT	Inception Report Discussion • Remarks from JICA Chief Representative, Nepal • Explanation of Inception Report • Discussion - The approach, work items and study schedule in the ICR were agreed by the SC - The government is considering forming new municipalities in Kathmandu Valley. The study has to incorporate the new municipalities.	• MOPIT • MOUD • KVDA • MTPD • DOR • DORW • JICA • Embassy of Japan (EOJ) (Observer)

	- Members and organization of Working Group were agreed by SC. • Closing remarks by chairperson	14 Members
December 21, 2014 MOPIT	Structure Plan Discussion • Explanation of Structure Plan • Discussion - Structure Plan Case 4 is agreed as the future urban structure. - Effective policies and tools to guide private sectors shall be established. - Urban delineation line shall be established to control urbanization. - The proposal made by JST is consistent with the "20 years Strategic Development Master Plan (2015-2035) for Kathmandu Valley". • Closing Remarks by chairperson	• MOPIT • MOUD • KVDA • DOR • MTPD • JICA • EOJ (Observer) 11 Members
March 30, 2015 MOPIT	Study Progress Discussion • Explanation of urban management measure. • Explanation of emergency transport road network • Explanation of road network • Explanation of public transport network • Explanation of proposed pilot project • Discussion - Alignment of T-M flyover should be planned considering AGT alignment. - Study team need to focus on discouragement and control of land fragmentation. - The proposed taxation system shall be further studied by GON. - The series of discussion by SC and WG are important to obtain consensus among relevant organizations. - The policies and tools for the implementation of urban development plan will be further discussed by the sub-committee. • Closing Remarks by chairperson	• MOPIT • MOUD • KVDA • MOSTE • DOR • DOTM • DORW • JICA 15 Members
March 18, 2016 MOPIT	Pilot Project Discussion • Explanation on selection of Pilot Project • Explanation on scope and schedule for Pre-FS on T-M Flyover • Explanation on alternative route for T-M Flyover • Discussion - Option-2 over the existing Thapathali road and Tripura Marg shall be eliminated from options because of difficulty in construction. - Remaining two options shall be examined in detail. - JST should provide necessary document for the higher rank discussion. • Closing Remarks by chairperson	• MOPIT • KVDA • MOUD • DOR • DUDBC • MTPD • JICA 13 Members
June 27, 2016 MOPIT	Pilot Project Discussion • Explanation on Plan Options • Explanation on preliminary engineering design and cost estimates • Explanation on traffic analysis • Explanation on economic analysis • Explanation on environmental social consideration • Discussion - Flyover with median is recommendable option. - Pedestrian movement should be taken into account. - T-M flyover with two lane and median is appropriate option. • Closing remark by chairperson	• MOPIT • KVDA • MOUD • DOR • DORW • DUDBC • JICA • PRNE (Observer) 16 Members
December 18, 2016 MOPIT	Pilot Project (KB Road seismic reinforcement and T-M Flyover) Discussion • Explanation on seismic reinforcement of KB Road • Explanation on T-M flyover with four lanes • Explanation on entire schedule of the project	• MOPIT • KVDA • MOUD • DOR • DORW

	• Discussion - Project site is known to be in heavy traffic condition. Appropriate traffic management is required. - Sheet piles for the reinforcement of KB road are good solution. - Introduction of signals to intersection is prudently discussed. Consensus among all stakeholders is required. - Possibility for additional access to T-M Flyover needs to be assessed in the detailed study. - Improvement of other intersections in Kathmandu Valley is needed based on judicious study.	• DUDBC • MTPD • KSUTP • JICA 16 Members
February 15, 2017 MOPIT	Draft Final Report Discussion - Target year of the study seems to be short. Measures for longer validity of Master Plan are required. - Applicability of cable car should be mentioned in the report. - Outer Ring Road is also in the process of development based on land pooling system. All such developments need to be considered. - GON will try to follow the outcome of the study as much as possible as way forward.	• MOPIT • KVDA • MOUD • DOR • DORW • KSUTP • MTPD • MOF • JICA 18 Members

2) Working Group (W/G)

W/G is organized to harmonize the relevant ministries/departments and to prepare report for presentation to S/C. Members of W/G are persons in charge from the following organizations:

Chairperson	Secretary, MOPIT
Co-chairperson	Development Commissioner, KVDA, MOUD
Members	Ministry of Science, Technology and Environment (MOSTE)
	Ministry of Land Reform and Management (MOLRM)
	Physical Development Section, KVDA
	Public Private Partnership, Heritage and Environment, KVDA
	Planning and Design Unit, DOR
	Road and Traffic Unit, DOR
	Geo-Environmental and Social Unit (GESU), DOR
	Department of Railway (DORW), MOPIT
	Department of Transport Management (DOTM), MOPIT
	Physical Planning and Urban Infrastructure Section, MOUD
	Physical Planning and Urban Development Section, DUDBC
	Environmental Section, DUDBC
	Metropolitan Traffic Police Division (MTPD)
	Social Statistics Division, Central Bureau of Statistics (CBS)
	Kathmandu Metropolitan City (KMC)
	Lalitpur Sub Metropolitan City
	Bhaktapur Municipality
	Kirtipur Municipality
	Thimi Municipality
	Foreign Co-operation Branch (FCB), DOR

Since the range of subjects discussed in W/G cover various field of land use and transport, W/G is divided into four thematic W/G. Organization structure of thematic W/G is shown in Figure 1.4.2.

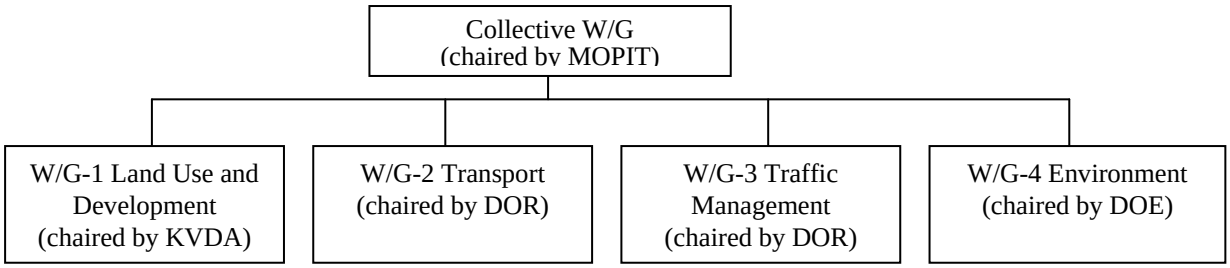


Figure 1.4.2 Organization Composition of Working Group

Under the W/G organization structure, four collective W/G meetings and seventeen thematic W/G meetings were conducted. Summary of agenda and discussion is shown in Table 1.4.2, Table 1.4.3, Table 1.4.4 and Table 1.4.5.

Table 1.4.2 Collective W/G Meeting Record

Date	Agenda	Participants
November 19, 2014 MOPIT	• Explanation of Agenda - Outline of Study - Issues and themes of Transport - Issues and themes of Land Use • Discussion - The reason for ineffectiveness of past policies and measures shall be analyzed. - Discussion of the procedure for obtaining building permits is needed.	• MOPIT • DOR • GESU, DOR • DORW • DOTM • KVDA • DUDBC, MOUD • DOE, MOSTE • MOUD • MOFALD • CBS • MTPD • KMC • Bhaktapur Municipality • Kirtipur Municipality • M. Thimi Municipality 27 Members
November 24,2014 MOPIT	• Explanation on guidelines for discussion in thematic Working Group • Discussion - Densely inhabited area should be given first priority. - Road width definition is required for future growth area. - ORR is recommended to be constructed only on the southern part. - TOD and nodes development need to be considered. - National Land Use Project has produced Land Zoning Maps. Their main objective is to preserve agricultural land.	• MOPIT • DOR • DOTM • KVDA • DUDBC • MOFALD • Kirtipur Municipality • Society of Consulting Agricultural and Engineering Firms (SCAEF) 14 Members
December 14, 2014 MOPIT	• Explanation on W/G discussion conclusion • Discussion - Structure Plan Case 4 is agreed for the future urban structure - More detailed Land Use Plan and strategic implementation method shall be discussed. - Strategic Development Master Plan (SDMP) will be authorized by the government within two months. It is expected this MP will be authorized as part of the SDMP	• MOPIT • DOR • KVDA • MOUD • DUDBC • CBS • KMC • Bhaktapur Municipality • M. Thimi Municipality 20 Members
March 19, 2015 MOPIT	• Explanation on urban management measure for appropriate urbanization control and urban development. • Explanation on Emergency Road Network. • Explanation on road network and public transport network. • Explanation on Pilot Project Candidate. • Discussion - Implementation plan for short term and mid-term is	• MOPIT • DOR • KVDA • GESU, DOR • DOTM • DUDBC • KMC

	required to discuss the priority project. - More discussion on Pilot Project Candidate is needed.	• M. Thimi Municipality • Bhaktapur Municipality • Kirtipur Municipality 13 Members

Table 1.4.3 W/G-1 (Land Use and Development) Meeting Record

Date	Agenda	Participants
November 14, 2014 KVDA	• Explanation on Scope and Theme of W/G-1, and issues of Land Use. • Discussion - Area of KV is limited; therefore transformation of existing urban area to high density is also required. - Various MPs exist, coordination is needed. - Appropriate population density should be analyzed. - Long term plan considering disaster risk is needed.	• KVDA • MOUD • DUDBC • MOFALD • CBS • KMC • Bhaktapur Municipality • Society of Nepalese Architects (SONA) • SCAEF • Regional and Urban Planner's Society of Nepal (RUPSON) 19 Members
November 21, 2014 KVDA	• Explanation on future land use constraints and possible urbanization area • Discussion - New urbanization area needs criteria. - For the new planned city, suitability, vulnerability to disaster should be considered. - Relocation of government offices might not been decided at the policy level. - Some service centers need to be established to decrease the flow of people to city center. - Creation of land bank is most required.	• KVDA • DOR • MOUD • DUDBC • MOFALD • MOLRM • KMC • Bhaktapur Municipality • Kirtipur Municipality • SONA • SCAEF 17 Members
November 28, 2014 KVDA	• Explanation on three subjects - Urban control with taxation system - Findings of Land Pooling system - Candidate Urban Structure Plan • Discussion - Need to analyze taxation system within KV. - Subsidy for Land Pooling system should be analyzed. - Development plan for creating opportunity for a livable city should be analyzed. - Need for detailed pilot project where incentives and disincentives could be practiced. - Public-private partnership should be emphasized for land pooling implementation.	• KVDA • KVDA Kathmandu • KVDA Lalitpur • Bhaktapur Municipality • SONA 13 Members
December 11, 2014 KVDA	• Explanation of Disaster Management System in Japan • Discussion - Simulation by NEST (National Society for Earthquake Technology) shall be utilized for analysis. - UNDP has information on buildings. Need for acquisition. - Subsidy for seismic strengthening is not available in Nepal. But Nest proposes tax incentive. - JST should coordinate with relevant donors such as UNDP, Red Cross and WFP.	• KVDA • National Society of Earthquake Technology (NSET) • Nepal Engineers' Association (NEA) 13 Members
December 18, 2014 KVDA	• Explanation of summary of Collective W/G on 14. Dec. • Explanation of opinions for Structure Plan Case 4 • Discussion - Structure Plan Case 4 is agreed but many issues should be solved to implement the structure plan. - Implementation program should be scrutinized, - Land use control is a measure for land speculation. - Participation of private sector to Land Pooling System shall be enhanced.	• MOPIT • DOR • KVDA • MOUD • MTPD • KMC • Bhaktapur Municipality • M. Thimi Municipality 13 Members
February 9, 2015 KVDA	• Explanation of summary of SC2. • Explanation on necessity of Sub center.	• MOUD • KVDA

	• Explanation of proposed function of new urban area. • Discussion - Name of Sub centers shall not be given. - Multi-functions in sub center are expected. - Coordination with Risk Sensitive Land Use Planning (RSLUP) by KVDA/UNDP is requested. - Workshop with participants including Parliament Committee will be held to explain the 20-year plan by KVDA, KUTMP and RSLUP will be held.	• RUPSON • Risk Sensitive Land Use Planning (RSLUP) • KMC • Kirtipur Municipality 13Members
February 27, 2015 KVDA	• Explanation on urban management measure for appropriate urbanization control and urban development. • Discussion - Other than explained taxes, Rent Tax is imposed. Necessity to confirm. - Scrutiny for appropriate population density in KV is required. - A system to collect capital gain to the government is needed. - Redevelopment is difficult without strong leadership of government.	• MOUD • KVDA • SCAEF • Bhaktapur Municipality • GENESIS Consultancy Ltd. 14 Members
March 13, 2015 KVDA	• Explanation of Emergency Road Network in KV • Discussion - Studies on Chile and Haiti case could be done. - Good practice from Japan could be done for promotion of retrofitting and reconstruction. - Sustainable funding mechanism is needed for DRR purpose. - Decision on Emergency Road Network should be made so that the survey could be carried out.	• MOUD • KVDA • KVDA Lalitpur • ADB • RUPSON • NSET 10 Members

Table 1.4.4 W/G-2 (Transport) and W/G-3 (Traffic Management) Meeting Record

Date	Agenda	Participants
December 4, 2014 DOR	• Explanation on three subjects - Discussion progress in W/G-1 - Structure Plan Alternatives - Solution for bottlenecks and missing links • Discussion - For the comprehensive urban transport, various traffic modes should be taken into account. - Construction of missing link of the IRR is thought to be possible.	• MOPIT • DOR • DOTM • KVDA • DUDBC • MTPD • Lalitpur Municipality • M. Thimi Municipality 13 Members
December 12, 2014 DOR	• Explanation on Road Network • Discussion - Introduction of TOD is essential; but application in KV where buildings are concentrated is very difficult. - Securement of pedestrian way and bicycle lane should be also considered for roads other than Arnico Highway. - Implementation of Outer Ring Road is obscure. MP should clarify the implementation of ORR.	• MOPIT • DOR • KVDA • MOUD • DUDBC • MTPD • KMC • Bhaktapur Municipality • M. Thimi Municipality • Kirtipur Municipality 17 Members
February 16, 2015 DOR	• Explanation on Road Network • Explanation on Public Transport Network • Discussion - Fast Track Road would be considered both in freight movement and in passenger movement. - Road for the disaster management will be discussed in WG-1	• MOPIT • DOR • KVDA • KMC • Kirtipur Municipality 11 Members
March 1, 2015 DOR	• Explanation on Public Transport Network • Discussion - Alignment of BRT route at intersections will be difficult. Detailed planning is necessary.	• DOR • KVDA • KMC 9 Members

	- Network plan proposed today is basically approved. Detailed plan is expected.	
March 4, 2015 DOR	• Explanation on Road Network • Discussion - To avoid congestion at the south of airport, tunnel under the airport could be investigated. - Northern part of IRR should be constructed. Detail will be investigated. - Roads connecting east side shall be investigated. - Network Plan proposed today is basically approved. Details will be discussed individually.	• DOR • KVDA • MOUD • KMC 9 Members
April 5, 2015 DOR	• Explanation on road network staging plan. • Explanation on road classification and design criteria. • Explanation on NMT network • Discussion - Median shall be at least 4.0 meter. - Existing pedestrian under-pass is gloomy. Comfortable pedestrian under-pass is required. - Urban Road Standard by UNHABITAT and proposal by JST are corresponding. Proposal by JST is basically agreed upon.	• DOR • DOTM • MOUD • MTPD • KMC • UN-Habitat • Architect's design Associates (ADA) 14 Members
April 15, 2015 DOR	• Explanation on public transport network • Discussion - Public transport alignment at T-M viaduct should be scrutinized to enlarge the effect of viaduct. - Design standard for BRT is necessary for the implementation. - Discussion including various stakeholders is necessary to finalize the MP>	• DOR • DUDBC • MTPD • KMC • UN-Habitat 8 Members

Table 1.4.5 W/G-3 (Traffic Management) Meeting Record

Date	Agenda	Participants
December 18, 2014 DOR	• Explanation on current traffic accidents and countermeasures • Discussion - Comparison with other developing countries will be effective. - Traffic safety education in Nepal is underdeveloped; therefore traffic regulation is not diffused to people. - DOTM is leading organization of traffic safety but specialist of traffic safety does not exist. Institutional arrangement is necessary. - Pedestrian and cyclist should be familiar with traffic regulation. - Many organizations are relevant for traffic safety. Controlling body for traffic safety is required.	• MOPIT • DOR • DOTM • KVDA • MOUD • DUDBC • MTPD • KMC • Bhaktapur Municipality 14 Members
March 17, 2015 DOR	• Explanation on development strategy for traffic safety • Discussion - Updating manual and guideline is proposed by WB project. Contract will be made shortly. - Traffic police is already conducting vehicle inspection and issuance of license. Necessary activity shall be inspected and proposed. - Many organizations are concerned with traffic safety. Leading authority for implementation would be proposed.	• DOR • KVDA • MOUD • MTPD • M. Thimi Municipality 13 members

3) Workshop

Workshop was held on 15th March 2015 with 65 participants including ten constituent assembly members. In the workshop, four projects under planning were introduced, namely 20 year strategic development master plan by KVDA, Risk Sensitive Land Use Plan (RSLUP) by UNDP, Urban Transport Improvement Master Plan (KUTMP) by JICA and Kathmandu Sustainable Urban Transport (KSUTP) by ADB.

Table 1.4.6 First Workshop Record

Date	Agenda	Participants
March 15, 2015 Hotel Himalaya	• Welcome speech by KVDA • Presentation on Strategic Development Plan of Kathmandu Valley • Presentation on Risk Sensitive Land Use Planning • Presentation on Urban Transport Improvement for Kathmandu Valley • Presentation on Kathmandu Sustainable Urban Transport Plan • Discussion/Comment - We need to decide whether we want to be self-sustainable or depend on foreign aid. - Many issues in the Valley: Waste management, Sewerage, Crime, Pollution, lack of public transportation etc. - - Only Tourism and Services might not be enough for KV's economic development. Industries are also required.	Major Participants • Mr. Deepak P. Kuikel, Constituent Assembly (CA) Member • Mr. Rajan K.C., CA Member • Mr. Prem Suwal, CA Member • Mr. Dhyan Govinda Ranjit, CA Member • Mr. Gagan Thapa, CA Member • Mr. Yogeshwar K. Parajuli, Development Commissioner, KVDA • Dr. Jagadish Chandra Pokharel, NPC and RUPSON • Dr. Mahendra Subba, Joint Secretary, MOUD • Mr. Surya Bhakta Sangachhe, Program Manager, NSET • Mr. Padma Sunder Joshi, HPM, UN-Habitat • Mr. Partha Parajuli, KSUTP • Mr. Janak Raj Joshi, Under Secretary, MOLRM • Mr. Padma K. Mainalee, Joint Secretary, MOUD 65 Members

4) Seminar

On 17 February, 2017, seminar was held with 58 attendants from government and relevant agency, Donor, academia and research institute, NGO, media and private company. The objective of the seminar was to disseminate the contents of the Master Plan and to build consensus. Program and major discussion is shown in

Table 1.4.7 Seminar Record

Date	Agenda	Participants
February 17, 2017 Hotel Himalaya	• Opening remark by DOR • Welcome remark by JICA Nepal • Explanation on Outline of the study by JST • Explanation on outline of DFR by JST • Discussion/Comment - Consideration on the exact carrying capacity of Kathmandu valley and its environment impact from social, conservational, and disaster aspect is needed. - Projects proposed in the MP including IRR seem viable and investors will be attracted to invest in Projects. - This project should try to reduce the pollution impacts significantly. - Consideration of the development of river corridors as alternative road network is needed. - Some centers for equipment to demolish collapsed buildings need to be planned in the Master Plan with appropriate locations. - Explanation on the selection of AGT instead of the Metro Rail is needed since the study on Metro Rail was conducted in 2012. - MP should give top priority to NMT. Some routs including bridge(s) need to declared NMT. Proposed inner ring road must be considered for bicycle facility. - Road side plants need to be selected based from the view point of air pollution etc. • Closing remark by KVDA	Major Participants • MOPIT • KVDA • MOUD • NRA • DOR • MOF • MOFALD • MOAD • DUDBC • DOE • DOLIDAR • DOTM • DPR • DMG • Investment Board • OMCN • Lalitpur Sub-metropolitan City • Bhaktapur Municipality • Madhyapur Thimi Municipality • KSUTP • NEA • UN-HABITAT • CEN • ENPHO • IUCN • LSMF • NSET

		• RUPSON • SCAEF • SONA • Radio Nepal • EOJ • JICA 58 Members

5) Stakeholder Meeting (SHM)

Four stakeholder meetings in total were held inviting governmental agencies, NGOs, donors, educational institutions, and media. The first one was held on 8th December 2014, the second one was held on 18th March 2015, and the third one was held on 3rd December, 2015. Environmental baseline and scoping were discussed on the first SHM. Evaluation of the Structure Plan was discussed in the second SHM. In the third SHM, comprehensive transport master plan was presented. The fourth stakeholder meeting was held on 23rd June, 2016 where the evaluation result of Pre-Feasibility Study on T-M Flyover was discussed. Participants and agenda are shown in エラー! ブックマークが自己参照を行っています。.

Table 1.4.8 Stakeholder Meeting Record

Date	Agenda	Participants
December 8, 2014 Everest Hotel	• Opening Remarks by chairperson • Explanation on three subjects - Outline of study - Structure Plan - Environment baseline and scoping • Discussion - Population framework should be considered taking account of future vision of whole country and positioning of KV. - If the Fast Track Road is developed, southern part of KV will be more important. - Analysis on introduction of LRT is necessary because current traffic is heavily dependent on road. - If the population is dispersed to sub city centers, travel distance will become longer and emission will be larger. - Agricultural land shall be added to land use constraints. - Use of bicycles should be enhanced like in Denmark.	• Department of Environment (DOE) • DOR • DOTM • DUDBC • KVDA • Ministry of Agricultural Development (MOAD) • Ministry of Forest and Soil Conservation (MOFSC) • DUDBC • Department of Plant Resource (DPR) • Department of Forest (DOF) • Nepal Forum of Environmental Journalists (NEFEJ) • International Center for Integrated Mountain Development (ICIMOD) • Environment and Public Health Organization (ENPHO) • Rajdhani Daily • Kantipur Daily 24 people
March 18, 2015 Everest Hotel	• Explanation on outline of the project. • Explanation on Structure Plan. • Explanation on transport network. • Explanation on Evaluation of Structure Plan • Discussion - Grade separation of intersections is needed to solve the traffic jam. - Cycling network should be considered along arterial roads and suburban roads. - The traffic management has been strongly implemented. - While considering the widening and construction of roads near the heritage sites, various options should be investigated. - The vehicles coming from outside of the Valley should be properly managed. Parking control should be strictly enforced.	• Ministry of Science, Technology and Environment (MOSTE) • DOE • DUDBC • GESU, DOR • KVDA • Department of Agriculture (DOA) • DPR • Office of Prime Minister • Clean Energy Nepal (CEN) • Kathmandu Valley Water Supply Management Board (KVWSMB) • Nutrition Promotion and Consultancy Services (NPCS) • ENPHO • Climate Change Network Nepal (CCNN) • JICA • Yatayat Samachar • Abhiyan Daily • Kantipur Daily

		• National News Agency, Nepal (RSS) • Radio Nepal • Kathmandu University 29 people
December 3rd, 2015 Mala Hotel	• Explanation on outline of the project • Explanation on land use plan • Explanation on road network plan • Explanation on public transport plan • Discussion - Inner ring road and outer ring road needs compensation, therefore compensation will be considered in the implementation stage. - Safety of National & International heritage place, monument, and archaeological place should be considered during the construction of roads. - Visual destruction of scenery (like electric wire) should be considered. - Before road construction as per master plan, identification of useful and valuable plants is required which helps conservation of plants for future. -	• MOSTE • DOE • MOAD • MOFSC • DUDBC • DPR • OPMCM • Madhyapur Thimi Municipality • Kirtipur Municipality Municipality • WHO • CEN • ENPHO • NEFEJ 24 Members
June 23rd, 2016 Mala Hotel	• Explanation on Outline of the project and Pre- Feasibility study for T-M Flyover. • Explanation on Alternative plans and traffic analysis • Explanation on Economic analysis • Explanation on prediction of environmental impact by the project • Discussion - Method for the compensation should be clarified. - All social related issues need to be solved before detailed design. - Consent by the different entities that will be affected by the Project should be acquired. - Air pollution during construction should be managed.	• Ministry of Population and Environment (MOPE) • KVDA • MOFALD • MOLRM • DOE • DOF • GESU, DOR • DUDBC • KVWSMB • NEFEJ • KMC • Madhyapur Thimi Municipality • Lalitpur Dub Metropolitan Municipality • International Union for Conservation of Nature (IUCN) 25 Members

CHAPTER 2 OVERVIEW OF KATHMANDU VALLEY

2.1 Natural Condition

2.1.1 Topography and Climate

(1) Topography

Federal Democratic Republic of Nepal is found in the South Asia and is located in the North-east side of South Asia sharing a border with China in North and with India in South. Total area is 147,181km^2, which is divided into five development regions, 14 zones and 75 districts.

Kathmandu Valley belongs to Central Development Region, Bagmati zone and covers three districts, Lalitpur, Bhaktapur and Kathmandu. The three districts have five municipality areas, Kathmandu Metropolitan City, Lalitpur Sub-Metropolitan City, Bhaktapur Municipality, Madiapur Thimi Municipality and Kirtipur Municipality. The areas outside of the municipalities are divided into VDC (Village Development Committee). Lalitpur District has 41 VDCs, Bhaktapur District has 16 VDCs and Kathmandu District has 57 VDCs. Among the total 114 Districts, 98 VDCs are in the Kathmandu Valley. Total area of the three districts is around 900km^2, in which Kathmandu Valley occupies around 620km^2.

In December, 2014, the government allotted 61 new municipalities in 37 districts. In Kathmandu Valley, VDCs were unified to create 16 municipalities. The area and name of new municipalities are shown in Figure 2.1.1. As of now, administrative function of the new municipalities is not yet established.

Source: http://lgcdp.gov.np/home/map_newmunicipality.php

Figure 2.1.1 New Municipalities in Kathmandu Valley

Kathmandu Valley is surrounded by four mountain ranges: Shivapuri (Northside, standing at elevation of 2,800 metres), Phulchowki (South-east side, 2,795 metres), Nagarjun (Northside, 2,825 metres) and Chandragiri (South-west side, 2,300 metres). Surrounded by mountain ranges, Kathmandu Valley is an oval-shaped basin. Most of the urban areas extend from 1,290m along the Bagmati River to 1,350m in the hillside. Central area of Kathmandu is located at about 1,300m elevation.

(2) Climate

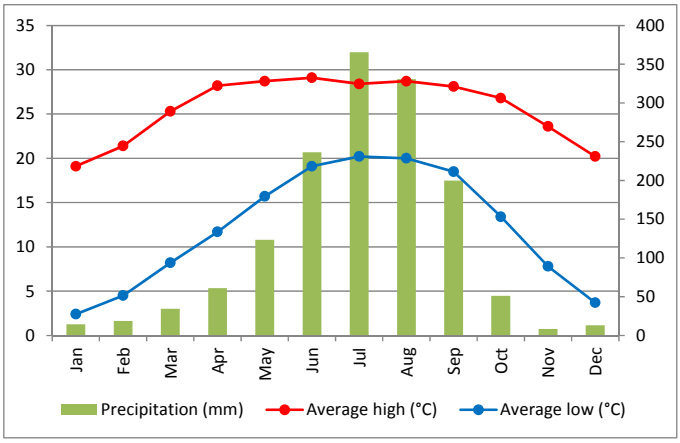
Kathmandu Valley has a mild, sub-tropical climate. The rainfall in the valley is affected by the South-west monsoon during the summer. The average monthly precipitation varies from 8.3mm in November to 365.4mm in July. Rainy season in Nepal is caused by the monsoon and almost 80% of the annual precipitation falls in the rainy season from June to September. The monsoon thus affects agricultural production in Nepal. In the years with less rainfall, harvests of farm produce decrease considerably.

The temperature in Kathmandu is characterized as the continental climate with a large difference between day and night tempeatures. The temperature ranges from a minimum of -2.4 ºC in January to a maximum of 29.1 ºC in July. The temperature variation is the largest in winter from 19 ºC to 2.4 ºC in January. Table 2.1.1 and Figure 2.1.2 shows the monthly variation of temperature and precipitation.

Table 2.1.1 Temperature and Rainfall in Kathmandu Valley

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high (°C)	19.1	21.4	25.3	28.2	28.7	29.1	28.4	28.7	28.1	26.8	23.6	20.2	25.5
Average low (°C)	2.4	4.5	8.2	11.7	15.7	19.1	20.2	20	18.5	13.4	7.8	3.7	12.1
Precipitation (mm)	14.4	18.7	34.2	61	123.6	236.3	365.4	330.8	199.8	51.2	8.3	13.2	1454.9

Source: Department of Hydrology and Meteorology



Source: Department of Hydrology and Meteorology

Figure 2.1.2 Temperature and Rainfall in Kathmandu Valley

2.1.2 Geology and Earthquake

(1) Geology

Geologically, Kathmandu Valley consists of Gokarna Formation (gkr) of Plio-Pleistocene, Kalimati Formation (klm) of Pio-Pleistocene, Chapagaon Formation (cpg) of Pio-Pleistocene, Recent alluvial soil (sal) of Quaternary and Alluvial fan deposit (salf) of Quaternary.

Recent alluvial soil consists of temporal sediment of a flood plain and fill terrace. The northern section consists of sand and gravel in the site river rocks. Silt, sand, and gravel can be found at the

central and southern section. Density is low and the consistency of the soil is soft and clayish. It is easily eroded, settled, or flooded. The bearing capacity is expected to be poor and will be easily flooded.

Gokarna Formation consists of bright brown gray and dense rectangular silt with poor grain size distribution. Total thickness is 330 m or thicker and the bearing capacity is expected to be between mid to high degree.

(2) Earthquake

Nepal is on the large fault which is the origin of orogeny of Himalayan mountain range, therefore Nepal is in the area where the danger of a major earthquake prevails. On 15th January 1934, Bihar earthquake with magnitude of 8.4 occurred and the epicenter of the earthquake was located about 10km south of Mt. Everest. Kathmandu, Lalitpur and Bhaktapur were severely affected and almost 60% of the buildings collapsed. Although the population was one-fifth of present population, 4,300 people lost their lives. Although Kathmandu Valley suffered from this big disaster, nevertheless development of building vulnerable to earthquake continued.

Gorkha Earthquake (Mw7.8) struck central Nepal on April 25, 2015 at 11:56 a.m. local time (6:11 a.m. UTC), one of the worst natural disasters to strike central Nepal since the 1934 Bihar Earthquake. The main jolt was later followed by a major aftershock (Mw7.3) on May 12, 2015. That tremor, plus subsequent aftershocks, left more than 9,100 people dead and nearly 25,000 others injured. Extensive damage was recorded throughout Nepal, particularly in the capital city of Kathmandu. The fatalities in Nepal were concentrated in the districts of Sindhupalchowk (3,557), Kathmandu (1,233), and Nuwakot (1,109). The district of Dhading suffered the largest number of homes destroyed with 81,406. Nuwakot was second with a total of 75,577 homes destroyed, then Sindhupalchowk followed with 64,595. Kathmandu was the district with the largest number of homes damaged at 56,301 followed by Kavrepalanchowk (23,745), and Makawanpur (17,560).

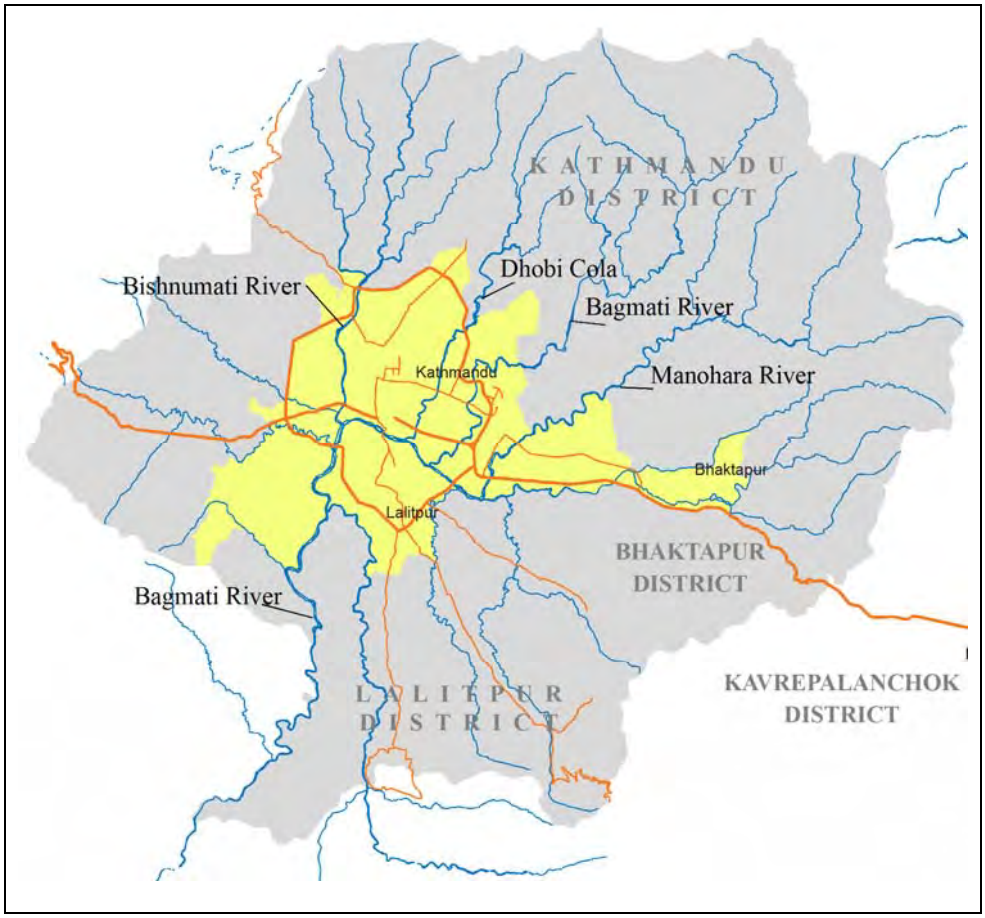
2.1.3 Rivers and Hydrology

Four major rivers are flowing through Kathmandu Valley. The main stream is Bagmati River and three rivers, Bishnumati River, Manohara River and Dhobi Cola, are tributaries. Bagmati River flows from North-east to the South through Kathmandu Valley, and then enters Chobar Gorge near the Dakshinkali temple complex.

As Bagmati River passes thorough Kathmandu Valley, it becomes heavily polluted and choked with trash. The rivers in Kathmandu Valley function not only as storm water drainage but also as sewerage of Kathmandu Valley. These rivers in ancient times were the jewels of the city, but have now turned into open sewer. Unplanned and haphazard growth of the city has caused an adverse effect on the condition of the rivers both environmentally and hygienically.

The river banks have been encroached upon and squatter settlements are found in abundance. The disposal of sewage from household, manufacturing, and industries into the rivers is causing tremendous waste discharge which has adverse hygienic and environmental effects on the river.

The rivers in Kathmandu Valley have a strong discharge correlation with the precipitation which shows that they are not glacier fed. This leads to a very low discharge during the precipitation poor winter months in which the river is mainly fed by spring sources and sewage discharge.



Source: JICA Study Team (JST)

Figure 2.1.3 River System of Kathmandu Valley

2.2 Socio-economic Profile of Kathmandu Valley

2.2.1 Socio Economy

(1) GDP in Nepal

Nepal is one of the eight countries composing SAARC (South Asian Association for Regional Cooperation) which was formed to promote and sustain mutual trade and economic cooperation by Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. Among the SAARC countries, Bhutan is the smallest and Nepal is the second smallest in terms of Gross Domestic Product (GDP). In terms of GDP per capita, Nepal is the lowest. On the other hand, Nepal's GDP growth rate is in the middle among SAARC countries: Bangladesh and Pakistan are lower than Nepal.

General condition of economy from 2001 to 2011 in Nepal is shown in Table 2.2.1. In this decade, real GDP increased by 1.46 times from 441.5 billion NPR to 642 billion NPR, whereas real GDP per capita increase was 1.19 times.

Table 2.2.1 Major Indices of National Accounts and Government Finance of Nepal

Subject Descriptor		Scale	2001	2011
Population		Person	23,151,423	26,253,828
	Increase rate per year	%		1.27
Real GDP at 2001 price		Billion NPR	441.5	642.6
		Billion USD	5.9	8.9
	Growth rate per year	%		4.23
Nominal GDP		Billion NPR	441.5	1,368.4
		Billion USD	5.9	19.0
	Growth rate per year	%		12.41
Real GDP per capita at 2001 price		NPR/person	17,678.3	21,077.1
		USD/person	235.9	292.3
	Growth rate per year	%		2.17
Nominal GDP per capita		NPR/person	17,678	44,887
		USD/person	236	622
	Growth rate per year	%		10.19
General government revenue		Billion NPR	53.1	241.6
	Percent of GDP		12.0	17.7
General government total expenditure		Billion NPR	65.1	255.0
	Percent of GDP	%	14.7	18.6
General government net lending/borrowing		Billion NPR	-12.0	-13.4

Source: Central Bureau of Statistics, IMF

(2) Industry

Major industry in Nepal is the tertiary sector which accounts for 49.7% of the total Gross Added Value, while the primary sector and the secondary sector account for 34.5% and 14.9% respectively. In the tertiary sector, wholesale and retail trade occupies the largest proportion followed by transport and communications, and real estate and renting. Underdeveloped secondary sector which is caused mainly by insufficient supply of electricity is one of the sources of low developed economic status of Nepal. The fastest growing sector is other community, social and personal service activities, followed by health and social work and education.

Table 2.2.2 Gross Value Added by Industrial Division (At 2000/01 Prices)

NPR in ten million

Industries	2006/07	Ratio in 2006/07	2011/12	Ratio in 2011/12	Annual increase rate (%)
Agriculture and forestry	18,195.80	35.30%	22,095.00	34.50%	4.0
Fishing	283.8	0.60%	378.1	0.60%	5.9
Mining and Quarrying	238.3	0.50%	277	0.40%	3.1
Primary sector	18,717.90	36.30%	22,750.00	35.50%	4.0
Manufacturing	3,989.10	7.70%	4,344.50	6.80%	1.7
Electricity, gas and water	1,306.50	2.50%	1,469.00	2.30%	2.4
Construction	3,145.30	6.10%	3,720.70	5.80%	3.4
Secondary sector	8,440.90	16.40%	9,534.20	14.90%	2.5
Wholesale and retail trade	6,429.20	12.50%	7,896.70	12.30%	4.2
Hotels and restaurants	827.8	1.60%	1,100.00	1.70%	5.9
Transport, storage and communications	4,409.40	8.60%	6,216.00	9.70%	7.1
Financial intermediation	2,210.30	4.30%	2,707.10	4.20%	4.1
Real estate, renting and business activities	4,124.00	8.00%	5,034.60	7.80%	4.1
Public Administration and defence	926.2	1.80%	1,120.30	1.70%	3.9
Education	3,073.80	6.00%	4,201.90	6.60%	6.5
Health and social work	688.8	1.30%	959.1	1.50%	6.8
Other community, social and personal service activities	1,664.30	3.20%	2,616.30	4.10%	9.5

Tertiary sector	24,353.90	47.30%	31,852.00	49.70%	5.5
Total GVA	51,512.70	100.00%	64,136.20	100.00%	4.5

Source: Central Bureau of Statistics

(3) Manufacturing

Manufacture in Nepal is mostly the living-related industry such as food products. As for the primary materials industry, other non-metallic mineral products and fabricated metal products are manufactured in Nepal. Processing and assembly industry is not developed in Nepal.

Around 61% of output value is produced in the districts in Terai area such as Morang, Sunsari, Bara, Nawalparasi and Pupandehi. Compared with the Terai area, manufacturing in the three districts of Kathmandu Valley is rather small and produces around 8.9% of national products. Leading manufacture in the three districts is food producing, whereas several industries, namely printing and reproduction (54.9%), wearing apparel (45.3%), beverage (29.2%) and furniture (21.0%) occupy a large share in Nepal. These industries appear to be the distinctive industry of the three districts of Kathmandu Valley.

Table 2.2.3 Value of Output by Manufacturing in 2011/12 (Nepal and KV)

		Three districts of Kathmandu Valley		Nepal		Percentage of Valley districts
		Value of output Thousand NPR	Percentage of output	Value of output Million NPR	Percentage of output	Value of output
Code	Total	28,711,710	100.0%	322,551	100.0%	8.9%
10	Food products	8,603,107	30.0%	84,912	26.3%	10.1%
11	Beverages	5,278,755	18.4%	18,104	5.6%	29.2%
12	Tobacco products			15,839	4.9%	
13	Textiles	2,244,435	7.8%	13,503	4.2%	16.6%
14	Wearing apparel	724,273	2.5%	1,598	0.5%	45.3%
15	Leather and related products			2,668	0.8%	
16	Wood and products of wood	150,336	0.5%	5,690	1.8%	2.6%
17	Paper and paper products			3,027	0.9%	
18	Printing and reproduction	769,187	2.7%	1,401	0.4%	54.9%
19	Coke and refined petroleum			1,164	0.4%	
20	Chemicals and chemical products			10,850	3.4%	
21	Pharmaceuticals, medical, chemical products	808,730	2.8%	5,595	1.7%	14.5%
22	Rubber and plastic products	2,826,162	9.8%	16,714	5.2%	16.9%
23	Other non-metallic mineral products	2,668,315	9.3%	40,378	12.5%	6.6%
24	Basic Metal			34,792	10.8%	
25	Fabricated metal products	635,333	2.2%	40,384	12.5%	1.6%
26	Computer, electronic and optical products			1,425	0.4%	
27	Electrical equipment	80,454	0.3%	2,859	0.9%	2.8%
28	Machinery and equipment			704	0.2%	
29	Motor vehicles, trailers			224	0.1%	
31	Furniture	547,115	1.9%	2,605	0.8%	21.0%
32	Other manufacturing			432	0.1%	0.0%

Source: National Census of Manufacturing Establishments Nepal, 2011/12, CBS

(4) Power

Table 2.2.4 shows the electricity consumption in SAARC countries and major countries in Asia. Generally, SAARC countries except Maldives do not consume much electricity. Nepal is the smallest in electricity consumption among SAARC countries and shows one fifteenth of world average.

Table 2.2.5 shows the source of power supply in Nepal. Around half of power was supplied by Nepal Electricity Authority (NEA) and a quarter was supplied by Independent Power Producers (IPPs). Although the supply by NEA increased by 1.5 times from 2005 to 2013, power purchase from India increased by 3 times.

Table 2.2.4 Electricity Consumption per capita in SAARC and other

	Average power per capita (Watts perr person)	Year of data
Bangladesh	0.63	2012
Bhutan	28	2009
India	90	2009
Maldives	188	2009
Nepal	21	2010
Sri Lanka	52	2012
Pakistan	47	2010
World	313	2002
China	447	2013
Japan	774	2011

Source: CIA World Fact book

Table 2.2.5 Source of Power Supply in Nepal (2005-2013)

Unit: GWh

	2005	2006	2007	2008	2009	2010	2011	2012	2013
NEA Hydro Generation	1,522.9	1,568.6	1,747.4	1,793.1	1,839.5	2,108.7	2,122.1	2,357.4	2,273.1
NEA Thermal Generation	13.7	16.1	13.1	9.2	13.0	3.4	1.6	18.9	9,6
NEA Generation Total	1,536.6	1,584.7	1,760.7	1,802.3	1,848.6	2,121.7	2,125.5	23,589.0	2,300.3
Power Purchase from India	261.4	266.2	328.8	452.2	356.5	638.7	694.1	746.0	790.1
Power purchase from IPPs	864.8	930.0	962.3	958.4	925.7	591.4	1,038.8	1,073.6	1,176.0
Power Purchase Total	1,106.2	1,196.3	1,291.1	1,383.6	1,282.2	1,230.1	1,732.9	1,819.6	1,966.1
Total Supply of Power	2,642.8	2,780.9	3,051.8	3,186.0	3,130.8	351.8	3,858.4	4,178.6	4,258.1

Source: Nepal Electricity Authority (NEA) Annual Report 2014

Table 2.2.6 shows the situation of load shedding in Nepal. In fiscal year 2006/07, the percentage of load shedding to the demand was 3.30%, but thereafter, load shedding gradually increased and the percentage reached to 22.92% in year 2011/12.

Table 2.2.6 Actual and Estimated Power Supply and Demand in Nepal

Unit: GWh

Fiscal year	Actual power supply a	Load shed estimate b	Estimated power demand c=a+b	Percentage of load shedding (%)
2006/07	3,019	103	3,122	3.30
2007/08	3,155	350	3,506	9.98
2008/09	3,100	972	4,072	23.87
2009/10	3,657	701	4,376	16.02
2010/11	3,827	1,084	4,912	22.07
2011/12	4,146	1,233	5,380	22.92

Source: Nationwide Master Plan Study on Storage-type Hydroelectric Power Development in Nepal, Final Report, February 2014, JICA

Currently NEA is implementing the following four projects:

- Kulekhani III Hydroelectric Project (14MW)
- Chameliya Hydroelectric Project (30MW)
- Rahughat Hydroelectric Project (32MW)
- Upper Trishuli 3 'A' Hydroelectric Project (60MW)

In order to improve the power condition, the WB is conducting the financing the Nepal-India Electricity Transmission and Trade Project (NIETTP) which will supply at least 100MW of electricity

JICA and Nepal concluded the Grant Agreement on 4 April, 2014, which aims at the improvement of small hydroelectric power plants in the Western area of Nepal.

(5) Tourism

Yearly tourist arrival in 2013 is around 800 thousand as shown in Table 2.2.7. Number of arrival doubled from 2006 to 2013. Since Tribhuvan International Airport is the single international airport in Nepal, arrival by air is through Kathmandu.

Table 2.2.7 Tourist Arrival and Average length of Stay

Year	Total		By air		By land		Average length of stay
	Number	Annual growth rate (%)	Number	percent	Number	percent	
2005	375,398	-2.6	277,346	73.9	98,052	26.1	9.09
2006	383,926	2.3	283,819	73.9	100,107	26.1	10.2
2007	526,705	37.2	360,713	68.5	165,992	31.5	11.96
2008	500,277	-5	374,661	74.9	125,616	25.1	11.78
2009	509,956	1.9	379,322	74.4	130,634	25.6	11.32
2010	602,867	18.2	448,800	74.4	154,067	25.6	12.67
2011	736,215	22.1	545,221	74.1	190,994	25.9	13.12
2012	803,092	9.1	598,258	74.5	204,834	25.5	12.16
2013	797,616	-0.7	584,848	74.6	202,768	25.4	12.60

Source: Nepal Tourism Statistics2013, Ministry of Culture, Tourism and Civil Aviation (MOCTCV)

Table 2.2.8 shows the number of tourist by visit purpose. 64 percent of arrival is for Holiday Pleasure and Trekking & Mountaineering, which are pure sightseeing purpose.

Table 2.2.8 Number of Tourist Arrival by Purpose of Visit in 2013

	Holiday Pleasure	Trekking & Mountaineering	Business	Pilgrimage	Official	Conv. / Conf.	Others	Not specified	Total
No. of tourist	410,934	102,001	28,183	71,610	37,386	15,552	54,326	77,263	797,616
Percentage	51.5	12.8	3.5	9.0	4.7	1.9	6.8	9.7	100.0

Source: Nepal Tourism Statistics2013, Ministry of Culture, Tourism and Civil Aviation (MOCTCV)

Table 2.2.9 shows the international tourist arrival in major south Asia and south-east Asia countries in 2013. Except India, attention of tourism to south Asia countries is very low compared with south-east Asia countries.

Table 2.2.9 International Tourist Arrivals by Major Country in 2013 (South Asia and South-East Asia)

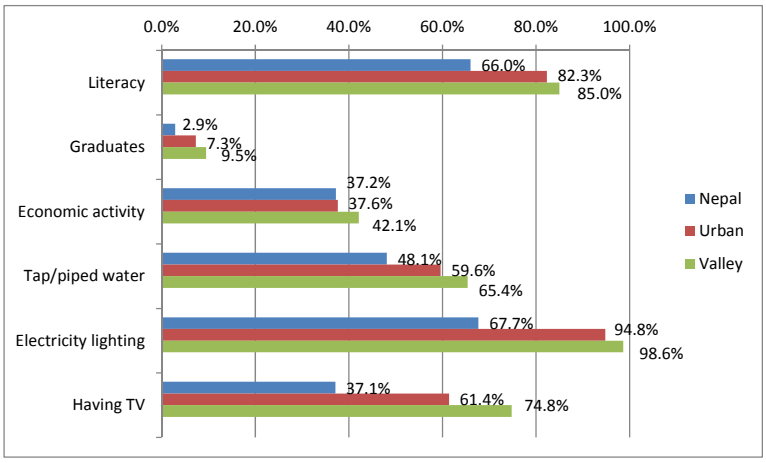
Nation	No. of tourist
South Asia	
India	6,848
Maldives	1,125
Nepal	798
Sri Lanka	1,275
South-East Asia	
Cambodia	4,210
Indonesia	8,802
Malaysia	25,715
Myanmar	900
Philippines	4,681
Thailand	26,547
Vietnam	7,572

Source: UNWTO (World Tourism Organization) Tourism Highlights 2014 Edition

There are seven groups of monuments and buildings which display the full range of historic and artistic achievements for which the Kathmandu Valley is world famous. The seven include the Durbar Squares of Hanuman Dhoka (Kathmandu), Patan and Bhaktapur, the Buddhist stupas of Swayambhu and Bauddhanath and the Hindu temples of Pashupati and Changu Narayan.

(6) Lives

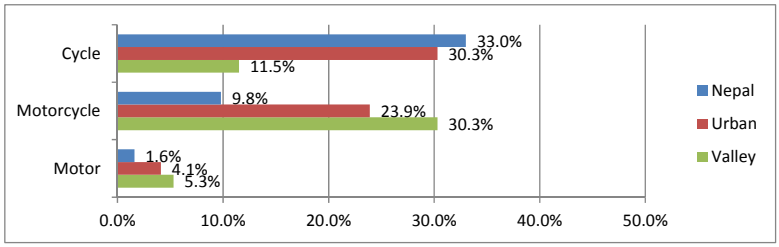
Figure 2.2.1 shows the comparison of living standard among Nepal, urban area and the three districts of Kathmandu Valley. In every indicator, the three districts of Kathmandu Valley are positioned higher than the average of Nepal and Urban area.



Source: National Population and Housing Census 2011, CBS

Figure 2.2.1 Comparison of Living Standard between Nepal, Urban Area and KV

Figure 2.2.2 shows the vehicle ownership. Regarding the bicycle, Nepal is higher than urban area and the three districts of Kathmandu Valley, but as for the motor car and motorcycle, the three districts is the highest.



Source: National Population and Housing Census 2011, CBS

Figure 2.2.2 Comparison of Vehicle Ownership between Nepal, Urban Area and KV

As shown in Table 2.2.10, according to the Living Standard Survey 2010/11, the average household income in urban Kathmandu is twice as high as that of Nepal. The income per capita in urban Kathmandu is more than twice as high as that of Nepal. High income in urban Kathmandu explains high average of motor vehicle and motorcycle ownership.

Table 2.2.10 Average Household Income, Nepal, Urban and Urban Kathmandu

NRS

	Household income	per Capita income
Nepal	202,374	41,659
Urban	318,167	71,720
Urban-Kathmandu	404,511	98,480

Source: Living Standard Survey 2010/11, CBS

2.2.2 Population

(1) Population in Nepal

Population in Nepal from 1961 to 2011 by national census is shown in Table 2.2.11. Population increase rate per year varies in each decade, but from 2001 to 2011, increase rate decreased to 1.27. This phenomenon is attributed to the decrease in birth rate.
"Population Monograph in Nepal" published by CBS in 2004 analyzes the reason as follows:
"The decline in population growth rate from 2.25% in 2001 to 1.35%in 2011 was attributed both to a decline in fertility and the emigration of youth." "It has to be noted that over 1.92 million of the population is absent (emigrants). The absent population has more than doubled in the past decade from 762,181 to 1,921,494."

Table 2.2.11 Population in Nepal (1961-2011)

	1961	1971	1981	1991	2001	2011
Population	9,412,996	11,555,983	15,022,839	18,491,097	23,151,423	26,494,504
Increase rate per year (%)		2.07	2.66	2.10	2.27	1.36

Source: National Population and Housing Census, CBS

(2) Population in Three Districts of Kathmandu Valley

Population in the districts of Kathmandu Valley is increasing rapidly. Although population rate in Nepal went down in the previous ten years, population in the three districts of Kathmandu Valley is still increasing. As a result, the population ratio of the three districts against Nepal grew up from 5.1% in 1981 to 9.4% in 2011. Effective measures are required to reduce the influx of population to Kathmandu Valley.

Table 2.2.12 Population Increase of Three Districts of Kathmandu Valley

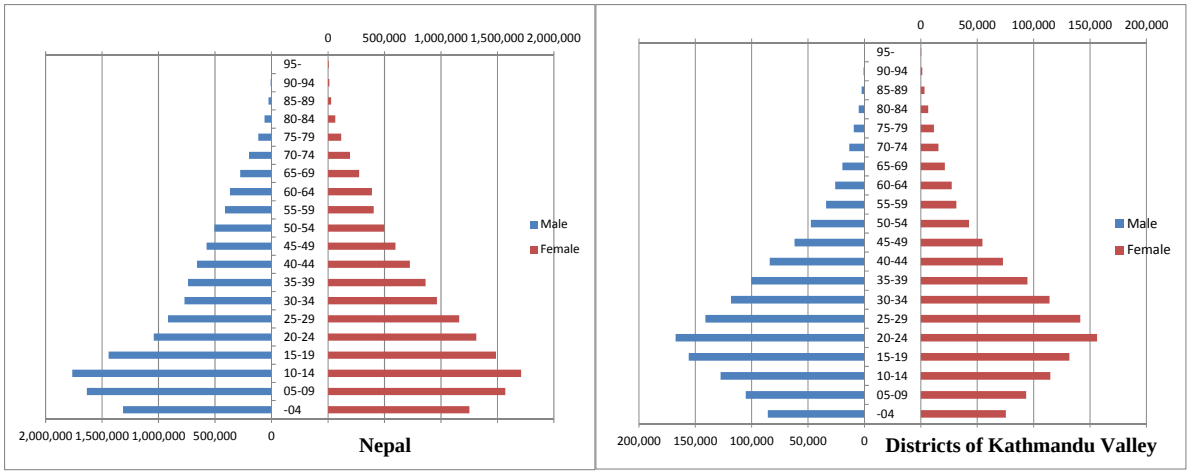
		1971	1981	1991	2001	2011
Population	Nepal	11,555,983	15,022,839	18,491,097	23,151,423	26,494,504
	Lalitpur	154,998	184,341	257,086	337,785	468,132
	Bhaktapur	110,157	159,767	172,952	225,461	304,651
	Kathmandu	353,756	422,237	675,341	1,081,845	1,744,240
	3 Districts	618,911	766,345	1,105,379	1,645,091	2,517,023
Ratio in Nepal	Nepal	100.00	100.00	100.00	100.00	100
	Lalitpur	1.34	1.23	1.39	1.46	1.77
	Bhaktapur	0.95	1.06	0.94	0.97	1.15
	Kathmandu	3.06	2.81	3.65	4.67	6.58
	3 Districts	5.36	5.10	5.98	7.11	9.50
Increase rate per year (%)	Nepal		2.66	2.10	2.27	1.36
	Lalitpur		1.75	3.38	2.77	3.32
	Bhaktapur		3.79	0.80	2.69	3.06
	Kathmandu		1.79	4.81	4.82	4.89
	3 Districts		2.16	3.73	4.06	4.34

Source: National Population and Housing Census, CBS

(3) Population by Age Group

Age structure of population in Nepal is basically Pyramid type, which is observed in developing countries showing the high birth and high death rate. However, after 2001, birth rate decreased and the population of age 0 to 9 is diminishing drastically. This causes the decrease of population increase rate shown in Table 2.2.12. The largest age group in Nepal is from 10 to 14, and the second largest is from 5 to 9.

Compared with Nepal, the age structure of districts in Kathmandu Valley shows a great difference where the largest age group is from 20 to 24. This is because many young people are gathering to Kathmandu Valley pursuing job opportunities and the benefits of metropolis.



Source: National Population and Housing Census 2011, CBS

Figure 2.2.3 Demographic Pyramid of Nepal and Three Districts of Kathmandu Valley

(4) Working Population and Students

According to the person trip survey conducted during Data Collection Survey in 2011, the numbers of working population and students were captured. The average percentage of the working population and students were approximately 33.8% and 31.9%, respectively. Generally, the percentage of the working population was high in urban areas and low in rural areas.

Table 2.2.13 Proportion of Working Population and Students at Residence by Large Zone

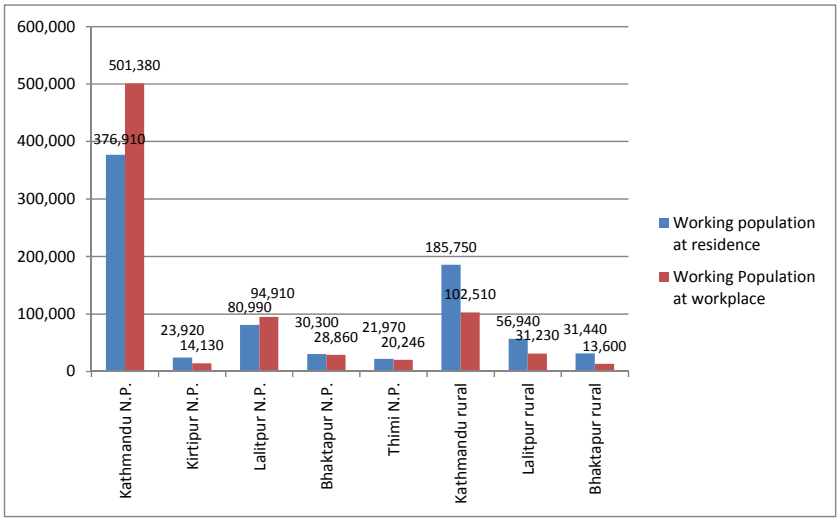
Large Zone No.	Name of Zone	Total Population	Working Population		Students	
			Population	Percentage of Population	Population	Percentage of Population
100	Kathmandu NP	975,453	376,910	38.6	306,340	31.4
200	Kirtipur NP	65,602	23,920	36.5	22,280	34.0
300	Lalitpur NP	220,802	80,990	36.7	66,460	30.1
400	Bhaktapur NP	81,748	30,300	37.1	27,070	33.1
500	Thimi N.P.	83,036	21,970	26.5	26,070	31.4
600	Kathmandu Rural	638,842	185,750	29.1	212,350	33.2
700	Lalitpur Rural	193,299	56,940	29.5	58,900	30.5
800	Bhaktapur Rural	133,920	31,440	23.5	43,930	32.8
Study Area Total		2,392,702	808,210	33.8	763,390	31.9

Source: Data Collection Survey on Traffic Improvement in Kathmandu Valley, 2012, JICA

Figure 2.2.4 shows the number of the working population that was counted at residential and work places. In Kathmandu N.P. and Lalitpur N.P., the number of people at workplaces exceeded the number of people at residences, showing that the working population flows into these areas from outside. Kathmandu N.P., which occupied 38% of the population of the survey area, covered 62% of the working population at work places.

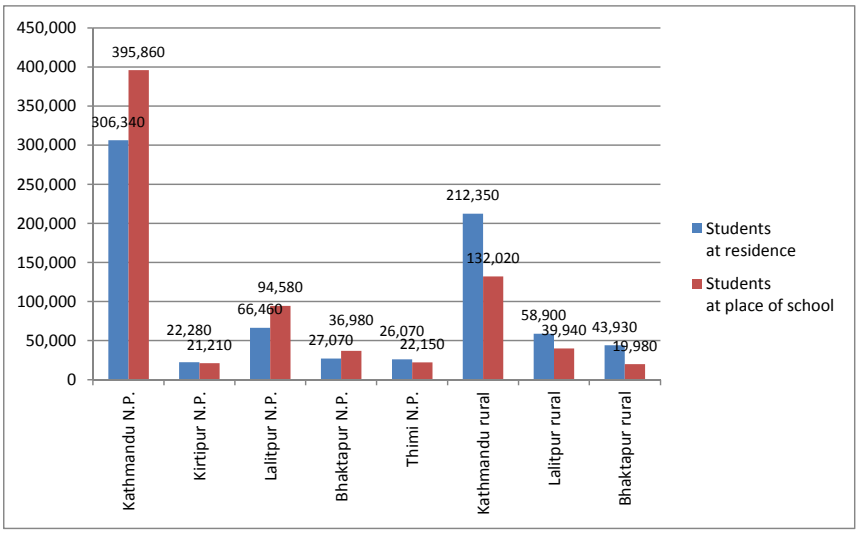
In terms of students as shown in Figure 2.2.5 , Kathmandu N.P., Lalitpur N.P., and Bhaktapur N.P. received students from peripheral areas.

Needless to say, three municipalities are the center of urban activities and attract influx of commuters.



Source: Data Collection Survey on Traffic Improvement in Kathmandu Valley, 2012, JICA

Figure 2.2.4 Working Population at Residences and Workplaces



Source: Data Collection Survey on Traffic Improvement in Kathmandu Valley, 2012, JICA

Figure 2.2.5 Number of Students at Residences and Place of School

2.2.3 Environmental Condition

The environmental baseline of Kathmandu Valley is briefly summarized in this section.

2.2.3.1 Air Quality

The national ambient air quality standards are shown in Table 2.2.14 . There used to be 6 stations for air quality data collection from 2003 to 2007, however since 2008 there are only 3 stations remaining.

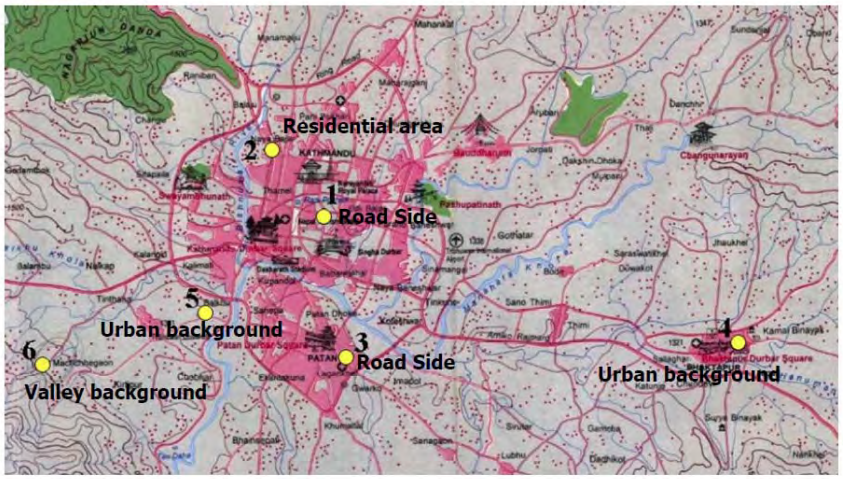
Table 2.2.14 National Ambient Air Quality Standards for Nepal, 2012

Parameters	Units	Averaging Time	Concentration in Ambient Air, maximum
TSP (Total Suspended Particulates)	µg/m3	Annual	-
		24-hours*	230

Parameters	Units	Averaging Time	Concentration in Ambient Air, maximum
PM10	µg/m3	Annual	-
		24-hours*	120
Solapur Dioxide	µg/m3	Annual**	50
		24-hours*	70
Nitrogen Dioxide	µg/m3	Annual	40
		24-hours*	80
Carbon Monoxide	µg/m3	8 hours*	10,000
Lead	µg/m3	Annual**	0.5
Benzene	µg/m3	Annual**	5
PM2.5	µg/m3	24-hours*	40
Ozone	µg/m3	8 hours*	157

*24 & 8 hourly values shall be met 95% of the time in year.18days per calendar year the standards may be exceeded but not on two consecutive days.
**The above indicators are prepared by the 104 data taken yearly average in a fixed location in one week by observing two times in 24 hours.

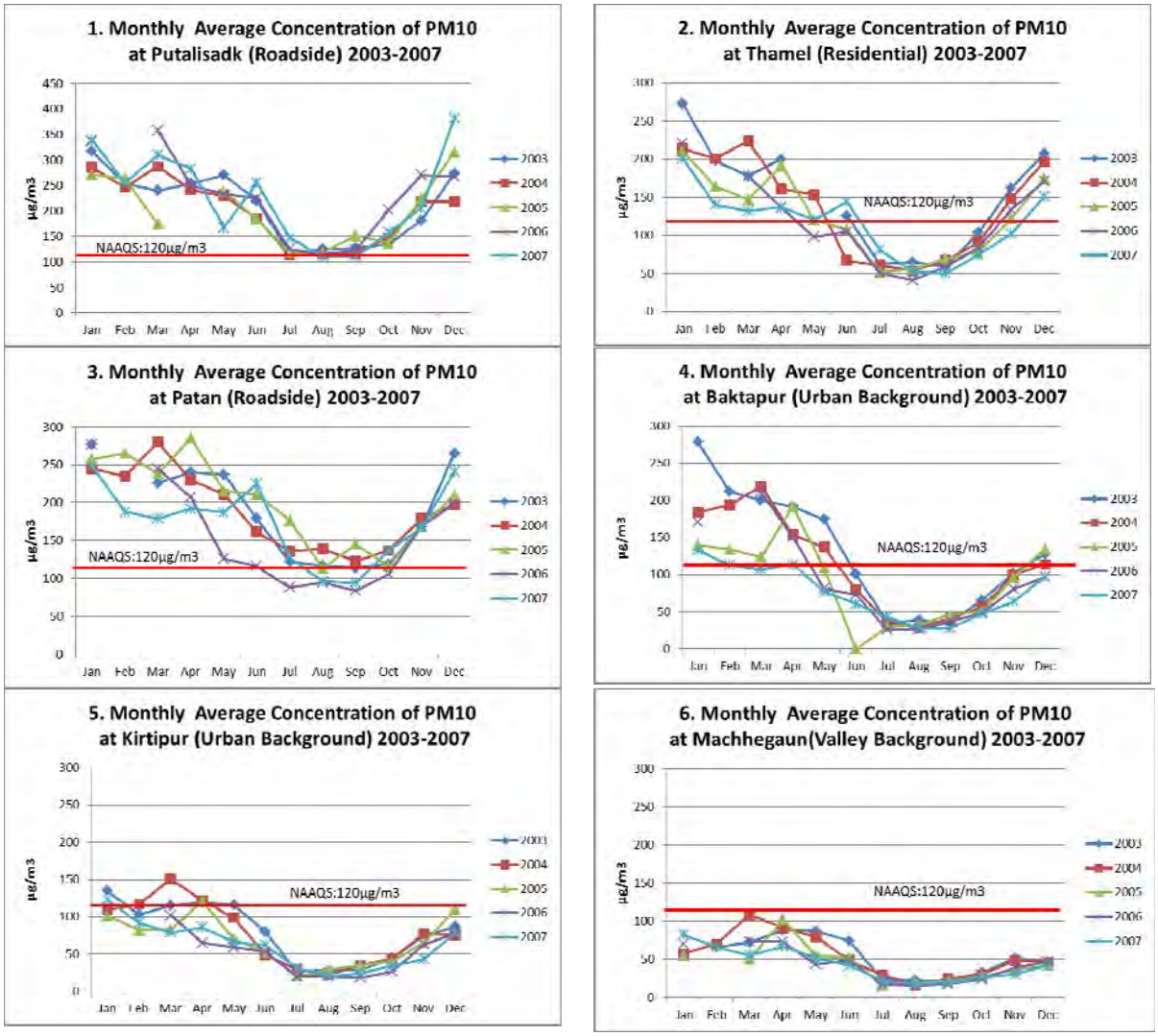
Source: ENVIRONMENT STATISTICS OF NEPAL 2013, Central Bureau of Statistics



Source: Ambient Air Quality of Kathmandu Valley 2007, MOEST

Figure 2.2.6 Air Quality Monitoring Station in Kathmandu Valley

The monthly average concentration of PM10 at each station is shown in Figure 2.2.7 below. During the rainy season, which is from May to October, the concentration of PM10 is relatively low at every station. The pollution level at roadside is above National Ambient Air Quality Standard (NAAQS) almost every month. At Thamel (residential) and Bhaktapur (urban background), the pollution level during the dry season between November and May is mostly above NAAQS.



Source: JICA Study Team

Figure 2.2.7 Monthly Average Concentration of PM10 for 2003-2007

The major source of TSP emission is road dust re-suspension, while vehicle exhaust is the major source of PM10 (See Table 2.2.15). This may be the explanation for the concentration of roadside air pollution.

Table 2.2.15 Source of TSP and PM10 Emission

Source		TSP(tons/yr)			PM10(tons/yr)	
		1993	2001	2005	1993	2001
Mobile Source	Vehicle exhausts	570	1971	NA	570	3259
	Road dust re-suspension	1530	7008	12239	400	1822
Stationary Source	Industrial / Commercial Fuel	582	NA	NA	292	NA
	Domestic Fuel Combustion	582	NA	630	1166	NA
	Brickkilns	2328	NA	630	1166	NA
	Himal Cement	6000	3612	0	800	455
	Stone Crushers	NA	NA	1720	NA	372
	Industrial Boilers	NA	28	28	NA	15
Fugitive Emissions	Refuse Burning	385	687	172	190	339
	Agricultural Sector	NA	NA	NA	2337	NA
	Cremation	NA	NA	158	NA	79

Source : Ministry of Environment, Science and Technology 2005.

2.2.3.2 Noise Pollution

Table 2.2.16 shows national noise quality standard. Since the regular environmental monitoring has not been implemented, the noise data in 2003 is the most recent data (see Table 2.2.17).

Table 2.2.16 National Noise Quality Standard

	Area	Sound Limit Leq(dBA)	
		Day	Night
Sound Limit	Industrial Area	75	70
	Commercial Area	65	55
	Rural Residental Area	45	40
	Urban Residental Area	55	50
	Mixed Residental Area	63	55
	Peace Area	50	40
Uptimum Sound emission limit		Houshold applicance	Uptimum Limit(dBA)
		Water Pump	65
		Diesel Generetor	90
		Entertainment goods	70

Source: Nepal Gadget, Division 5, National noise quality guideline 2012

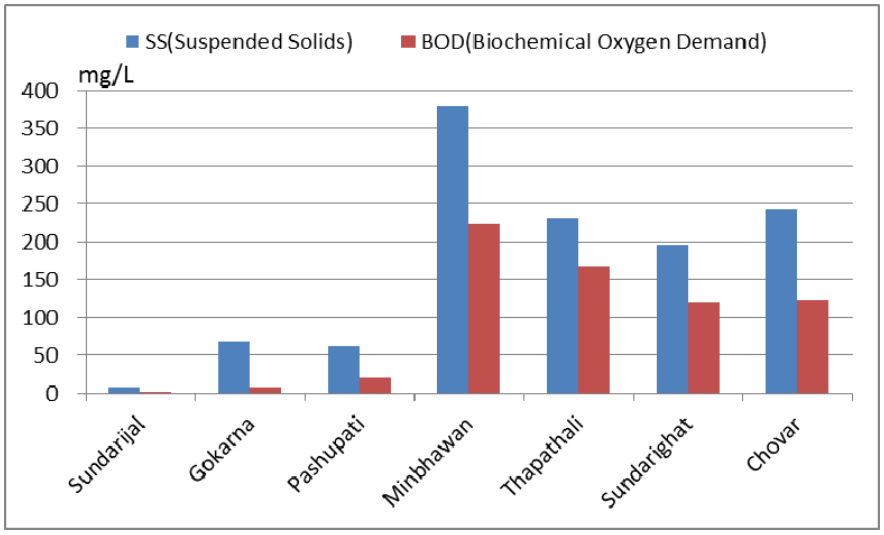
Table 2.2.17 Noise Level at Different Areas

Traffic Area	District	Station	Day Hour	Night Hour
High Traffic Area	Kathmandu	Kalanki	74	70
		Shahidgate	67	69
		Putalisadak	75	69
		Maitighar	71	70
		TU Gate,Kirtipur	58	58
	Lalitpur	Lagankhel	70	70
		Satdobato	70	71
		Kupandol	77	75
	Bhaktapur	Surabinayak	71	81
		Thimi Bus Stop	65	53
Commercial Cum Residence Area	Kathmandu	Asan Chowk	74	67
		Naya Bazar,Kirtipur	64	62
	Lalitpur	Mnbhawan	71	67
Commercial Cum Tourist Area	Kathmandu	Thamel Chowk	75	61
	Bhaktapur	Darbat Squar	59	50
	Lalitpur	Mangal Bazar	69	59
Old Residence Area	Kathmandu	Lagan	68	67
		Panga,Kirtipur	60	57
		Bgatkepati , Kirtipur	52	60
	Lalitpur	Pimbhal	57	51
	Bhaktapur	Ktunje	52	65
		Bharirab Mandir	67	51
New Residense Area	Kathmandu	Samakhushi	55	60
	Bhaktapur	Sano Thimi	62	62
		Santiar	60	53
	Lalitpur	Sanibu	45	42
		Khumaltar	53	54

Source: Nepal Health Reserch Council and World Health Organaization, Assessment of Noise and Development Criteria for its Prevention and Control , June 2003

2.2.3.3 Water Quality

According to ENPHO's Bagmati river water quality monitoring, the water quality of Bagmati River is very poor especially at the downstream.



Source: ENPHO 2011

Figure 2.2.8 SS and BOD in Bagmati River

2.2.3.4 Natural Environment

(1) Forest Area

The outer periphery of Kathmandu Valley is forest area. The forest located in the North and North-east is designated as Shivapuri Nagarjun National Park. There are also 3 reserved forests in Kathmandu Valley.

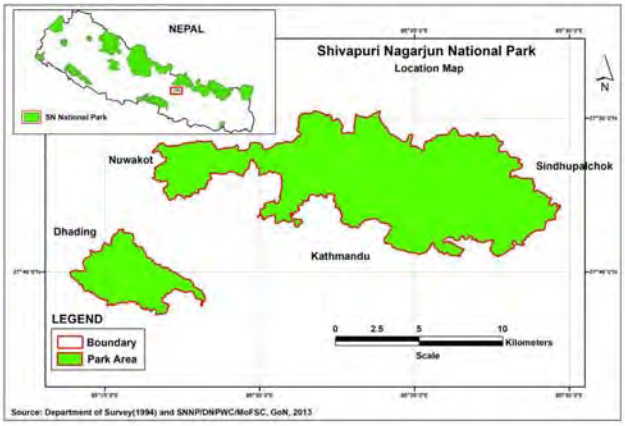
Figure 2.2.9 shows the forest area in Kathmandu Valley.

Source: Comprehensive Study of Urban Growth Trend and Forecasting of Land Use in the Kathmandu Valley, 2013 MOUD, KVDA

Figure 2.2.9 Forested Area of Kathmandu Valley

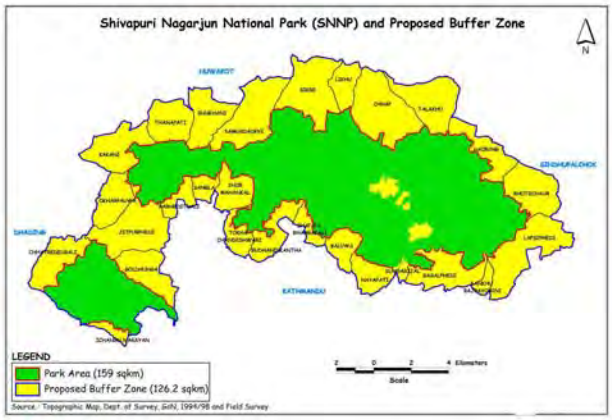
(2) National Park

Shivapuri Nagarjun National Park (SNNP) is situated on the northern fringe of Kathmandu valley, and the Park headquarters (Panimuhan) is just 12 km away from the center of Kathmandu city (Ratnapark). SNNP initially established as Shivapuri Watershed Reserve in 1976, as Shivapuri Watershed and Wildlife Reserve in 1984, as Shivapuri National Park (144 km2) gazette in 2002 and Nagarjun forest area (15 km2) was added and renamed as SNNP in 2009. The history of Nagarjun forest indicates that it was a royal private forest. The significance of SNNP can be described as a source of fresh water, rich biodiversity, cultural heritage and tourist destination, and sink for air pollution.



Source:Shivapuri Nagajun National Park And Proposed Buffer Zone Management Plan(2015-2019),2014, Ministry of Forest and Soil Conservation Department of National Parks and Wildlife Conservation

Figure 2.2.10 Location Map of SNNP



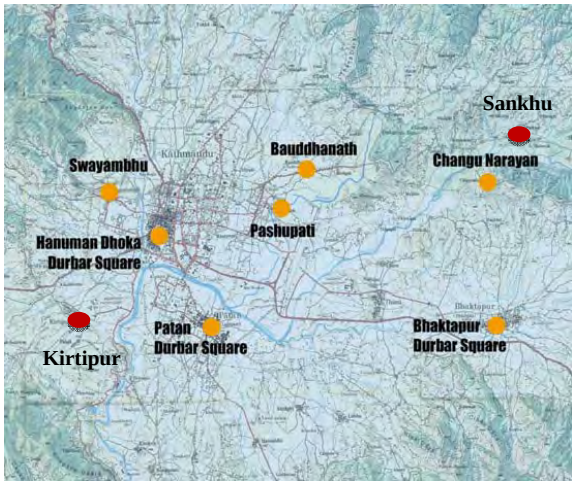
Source: Shivapuri Nagajun National Park And Proposed Buffer Zone Management Plan(2015-2019),2014, Ministry of Forest and Soil Conservation Department of National Parks and Wildlife Conservation

Figure 2.2.11 Proposed Buffer Zone of SNNP

2.2.3.5 World Heritage Site

The seven monument zones of Kathmandu Valley which were designated as World Heritage Sites in the early 1979 by UNESCO are taken as constraints for future urban expansion. The sites consist of three ancient royal palaces (Hanumandhoka Durbar square, Patan Durbar square and Bhaktapur Durbar square) and four religious complexes (Pashupatinath, Swayambhunath, Baudhanath and Changu Narayan). According to UNESCO, these zones have their unique historical, cultural and social values and they should be shielded from the effect of urban development.

There are also two properties inside Kathmandu Valley which are on the tentative list, namely Medieval Settlement of Kirtipur and Vajrayogini and early settlement of Sankhu.



Source: 20120523 WHC ICOMOS Kathmandu RM Mission Report [modified]

Figure 2.2.12 World Heritage Sites and Properties on the Tentative List in KV

2.2.4 Analysis of Socio-economic Condition in Kathmandu Valley

Based on the socio-economic profile of Kathmandu Valley, SWOT analysis was conducted for the socio-economic condition in the Valley. Result is shown in Table 2.2.18

Table 2.2.18 SWOT Analysis on Socio-economic Condition of Kathmandu Valley

		Strength	Weakness
		S1: Powerful gravity as the political, economic center S2: Gateway city to whole country S3: Abundant young workforce S4: Peculiar industry like apparel and printing S5: High standard of living in the country S6: World famous culture	W1: Lack of pivotal industry except commerce W2: Insufficient supply of electricity W3: Insufficient supply of water W4: Insufficient infrastructure, social services to cover population influx
Opportunity	O1: Deep concerns by many partners to support social, economic development O2: Vigorous private sector for economic development O3: Increase in logistics by inter regional road development	Opportunity-Strength strategies *Use strength to take advantage of opportunities* ・ Intensive investment in infrastructure to invigorate economic activities ・ Application of the vibrant private sector to create the foundation of livable city ・ Reinforce the function of national hub for economy	Opportunity-Weakness strategies *Overcome weakness by taking advantage of opportunities* ・ Creation of less consumption society utilizing advanced technologies ・ Creation of original brand based on the peculiar culture to attract investment
Threat	T1. Vulnerability for disaster T2. Imbalance of life standard between urban and rural T3: Worsening traffic condition and mobility of people T4: Worsening air pollution T5: Destruction of natural environment	Threat-Strength strategies *Use strength to avoid threats* ・ Creation of disaster resistant urban area by urbanization control and building guideline ・ Clarification of conservation area for nature and heritage ・ Provision of appropriate traffic mode for the capital city	Threat-Weakness strategies *Minimize weakness and avoid threats* ・ Reduction of disparities by welfare policy ・ Improvement of efficiency of infrastructures by planned urbanization ・ Strengthen public transport to improve people's mobility

2.3 Roles and Tasks of Related Organization

2.3.1 Urban Planning and Development

2.3.1.1 Three Related Ministries on Urban Planning and Land Use Control

Urban governance and public service delivery are marked by fragmentation of the institutional arrangement. The current arrangement has put urban planning and infrastructure development under one umbrella, while urban governance and administration in another.

Ministry of Federal Affairs and Local Development (MOFALD) is the central agency for governance and administration oversight of local bodies. Municipalities are also required to create Ward Citizens Forum and Integrated Plan Formulation Committee to empower the role of citizens in formulating annual plans, programs and budget.

On the other hand, Ministry of Urban Development (MOUD), formed in 2011, deals with the same

urban space including municipalities, small towns and market centers. It also undertakes functions of developing and managing basic urban infrastructure services such as water supply, sanitation, solid waste management and housing. Moreover, MOUD carries out specialized functions such as urban and regional planning, urban development, new towns and government buildings.[1]

Another ministry plays a different role such as creating land use zoning maps for VDCs, which is Ministry of Land Reform and Management (MOLRM). Their intention is to control and protect natural and agricultural land use from urbanization.

Table 2.3.1 Ministries and Departments Relating Urban Development and Land Use

Sector	Ministry	Role
Urban Development	**DUDBC** (Department of Urban Development and Building Control) **MOUD** (Ministry of Urban Development)	The Ministry undertakes functions of developing and managing basic urban infrastructure services such as water supply, sanitation, solid waste management and housing. And also it carries out specialized functions such as urban and regional planning, urban development, new towns and government buildings.
Local Development	**DLRM** (Department of Land Reform and Management) **MOFALD** (Ministry of Federal Affairs and Local Development)	Develops the structural framework and is accredited with the role of coordination, cooperation, facilitation and monitoring and evaluation of activities undertaken by local bodies.
Land Management	**DLRM** (Department of Land Reform and Management) **MOLRM** (Ministry of Land Reform and Management)	This ministry is responsible for land administration and management activities which ensures efficient and effective administration and sustainable management of available land resources in Nepal.

(1) MOUD

MOUD was established in May 2012, separated from MOPPW. MOUD has five divisions which are given as below:

Table 2.3.2 Divisions, Sections and Departments of MOUD

Division		Section
1	Administration Division	1. Personnel Administration Section 2. Internal Management Section 3. Financial Administration Section 4. Legal Advisory Section
2	Planning, Monitoring and Foreign Aid Division	1. Planning Section 2. Monitoring and Evaluation Section 3. Foreign Aid and Investment Promotion Section 4. Social Coordination Section
3	Water Supply and Environment Division	1. Drinking Water and Sanitation Section 2. Environment Section 3. Sector Coordination and Capacity Upgrade Section
4	Physical Planning and Urban Development Division	1. Physical Planning and Urban Infrastructure Section 2. Urban Development Committee and Small Town Section
5	Housing and Building Division	1. Housing Section 2. Building Section 3. Disaster Management Section
6	Municipality Cooperation Division	1. Municipality Good Governance and Capacity Development Section 2. Municipality Financial Management Development Section

[1] National Urban Development Strategy, MOUD

Department		**Outline**
1	Department of Urban Development & Building Construction (DUDBC)	The Department of Urban Development and Building Construction is the main body for implementing housing policies, regulations and standards. The department has 25 district level divisional offices all over the country supporting municipalities in preparing periodic plans and digital base maps.
2	Department of Water Supply and Sewerage (DWSS)	The Department established in 1972, is the lead agency for the drinking water supply and sanitation sector of Nepal.
Organization under Ministry		**Outline**
1	Kathmandu Valley Development Authority	
2	Kathmandu Valley Water Supply Management Board (KVWSMB)	Kathmandu Valley Water Supply Management Board (KVWSMB or Board) is an autonomous government body formed under Water Supply Management Board Act, 2063. The reporting line ministry of the Board is Ministry of Physical Planning and Works.
3	Kathmandu Upatyaka Khanepani Limited (KUKL)	Kathmandu Upatyaka Khanepani Limited (KUKL) is a public company registered under the Nepal Government's Company Act 2063, with objective to undertake and management of the water supply and sanitation system of the valley operated by NWSC and provides quantitative, qualitative and reliable service to the consumer to their full satisfaction at an affordable price.
4	Project Implementation Directorate (PID)	Started on 21 December 2000, Melamchi Water Supply Project (MWSP) is an Asian Development Bank assisted project which aims to improve the overall scenario of the water and wastewater utility of the Kathmandu Valley.
5	Town Development Fund (TDF)	In the context of rapidly growing urbanization process and at the same time financial, technological and administrative deficiencies at the municipal levels, HMG/Nepal in accordance with the Development Board Act, 1956 established Town Development Fund (TDF) in February 1988 with a view to assist the municipalities in their efforts of overall development.
6	Nepal Water Supply Corporation (NWSC)	After realizing demand for potable water in Kathmandu valley, government established a systematic development of water supply system with the PANI ADDA (PANI GOSWARA) unit in 2029 B.S. (May 1973A.D.).
7	Melamchi Water Supply Development Board (MWSDB)	Melamchi Water Supply Development Board (MWSDB) has been established by the government of Nepal in November 9, 1998 (2055/7/23 BS) as an implementing agency of Melamchi water supply project.
8	Singhdurbar Secretariat Reconstruction Committee	In June 1973, the Singha Durbar palace which housed almost all the total government offices caught fire and was brought to the ground except for the front wing of the first chowk. At present the various ministries and departments are scattered all over Kathmandu and Patan, some of them being housed in private residential buildings and others in very old nonfunctional buildings.
9	International Conference Hall Development Committee	
10	High Powered Committee for Integrated Development of The Bagmati Civilization	The Bagmati River is the largest river in the capital city of Kathmandu Valley which comprises 57 rivers and rivulets as its tributaries. It originates from Bagdwar, bifurcates Kathmandu valley in to two parts and crosses the valley at Chovar. There are so many shrines and cemeteries located in its bank. Gokarneshwar, Guheshwari and Pashupatinath temples are famous shrines enlisted in the World Heritage which reflects its importance to all the races of human civilization.
11	National Housing Co. Ltd.	
12	Rural Water Supply and Sanitation Fund	Rural Water Supply and Sanitation Fund Development Board (RWSSFDB) is promoting demand-driven community based approach in

	Development Board (RWSSFDB)	water supply and sanitation sector in Nepal by mobilizing non-governmental and private sector organizations in assisting communities to implement water supply and sanitation schemes.
13	Solid Waste Management Technical Support Center (SWMTSC)	
14	Urban Development Training Centre (Pokhara)	
15	UN Park Development Committee	
16	Drinking Water Tariff Fixation Commission	
17	Dhobikhola Corridor Improvement Project	

Source: MOUD Website

(2) DUDBC

The function, vision and objectives of DUDBC are summarized as below:

Table 2.3.3 Outline of DUDBC

Function	i) Formulation, planning and implementation of urban policies ii) Formulation, planning and implementation of housing plans and policies iii) Design, construction, repair and maintenance of government buildings
Long Term Vision	i) Safe, economical and environmentally friendly building construction ii) Affordable housing iii) Sustainable urban development
Objectives	**i) Housing Division** Promote safe and affordable housing through development of planned settlements **ii) Building Construction Division** Promote construction and development of safer, economical, and environmentally friendly buildings which also foster local architecture **iii) Urban Development Division** Promote sustainable urban development and urban rural linkages through development of modern physical facilities and conservation of cultural, religious, and historical heritage sites.

(3) MOFALD

Ministry of Federal Affairs and Local Development is one of the ministries of the government with widespread network up to grass-root level (VDCs and Municipalities). As per the main guiding policy (Geeta) of local development, Local Self Governance Act, 1999, this ministry has been placed at the apex of a three tier structural framework and accredited with the role of coordination, cooperation, facilitation and monitoring and evaluation of activities undertaken by local bodies (75 District Development Committees, 58 Municipalities and 3915 Village Development Committees).

In the line of creating various institutional mechanisms for initiating and facilitating developmental activities, Department of Local Development was created under the then Home & Panchayat Ministry in 1971. It was later upgraded as the Ministry of Local Development in 1980. It underwent some so-called (only in its nomenclature) and structural changes along with the change in political- economic ambiance. Finally in 1990, it was renamed as Ministry of Local Development from the then Ministry of Panchayat and Local Development which was named in 1981. The ministry since then has been inheriting the present organization structure and assuming the role of expediting local development and decentralization.

Table 2.3.4 Outline of MOFALD

Objectives	As a focal organization for promoting local development and decentralization, the main objectives, roles and responsibilities are as follows: • Contribute to poverty reduction by mobilizing local means and resources, utilizing skill and technology to the optimum level and creating employment opportunities. • Enhance access of socially and economically disadvantaged groups, regions and communities to the services and facilities delivered. • Capacity building of local governments through local self-governance and contribute to the promotion of local good governance. • Empowerment of women, dalit, indigenous, Madheshi, Muslim, disable and ultra-poor people through social mobilization and their mainstreaming into the wave of development. • Ensure inclusive development by enhancing peoples' participation in decision making and planning process.
Roles and Responsibilities	• Formulation of policies, plans and programs related to local self-governance, local development, remote area development, rural and community development, water supply and sanitation at local level and their implementation, monitoring and evaluation, • Training, research and investigation related to local self-governance, local development, rural and remote area development, community development, and water supply and sanitation at local level, • Demarcation and mapping of Village Development Committee, municipality, district, zone and development region, • Coordination of local development, local human resource and programmes, • Mobilization of local human resource and people's participation, • Necessary arrangement for local development related international conference and relations, • Management of local level fairs and markets, • Coordinate and develop cordial relation among local bodies, • Administration of vital registration, • Policy formulation, implementation and monitoring related to decentralization and devolution, • Identification of local technology and its promotion, • Activities related to rural development, • Local infrastructure and agricultural road construction and maintenance. • Activities related to the development of indigenous dalits and janajatis. • Social security, • Coordination with regional and international organizations for rural and local development etc.

Table 2.3.5 Divisions, Sections and Departments of MOFALD

Department & Division		**Section**
1	Federal Affairs and Autonomous State Management Department	1. Local Bodies Support Section 2. Federal Affairs and Decentralization Section 3. Population and Vital Registration Management Section
2	Municipal Management Division	1. Environmental Management Section 2. Disaster Management and Municipal Planning Section 3. Municipal Management Section
3	Department of Infrastructure Development	1. Infrastructure and Technology Development Section 2. Infrastructure Policy Co-ordination Section 3. Standard Development and Technology Testing Section
4	General Administration Department	1. Gender Equality and Social Inclusion Section 2. Legal Advisory Section 3. Personnel Administration Section 4. Financial Administration Section 5. Internal Management and Human Resource Development Section 6. Good Governance Section
5	Planning and Foreign Aid Co-ordination Division	1. Information, Publication and Archival Section 2. Planning & Foreign Aid Coordination Section

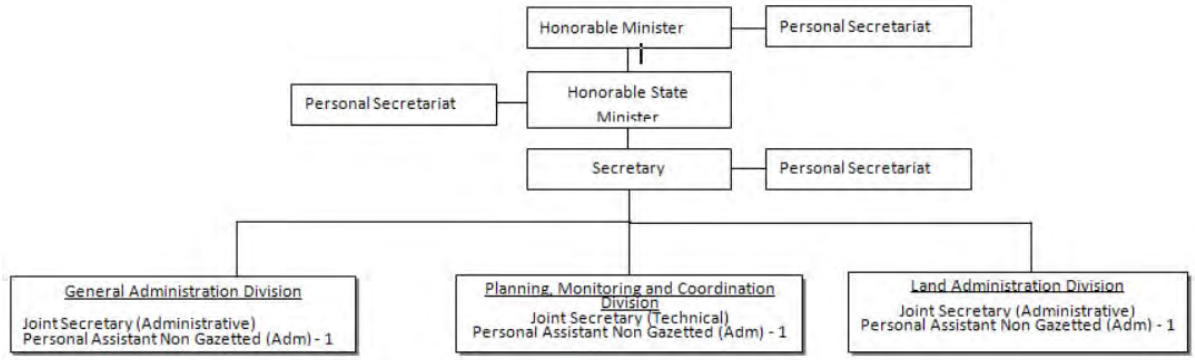
		3. Monitoring and Evaluation Section

(4) MOLRM

Ministry of Land Reform and Management (MOLRM), being the core ministry looking after the land administration and management activities, is responsible for ensuring efficient and effective administration and sustainable management of available land resources. It is also the prime responsibility of the ministry to provide effective and efficient service delivery to the general public. Furthermore, ensuring the availability of all kinds of geo-information products, which is the foundation of land administration and management activities, is the other principal responsibility of the ministry.

Table 2.3.6 Outline of MOLRM

Vision	Equitable access to land, secured tenure, desired geo-information products and quality services to all.
Mission	Provide good governed and qualitative services with modern and simplified national mapping, cadastral, land administration and land management system.
Objectives	1. Scientific Land Reform for equitable access to land. 2. Optimal use of land for sustainable development. 3. Protection of state and Guthi (trust) land for the benefit of the people at large. 4. Good land administration system for public satisfaction 5. Efficient and effective organization to serve the people better. 6. Modernized mapping services for modern Nepal. 7. Land Information System for e-Governance. 8. National Spatial Data Infrastructure for optimal utilization of public fund. 9. Qualified human resources and adequate infrastructure for delivering quality services.



As of 2014

Figure 2.3.1 Organizational Structure of MOLRM

Table 2.3.7 Divisions, Sections and Departments of MOLRM

Division		**Section**
1	Administration Division	1. Personal Administration Section 2. Internal Management Section 3. Financial Administration Section 4. Legal & Decision Execution Section 5. Grievance Management Section
2	Planning, Monitoring and Evaluation Division	1. Planning and Program Section 2. Supervision, Monitoring and Evaluation Section 3. Land Information Coordination Section

3	Land Management Division	1. Land Administration Section 2. Settlement Management Section
Department		**Section**
1	Survey Department	1. Geodetic Survey Division 2. Topographical Survey Division 3. Cadastral Survey Division 4. National Geographical Information Infrastructure Program 5. Survey Offices
2	Department of Land Reform and Management	1. Planning Section 2. Administration Section 3. Survey Section 4. Land Information Section 5. Land Revenue Offices 6. Land Reform Offices
3	Land Management Training Centre	
4	Department of Land Information and Archive	
Programs and Projects		
1	Land Information and Archive Program	
2	National Land Use Program	
3	Land Reform Program, Freed Kamaiya and Freed Haliya Rehabilitation Program	
4	Topographical Survey Program	• Topographical Survey Program • National Geographic Information Program (NGIIP)
5	Cadastral Survey Program	• Cadastral Survey Program • Survey office Strengthening Program
6	Geodetic Survey Program	
7	Land Revenue Record Security and Strengthening Program	

2.3.1.2 Urban Planning and Land Use Management in KV (Local Level)

At the local level in Kathmandu Valley, several local bodies have each role to manage urban development and land use. The summary is shown below.

Table 2.3.8 Local Bodies Relating Urban Development and Land Use

Sector	Ministry	Role
Urban Development	**KVDA (Kathmandu Valley Development Authority)**	• Preparation and implementation of PDP (Physical Development Plan) • Land Development /Land Pooling • Open Space Revitalization/ Greenery Enhancement • Project(s) Transcending One Local Body • Preparation and implementation of valley-wide planning, building bye-Law • Preparation, implementation & monitoring of various urban development guidelines, handbooks and tools. • Coordinating with different line agencies, local authorities and development partners for development of the KV. • Preparation, implementation and monitoring of various regulating and prohibition. • Permission for development project plan
Local Development	**Municipality and VDC (Village Development Committee)**	• Prepare periodic plans • Issue building permits • Implement infrastructure projects
Land Management	**National Land Use Project**	• Update existing land resources maps, • Preparation of land zoning data.

		• Preparation of profile of district level and land use data, • Preparation of land zoning data and profile for Village Development Committees / municipalities level.

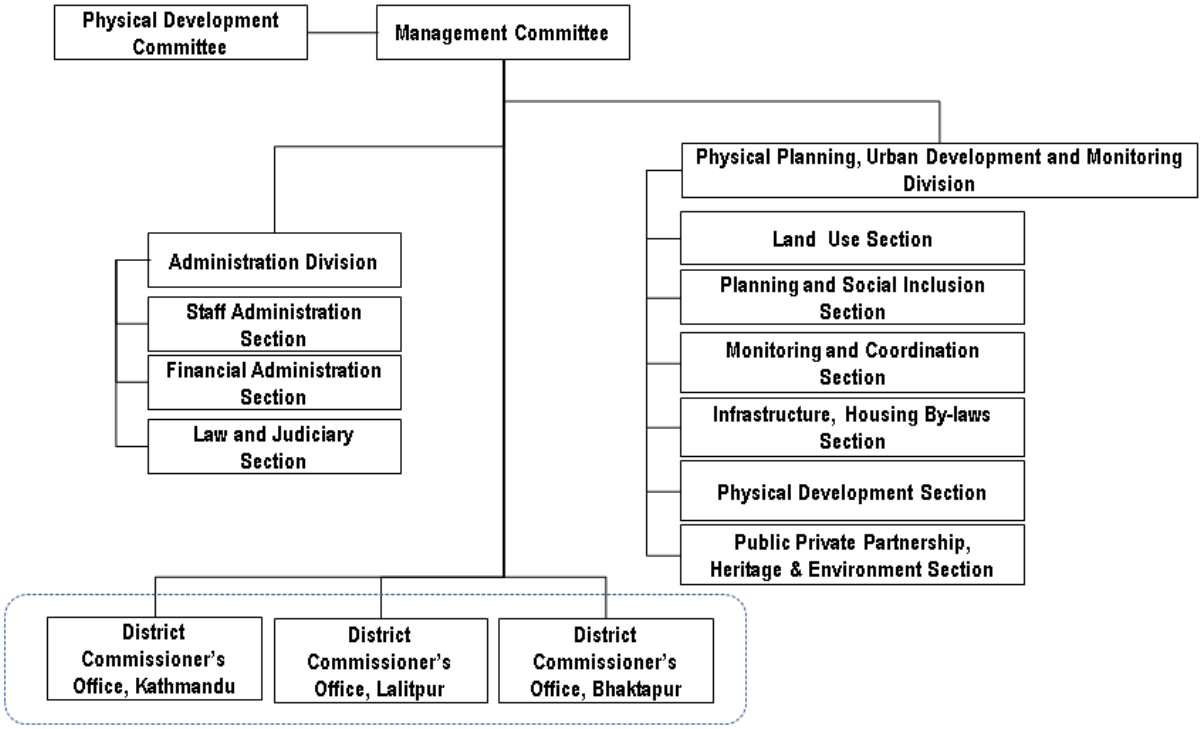
(1) KVDA

KVDA was established in 2012 under Ministry of Urban Development (MOUD) in accordance with the Kathmandu Valley Development Act, 1988. KVDA is initiating the urban planning including the land pooling which is utilized to develop the infrastructures in new urban area.

Since neither government agencies nor donor partners are necessarily well-coordinated in urban planning, the duplication of projects and roles can be observed, which leads to wastage of limited resources. Creation of KVDA was intended to integrate fragmented development and to control development as one administrative system in the Kathmandu Valley. The newly created organization still needs capacity development both in terms of human resource and technical capacity; it will be capacitated to become the leading authority for development control in the Valley.

Table 2.3.9 Outline of KVDA

Mission	KVDA's mission is to develop "Kathmandu Valley as a Safe, Clean, Organized, Prosperous and Elegant (SCOPE) National Capital Region", so as to foster the global image of Kathmandu Valley as a "livable city with the synergy and harmonization of nature, society and culture".
Functions	**1. Planner/ Planning Agency** • Preparation and implementation of PDP (Physical Development Plan) which includes: TOD (Transit Oriented Development Plan) preparation and implementation LUP (Land Use Plan) preparation incorporating risk sensitiveness as one of the features **2. Developer/ Developing Agency** • Land Development /Land Pooling • Open Space Revitalization/ Greenery Enhancement • Project(s) Transcending One Local Body **3. Monitoring, Regulating and Prohibiting Agency** • Preparation and implementation of valley-wide planning, building bye-Law • Preparation, implementation & monitoring of various urban development guidelines, handbooks and tools. • Coordinating with different line agencies, local authorities and development partners for integrated and inclusive development of the KV. • Preparation, implementation and monitoring of various regulating and prohibition mechanisms for integrated development of the KV.



As of 2014

Figure 2.3.2 KVDA - Current Organizational Structure

The total number of staff in KVDA in 2014 is 149. To plan and monitor development activities, more staff will be required in the respective sections.

Table 2.3.10 Human Resource in KVDA in 2014

Division	Section	No
Management Committee		6
Physical Planning, Urban Development and Monitoring Division	Infrastructure, Housing & By-laws Section	7
	Land Use Section	3
	Monitoring & Coordination Section	5
	Physical Development Section	3
	Physical Planning, Urban Development and Monitoring Division	2
	Planning & Social Inclusion Section	4
	Public Private Partnership, Heritage & Environment Section	3
Sub Total		27
Administration Division	Administration Division	2
	Financial Administration Section	2
	Law and Judiciary Section	4
	Staff Administration Section	18
Sub Total		26
District Commissioner's Office, Bhaktapur	Accounts Section	1
	Administration Section	11
	Building Section	3
	Infrastructure Development Section	3
	Monitoring Section	12
Sub Total		30
District Commissioner's Office, Kathmandu	Accounts Section	1
	Administration Section	11
	Building Section	3
	Infrastructure Development Section	3
	Monitoring Section	12

Sub Total		30
District Commissioner's Office, Lalitpur	Accounts Section	1
	Administration Section	11
	Building Section	3
	Infrastructure Development Section	3
	Monitoring Section	12
Sub Total		30
Grand Total		149

The number of employees at the District Commissioner's Offices is not confirmed.

Detailed functions and demarcation among related agencies will have to be planned; however, as a planning authority, there shall be more planners and mapping (GIS) staff.

Table 2.3.11 KVDA Human Resource by Professions in 2014

Tech or Admin	Title	No
Administration	Accounts Officer	3
	Administrative Officer	1
	Assistant	2
	Assistant Administrative Officer	2
	Computer Operator	5
	Senior Accounts Officer	1
	Senior Adm. Officer	3
	Senior Administrative Officer	1
	Senior Assistant	21
	Senior Assistant (Adm.)	9
	Senior Assistant (legal)	3
	Vice Development Commissioner	1
Administration Total		52
Technical	Assistant Engineer	8
	Computer Operator	1
	Deputy Development Commissioner	1
	Development Commissioner	1
	Division Planner	2
	Divisional Engineer	6
	Engineer	7
	G.I.S. Officer	1
	Junior Surveyor	3
	Senior Divisional Engineer	1
	Sociologist	1
	Sub Engineer	26
	Surveyor	4
	Vice Development Commissioner	1
Technical Total		63
Other	Assistant Senior Law Officer	1
	Driver	3
	Law Officer	1
	Light Vehicle Driver	5
	Office Assistant	9
	Peon	12
	Senior Assistant	3
Other Total		34
Grand Total		149

(2) National Land Use Project, Ministry of Land Reform and Management

The National Land Use Project under the Ministry of Land Reform and Management has been conducting land use zoning mainly to protect agricultural land. In accordance with the Land Use Policies, the National Land Use Project Office assesses land capabilities and prepares land use zoning

maps. After the zoning maps are prepared, the maps are overlaid on to the cadastral maps to add land use classification information to land registration records.

The objectives of the land use program are as follows:

1) Minimize the ratio amongst the different land use sectors for maintaining a balanced land use from the point of view of population, environment and sustainable development; and classify the land for agriculture, forest, pasture, settlement, urban development, industrial areas, etc.
2) Identify and classify the sectors based on geographical characteristic, land capability and soil quality which are comparatively more beneficial for arable land for agricultural crop production and the areas for income generation such as fruits, cash crops and herbs production areas.
3) Identify and zoning the land for housing, urbanizing, industrialization and other non-agricultural purposes in the existing municipalities and urban oriented rural areas as well as to balance the environment and sustain the system by preserving and developing water, forest and living treasure.
4) Identify the main settlements which are in transition zone and develop such areas in a planned and environmentally justifiable way.

Table 2.3.12 Human Resource in the National Land Use Project, MOLRM in 2014

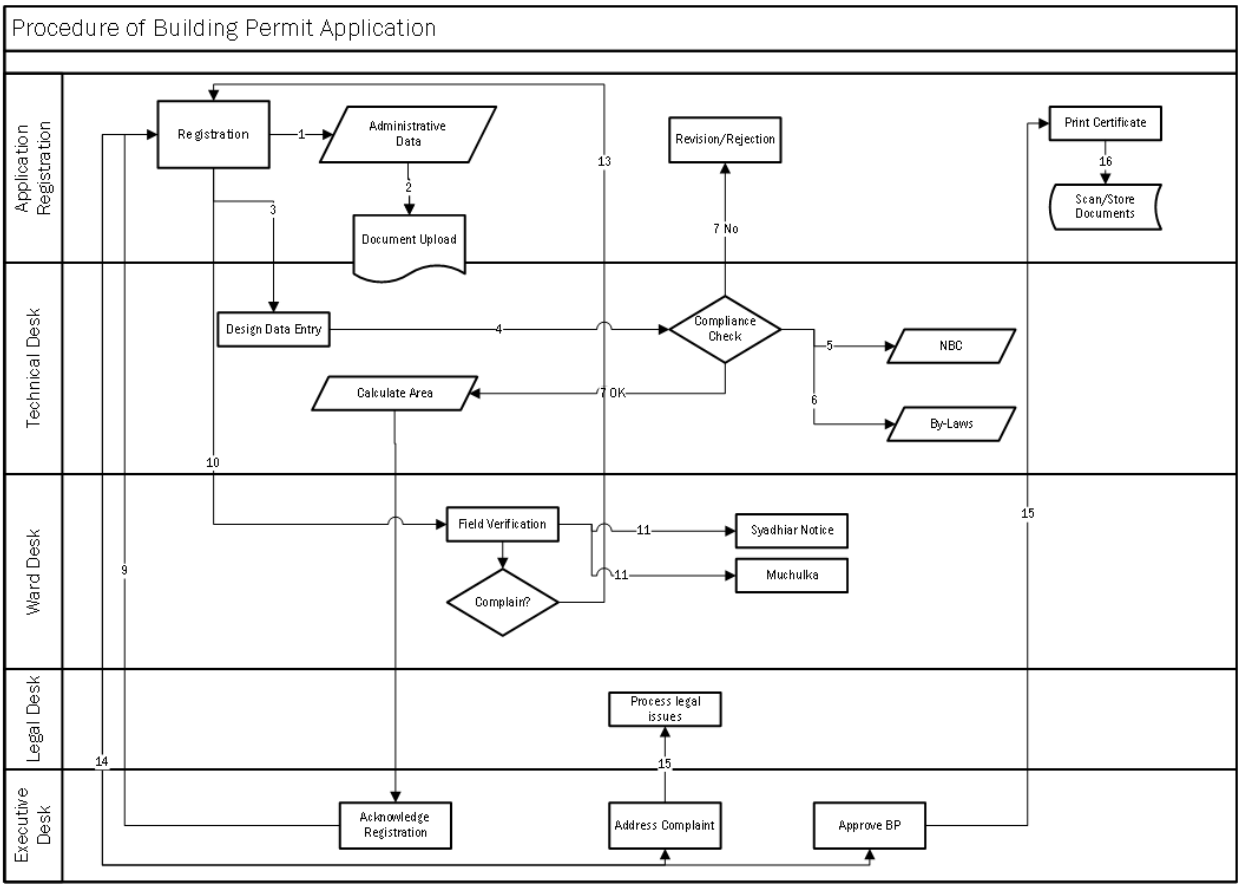
Title	No
Team Leader	1
Soil Specialist	1
Agriculture Expert	1
Agro-forester	1
Agronomist	1
Horticulturist	1
Senior Surveyor/Geomatic Engineer	1
Cartographer	1
Natural Resources Manager	1
Environmentalist	1
Forester	1
GIS Expert	2
Remote Sensing Expert	2
Land Use Planner	1
Geologist	1
Digitization Operator	4
GPS Operator	4
Socio-economist	1
Field Enumerator	4
Soil Sample Collector	4
Soil Lab Technician	1
Total	35

Already, 34 VDCs (22 VDCs in Lalitpur DDC and 12 VDCs in Kathmandu DDC) have established their own zoning maps. Major mapping works are outsourced to private companies.

(3) Kathmandu Metropolitan City – KMC

1) Building Permission Procedure

33 persons are employed in the Urban Development Department of KMC which administers building permission. The building permit is processed at five desks: Application Registration; Technical Desk; Ward Desk; Legal Desk; and Executive Desk.



Syadhiar Notice: Notice to neighbors
Muchulka: Minutes or meeting record

Figure 2.3.3 General Building Permit Application and Approval Procedure (KMC)

2) Monitoring and Inspection

KMC started third party monitoring and inspection system a year ago. Currently five consulting firms are hired to conduct monitoring of structures with 6 or more stories or with total floor area of 10,000 sq.ft. or more.

Table 2.3.13 Third Party Monitoring Check List (1)

Field verification Check-List of Building construction

First Report: Upto Plinth Level, Submitted to KMC, Urban Development Department

Owner name:-
Location:-
Ward no.:-
Type of Building:-
Computer Entry No:-
Plot No:-
Plinth area:-
Total Floor area:-
No. of Storeys:-

S.N.	Description	As per Permitted Drawing	As perConstruction on site	Construction on the site As per Permitted Drawing (Yes/No)		Remarks (If No; Justify)
				Yes	No	
1.0	**FOUNDATIONS**					
1.1	Size of Footings					
1.2	Depth of Footings					
1.3	Size of Reinforcements					
1.4	Spacing of Reinforcements					
1.5	Size and depth of Wall Footings					
1.6	Others...					
2.0	**COLUMNS**					
2.1	Size of Columns					
2.2	Size of Reinforcements					
2.3	Number of Reinforcements					
	Splice position					
2.5	Size of Stirrups					
2.6	Spacing of Strriups					
2.7	Others...					
3.0	**PLINTH LEVEL**					
3.1	Size of Plinth beam					
3.2	Size of Main Reinforcement					
3.3	Number of Reinforcements					
3.4	Size of Stirrups					
3.5	Spacing of Stirrups					
3.6	Others...					
4.0	**BUILDING BYELAWS**					
4.1	Set-backs					
	N					
	S					
	E					
	W					
4.2	Size of Building					
	L					
	B					
4.3	Others…					

Remarks/Conclusion:

Note:- Photos are required all details and views.

-Separate Sheet of report is required with this Check-List.

Submitted by:-

Table 2.3.14 Third Party Monitoring Check List (2)

Field verification Check-List of Building construction

..... Report:.....Floor, Submitted to KMC, Urban Development Department

Owner name:-
Location:-
Ward no.:-
Type of Building:-
Computer Entry No:-
Plot No:-
Plinth area:-
Total Floor area:-
No. of Storeys:-

S.N.	Description	As per Permitted Drawing	As perConstruction on site	Construction on the site As per Permitted Drawing (Yes/No)		Remarks (If No; Justify)
				Yes	No	
1.0	**COLUMNS/WALL**					
1.1	Size of Columns					
1.2	Size of Reinforcements					
1.3	Number of Reinforcements					
1.4	Special Confining Reinforcement					
1.5	Splice position					
1.6	Size of Stirrups					
1.7	Spacing of Stirrups					
1.8	Grade of Concrete					
1.9	Grade of Reinforcement					
1.10	Comumn+Beam Junction Detailing					
1.11	Vertical and Horizental Bands					
1.12	Clear Cover					
1.13	Others...					
2.0	**Beams**					
2.1	Size of Beams					
2.2	Size of Reinforcements					
2.3	Number of Reinforcements					
2.4	Special Confining Reinforcement					
2.5	Splice position					
2.6	Size of Stirrups					
2.7	Spacing of Stirrups					
2.8	Grade of Concrete					
2.9	Grade of Reinforcement					
2.10	Beam+Beam Junction Detailing					
2.11	Clear Cover					
2.12	Others...					
3.0	**SLAB/STAIRCASE**					
3.1	Size/Area of Slab					
3.2	Thickness of Slab					
3.3	Size of Reinforcement					
3.4	Spacing of Reinforcement					
3.5	Position of top/bottom reinforcement					
3.6	Grade of Concrete					
3.7	Grade of Reinforcement					
3.8	Splice position					
3.9	Clear Cover					
3.10	Others...					
4.0	**BUILDING BYELAWS**					
4.1	Set-backs					
4.2	Side Extension					
4.3	Septic Tank/Soak Pit					
4.3	Others…					

Remarks/Conclusion:

Note:- Photos are required all details and views.

-Separate Sheet of report is required with this Check-List.

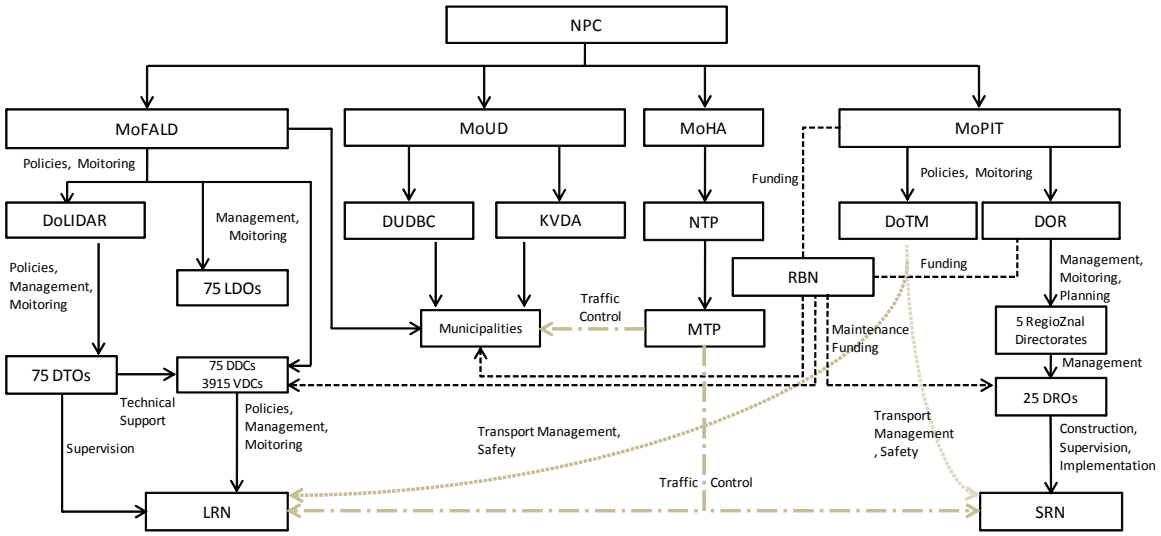
Submitted by:-

For other buildings, KMC directly conducts monitoring. KMC also asks designers (architects or engineers) who designed the buildings to conduct their own monitoring using the same check lists used by the third party monitoring consultants.

2.3.2 Road and Traffic Control Sector

Generally, the road network in Kathmandu Valley is classified into two categories such as SRN (Strategic Road Network) and LRN (Local Road Network) depending on the jurisdiction of administration bodies. Department of Roads (DOR) under Ministry of Physical Infrastructure and Transport (MOPIT) is responsible for SRN. Department of Local Infrastructure Development and Agricultural Roads (DOLIDAR) and the local bodies (DDCs, VDCs and Municipalities) under Ministry of Federal Affairs and Local Development (MOFALD) have the overall responsibility for LRN.

In addition, various authorities are involved in the road sector in Nepal as summarized below.

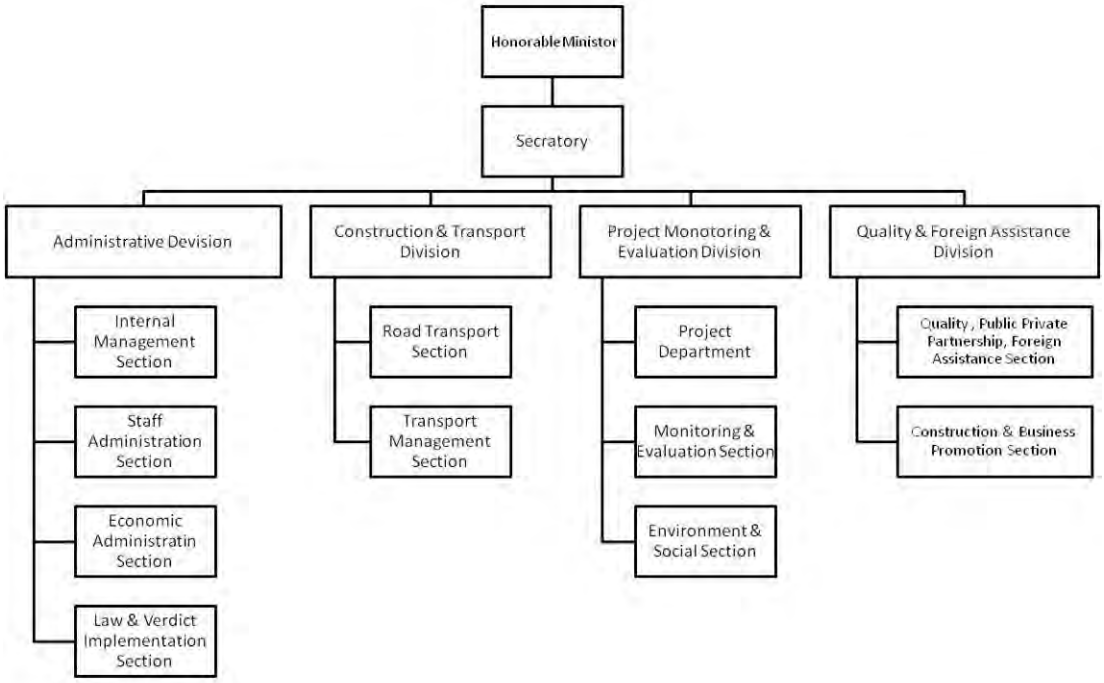


Source: JICA Study Team (JST) based on various source from GON in 2014

Figure 2.3.4 Authorities Related to Road Sector in Kathmandu Valley

(1) MOPIT

MOPIT has three departments namely DOR, DOTM and Department of Railways. Therefore jurisdiction of transport infrastructure is limited to land transport. Administration of airports and air transport is under the Ministry of Culture, Tourism and Civil Aviation (MOCTCA). In 2014/15, budget allocated to MOPIT was 41.1 billion NPR, which is 7.6% of national total budget. Vision of MOPIT is "Infrastructure development for national integration, socio-economic development and peace." The mission of MOPIT is through the development of infrastructure, to enhance the economic and social development of the whole country and to promote the evolution of Nepal. The organization chart of MOPIT is shown below.



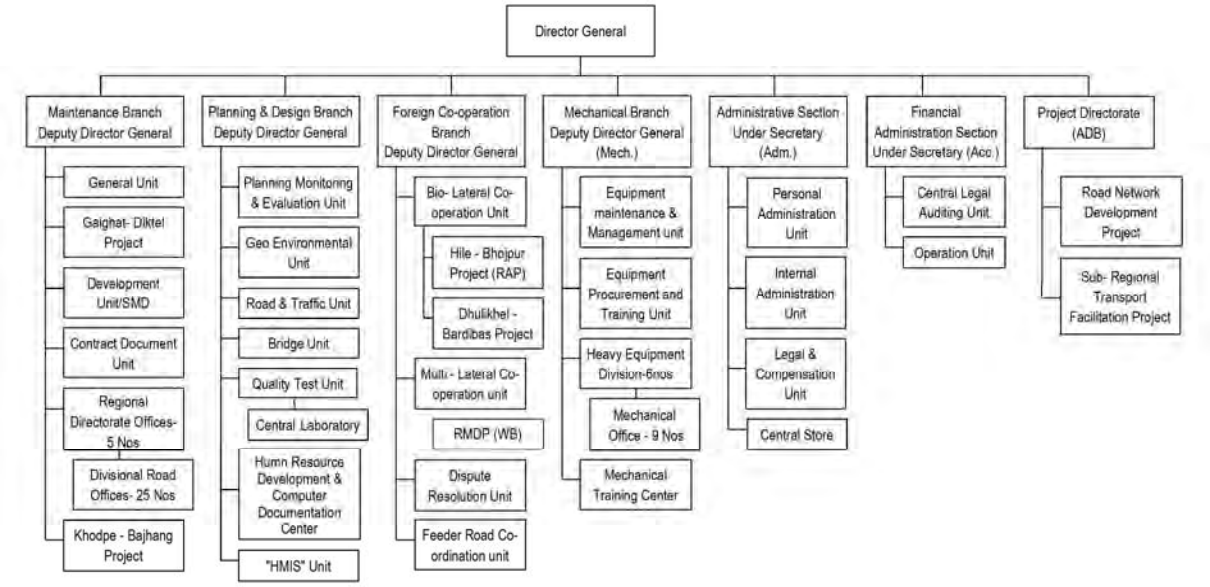
Source: MOPIT website, in 2014

Figure 2.3.5 Organization Chart of MOPIT

(2) Department of Roads (DOR)

DOR is one of three departments under MOPIT. The organization chart is shown in Figure 2.3.6.

DOR is the responsible authority of SRN which consists of national highways and feeder roads including primary, secondary, and strategic urban roads.



Source: SSRN 2013/14, DOR

Figure 2.3.6 Organization Chart of DOR

In order to develop, expand and strengthen the road network in a sustainable way for enhancing the nationwide socio-economic development, DOR sets their objectives as being the implementation of the following development priorities:

- To maintain road network effectively and efficiently (Asset Preservation)
- To provide access to all District Headquarters so as to strengthen social, economic and administrative linkages
- To improve existing access to District Headquarters for safe, reliable and cost effective travel
- To develop roads to supplement Poverty Reduction Program and to improve accessibility in Mid-hills and Terai
- To develop and expand the existing SRN to facilitate effective and efficient movement of goods and services and to foster economic growth
- To develop and adopt cost effective measures by initiating innovativeness in road pavement and bridge design
- To develop roads to support other infrastructure development and to link areas of significant social and economic importance
- To encourage private sector participation in the development, maintenance and management of roads

Table 2.3.15 Budget Allocation for Core Business Activities of DOR

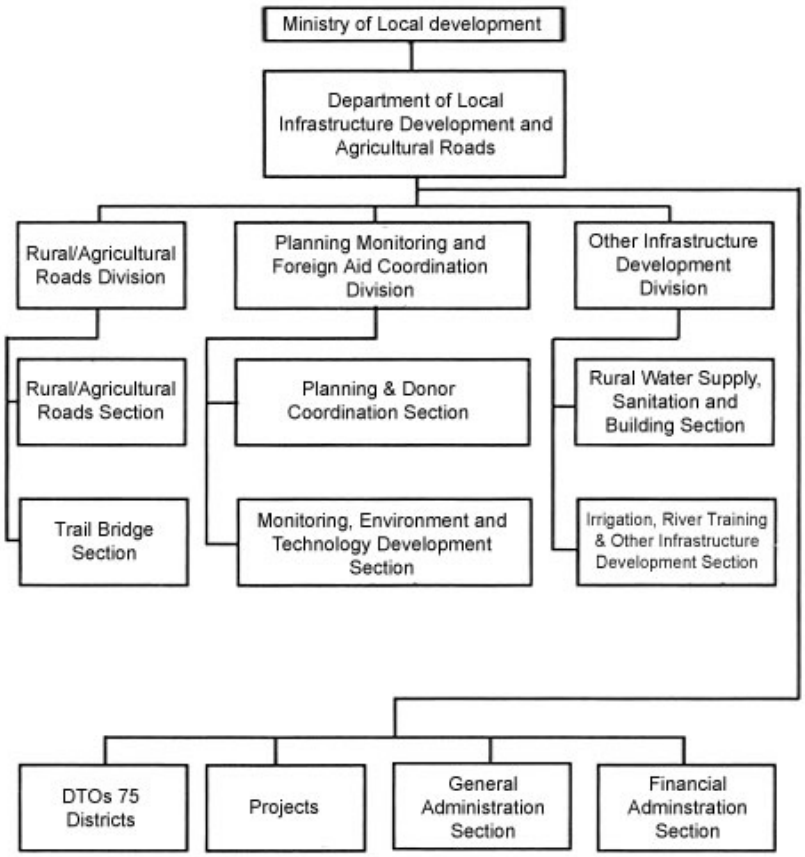
Major Programs	FY 2010/2011	Total for FY 2010/11-2012/13
Connecting District Headquarters (DHQ)		
4. New Road Construction	452,000	1,448,000
5. Road Upgrading	5,607,566	15,926,566
North-south Trade and Transit Road	3,248,934	10,426,491
Kathmandu Valley Urban Roads Repair and Improvement	748,953	3,082,124
Mid Hill Road Development	923,508	4,468,876
Upgrading of Postal and Other Roads	3,704,471	16,170,748
New Road Construction and Extension	1,636,416	5,762,765
Bridge Construction	2,743,136	9,893,719
Road Strengthening and Repair Maintenance	4,280,524	15,135,090
Study and Planning, etc.	75,000	245,400
Miscellaneous	111,000	412,000
Total	23,304,508	82,147,779

Source: Business Plan, DOR, 2011

(3) Department of Local Infrastructure Development and Agricultural Roads (DOLIDAR)

Local Road Network (LRN) is defined as the roads which are not identified as SRN. LRN is managed at the local level such as DDCs, VDCs and Municipalities.

DOLIDAR under Ministry of Federal Affairs and Local Development (MOFALD) is to undertake infrastructure development programs including the road sector in accordance with decentralization policies for attaining the goals set forth by the GON's national strategy for rural infrastructure development by making the local authorities technically capable and competent and ensuring their accountable participation.



Note: Ministry of Local Development was renamed to Ministry of Federal Affairs and Local Development (MOFALD)

Source: Website of DOLIDAR, 2015 (http://www.DOLIDAR.gov.np/about-DOLIDAR/organization/)

Figure 2.3.7 Organization Chart of DOLIDAR

In direct co-ordination with other line departments such as DOR and DOTM and in accordance with national policies and guidelines, DOLIDAR is undertaking the followings:

- Implement or arrange to implement the Rural Roads programs under Agricultural Perspective Plan
- Undertake or arrange to undertake planning of local-level rural roads, suspension bridges under the Ministry in co-ordination with local authorities
- Undertake or arrange to undertake the monitoring and evaluation of local-level rural roads and suspension bridges
- Assist local authorities (DDCs, VDCs, Municipalities) in preparing resources maps, periodic plans and undertaking technical studies
- Undertake activities for enhancing technical capability of the local authorities to implement local infrastructure development programs
- Co-ordination of the donor funded projects for providing technical and administrative support on behalf of the government
- Preparing and implementing necessary technical human resources development plan for the department as well as local authorities

- Establishing and operating centers for quality control and maintenance of construction and survey equipment
- Preparing various Norms, Standards and Manuals and providing training and orientation within the agency for uniformity and simplicity in infrastructure development programs
- Monitoring and evaluation of the civil construction and development activities implemented by different autonomous authorities within MOFALD
- Assess and evaluate the environmental aspects of the infrastructure projects and promote these skills and techniques to the local institutions

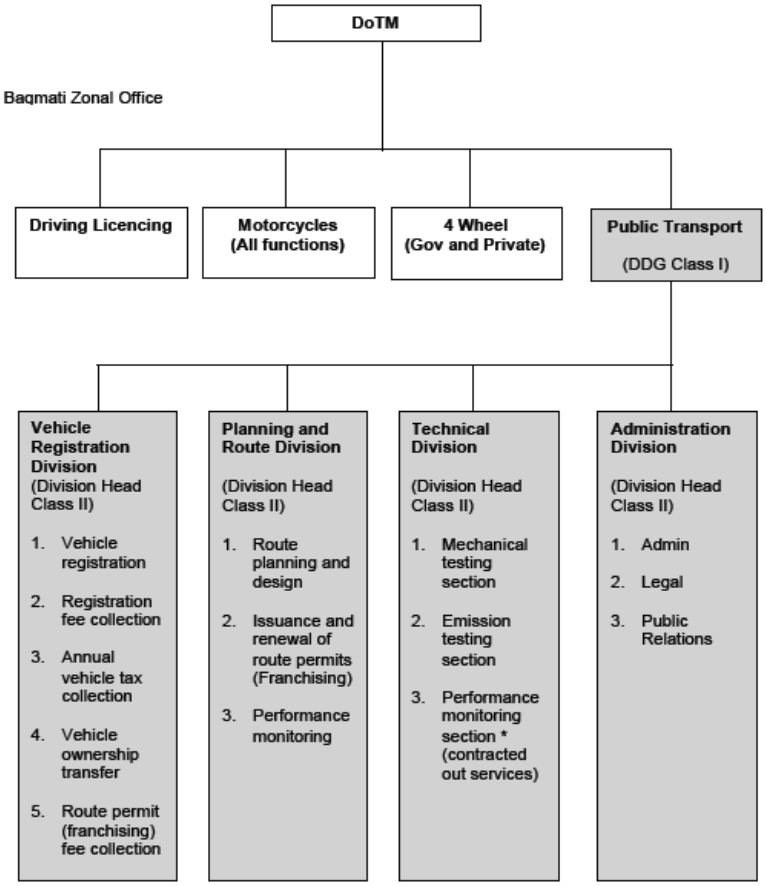
(4) Kathmandu Valley Development Authority (KVDA)

In road development, KVDA was responsible for the land acquisition of the road widening program in the Valley in cooperation with DOR, and the implementation of Outer Ring Road (ORR) formerly under the jurisdiction of DOR. The implementation of ORR is currently proceeding under the land pooling system. However the capacity for planning and design of the road facility is limited in the recently established KVDA and strong support from DOR might be required.

The details of KVDA such as its overall functions and organization are presented under section 2.3.1 of this chapter.

(5) Department of Transport Management (DOTM)

DOTM was established in 1984 to manage vehicles plying the road network. DOTM recently belongs to Ministry of Physical Infrastructure and Transport (MOPIT) since 2012. The functions of DOTM are specified in the Vehicle and Transport Management Act (1992) and Regulation (1997). Based on the act and the regulation, DOTM issues road permit for public vehicles (passenger/goods), registers new vehicles, issues driving licenses, renews and cancels driving licenses, and regulate tariff on public vehicles together with introducing many other safety measures for safe travel. DOTM has 14 zonal offices (3 offices in Bagmati Zone) throughout the country. DOTM has failed to manage the transport operation effectively due to lack of knowledge and enforcement which has led to increased ownership of private vehicles thus increasing traffic congestion in Kathmandu Valley.



Source: KSUTP, ADB, 2014

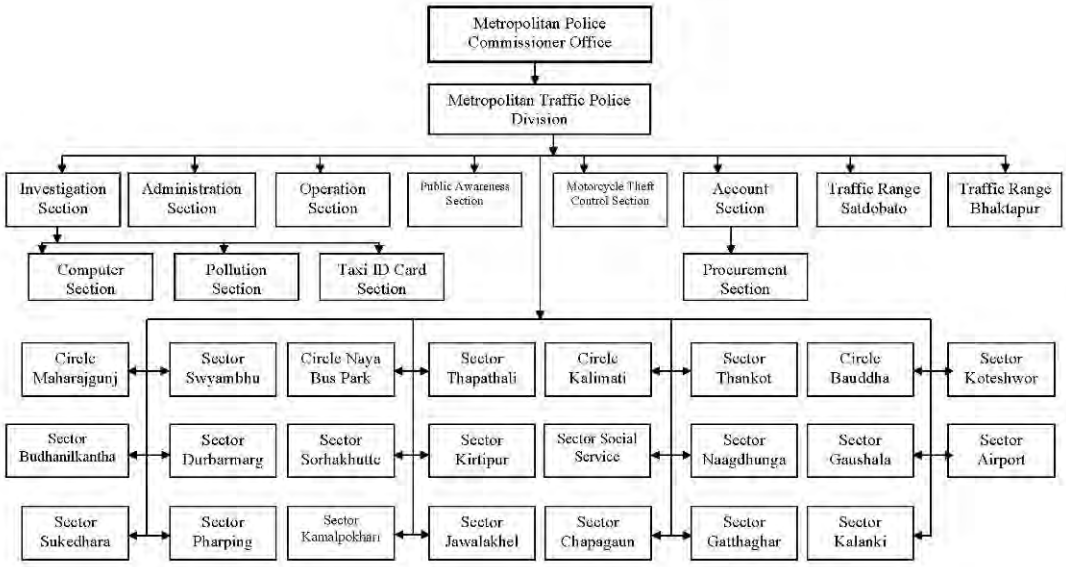
Figure 2.3.8 Organization Chart of DOTM

(6) Road Board Nepal (RBN)

RBN was founded in 2001 with the objective of providing sustainable fund for planned maintenance of the road network in Nepal. It is self-governing, self-sustaining organized institution based on Public Private Partnership model. RBN mobilizes resources for maintenance directly from road tariff and indirectly from fuel levy and vehicle registration fee from the government together with donor and government fund for road maintenance, based on agreement. The objective of planned maintenance of road is to preserve road asset and keep existing maintainable road in serviceable condition, reduce vehicle operating cost and provide comfort to road users, facilitating socio-economic growth of Nepal. Main function of RBN is to collect fund given from Road Board Act and manage the fund for maintenance, and allocate the fund to road agencies (DOR, DDCs, VDCs, Municipalities) for maintenance of road; and monitor and improve the system for better management of road network.

(7) Metropolitan Traffic Police (MTP)

MTP is a branch of Nepal Police (NP) under Ministry of Home Affairs (MOHA), which is responsible for smooth flow of traffic and enforcing the prevailing traffic rules and regulations, in coordination with Department of Traffic Management (DOTM) in Kathmandu Valley. With the rapid increase in the volume of vehicles and population of Kathmandu Valley, the challenge to maintain smooth flow of traffic in the limited road network of Kathmandu Valley is a difficult one for the MTP. It has become more complicated and difficult to manage traffic, with prevailing unscientific procedure in the issuing of driving license and a cartel-like syndicate in the operation of public transport; and lack of necessary logistics and training within the traffic police. Rapid urbanization of Kathmandu Valley has further increased the problem of traffic management in Kathmandu.

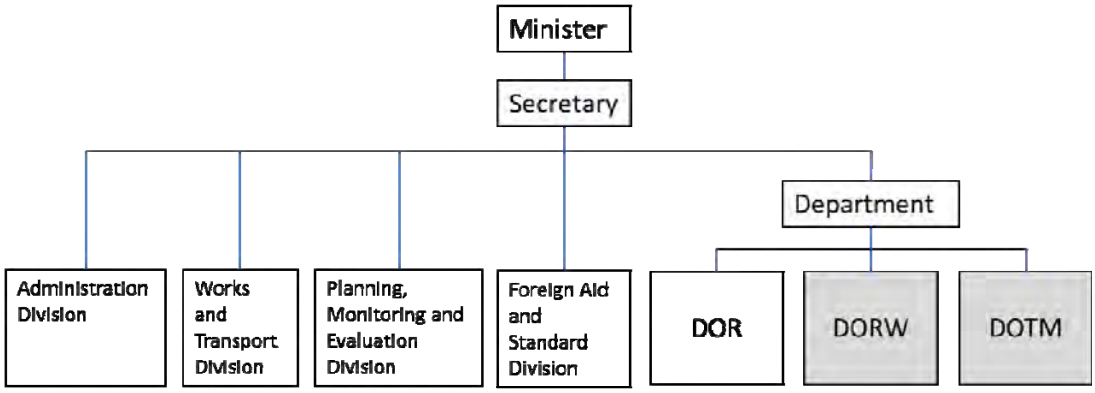


Source: JICA Study Team (JST) based on MTP website in 2014

Figure 2.3.9 Organization Chart of MTP

2.3.3 Public Transport Sector

There are two organizations, the Department of Traffic and Transport Management (DOTM) and the Department of Railway (DORW), which are related to public transport. Both organizations are under the Ministry of Physical Infrastructure and Transport (MOPIT).



Source: MOPIT

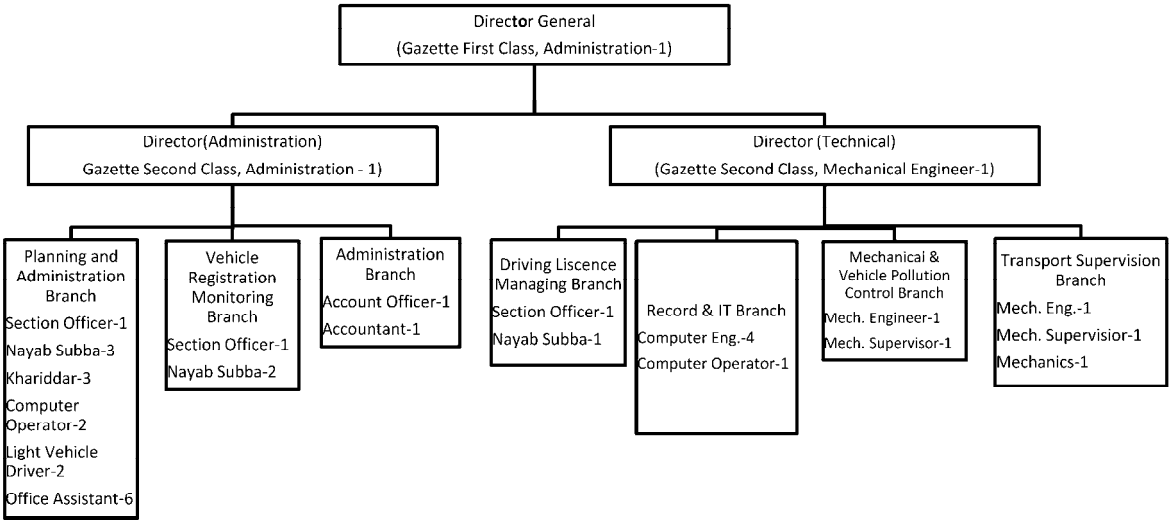
Figure 2.3.10 DOTM and DORW in MOPIT

(1) Department of Traffic and Transport Management (DOTM)

The functions of DOTM are specified in the Motor Vehicles and Transport Management Act (1993). Based on the Act, DOTM is responsible for the overall management of transport services, transport policy formulation, transport planning, management and regulations. In detail, the main functions of DOTM are:

- to determine policies and to give necessary direction to persons, firms, companies or organization related to transport services,
- to determine routes and fares for public motor vehicles,
- to determine speed and weight of motor vehicle and the number of passengers to be seated
- to issue driver and conductor license,
- to implement transport security system,
- to implement road safety audit, and

- to plan electric transportation system.



Source: DOTM in 2014

Figure 2.3.11 Organization Chart of DOTM

DOTM has 14 zonal transport management offices (ZTMO) throughout the country. The Bagmati ZTMO is responsible for the Kathmandu Valley. The ZTMOs are responsible for:

- registration, renewal and title transfer of vehicles,
- collections of vehicle tax,
- issuance of driving license,
- issuing route permits,
- regulating pollution standards of vehicles,
- testing the fitness of vehicles, and
- monitoring and regulating the provisions of laws regarding transport management.

DOTM is currently engaged in the following three projects:

- Kathmandu Sustainable Urban Transport Project (KSUTP),ADB
  Information about KSUTP is described under sections 3.1.2 and 3.2.2 in detail.

- Information and Communications Technology (ICT) Development Project, ADB
  The Project involves (i) building a government ICT network, which allows government-to-government exchange of data and information and central management of government data and information; (ii) developing various priority e-government applications; and (iii) developing and implementing human resource development programs. For example, e-driving license was planned to be introduced from 2 May 2015 and smart cars are being studied.

- Nepal and India Regional Trade and Transport Project(NIRTTP), WB
  Road Transport Safety and Axle Load Control Study in Nepal are being conducted as one of the components of NRTTP. For example, development of safe vehicle guidelines, assessment of existing route selection and permit procedure, guidelines for establishment and operation of road transport facilities, assessment of existing accident data recording, review and update of existing standard road traffic signs, assessment of freight flow pattern and possibility of using privately owned weigh-bridges are being studied.

Referring to "Final report on Institutional Strengthening of Department of Transport, Management (DOTM), Kathmandu Sustainable Urban Transport Project (KSUTP), ADB, October 2013", DOTM was found to have a number of constraints and problems such as lack of manpower, accountability

without commensurate authority, lack of infrastructure, lack of incentives and motivation of staff, lack of a database, etc. and therefore any institutional development plan needs to address these issues for effective transport planning and management. As a conclusion of the report, an institutional framework for overall institutional development was recommended. The framework covers areas such as mission and vision, legal framework, logistical support, physical infrastructure, information database, human resource planning, motivational aspects, training and development, education and awareness, outsourcing options, restructuring of DOTM and development of an integrated transport management plan.

JICA Study Team confirmed the several problems which the Report pointed out through an interview with DOTM, in December 2014. In particular, it seems that DOTM is facing lack of manpower to deal with increasing workload related to vehicle registration, determination of bus routes and implementation of KSUTP.

(2) Department of Railway (DORW)

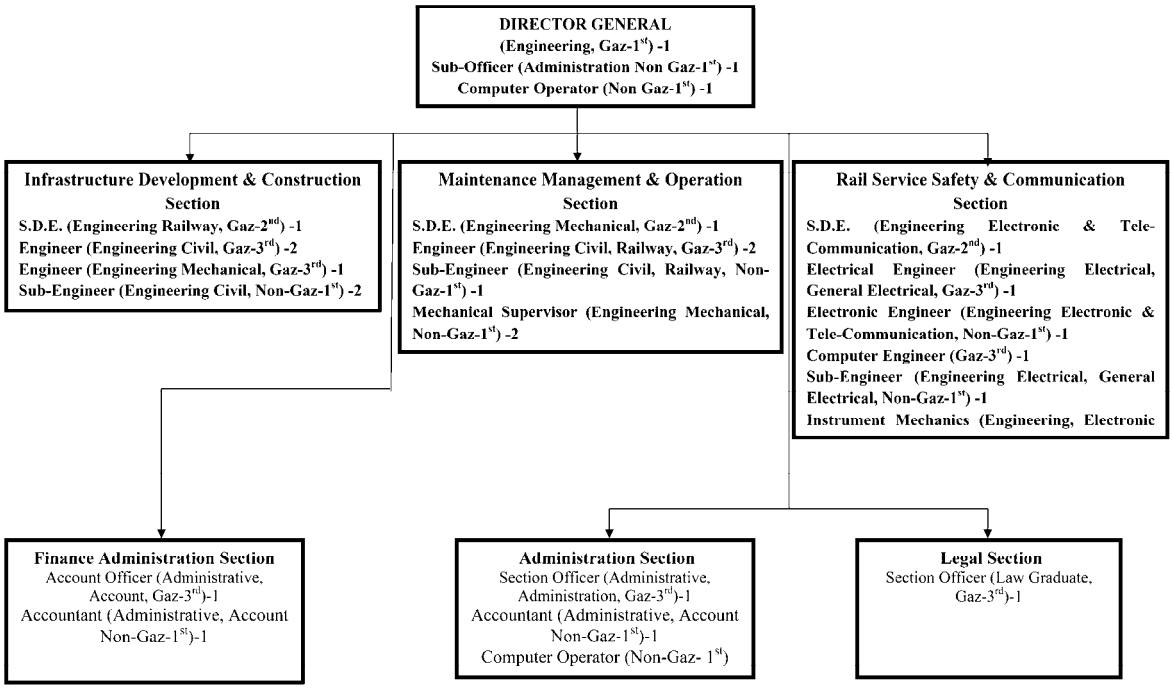
The Department of Railway (DORW) under the Ministry of Physical Infrastructure and Transport (MOPIT) was established in 2012 for the planning of the development of railway network in the country to meet the growing passenger and freight transport demand. Nepal's transport infrastructure is dominated mainly by the roads and civil aviation. The present day railway transportation in Nepal is limited to one narrow gauge 29 km long Jayanagar (India) – Janakpur(Nepal) railway operating in the central Terai region and 800 meters of the 5 km broad gauge line for freight service connecting Inland Container Depot (ICD) Birjunj, a border town to Raxaul(India).

Extension of the existing railway to Bardibash at East - West Highway has been planned. Dry port at Birgunj was connected with Indian Railways several years ago. Similarly it is planned to connect dry ports at Birat Nagar, Bhairahawa and Nepalganj with Indian Railways in the near future. In addition, feasibility study was done to examine the viability of Mech-Mahakali Railway Service and Kathmandu- Pokhara Railway Service.

DORW's vision is the development and construction of rail network within the country as well as connecting with international networks so as to contribute to the overall socio-economic development ensuring safe, affordable, accessible, and reliable rail transportation system.

DORW's objectives are:

- to develop, extend and manage railway network effectively and efficiently;
- to enhance socio-economic, cultural and administrative relation between trading center, industrial areas, places of religious values and tourism with the national capital as well neighboring nations with railway networks;
- to avail safe, affordable and reliable passenger rail and freight transport system;
- to encourage Public Private Partnership in the development, extension, operation and management of the railway network;
- to enhance international trade connecting national railway network to Trans-Asian railway network;
- to develop, extend and manage ropeway services; and
- to develop, extend and manage cable car services.



Source: DORW in 2014

Figure 2.3.12 Organization Chart of DORW

DORW is currently engaged in the following two projects:

- Feasibility Study of Mass Rapid Transit (MRT, Underground and Elevated Railway) System in Kathmandu Valley, 2012(Final Report); and
- Feasibility Study of Mechi - Mahakali and Pokhara - Kathmandu Electric Railway, MOPPW, Government of Nepal, 2010(Final Report).

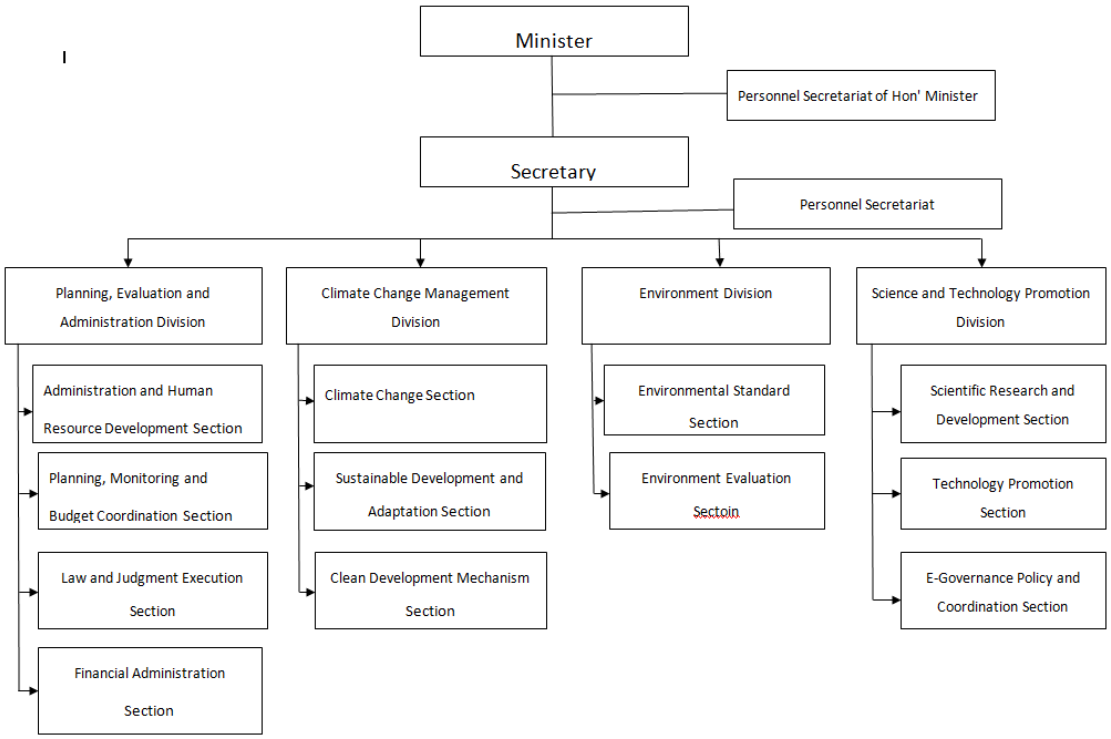
2.3.4 Environmental Sector

(1) Ministry of Science, Technology and Environment

MOSTE is in charge of approval of EIA. Since there are no laws and regulations concerning SEA, MOSTE is not in position to approve SEA report. As a counterpart of the Project, MOPIT is responsible for decision on SEA.

Each department under MOSTE has environmental data individually. For example, DOE has data on air pollution and Department of Hydrology and Meteorology has data on water quality.

Ministry of Forests and Soil Conservation and Department of National Parks and Wildlife Conservation has the information about protected areas and national parks.



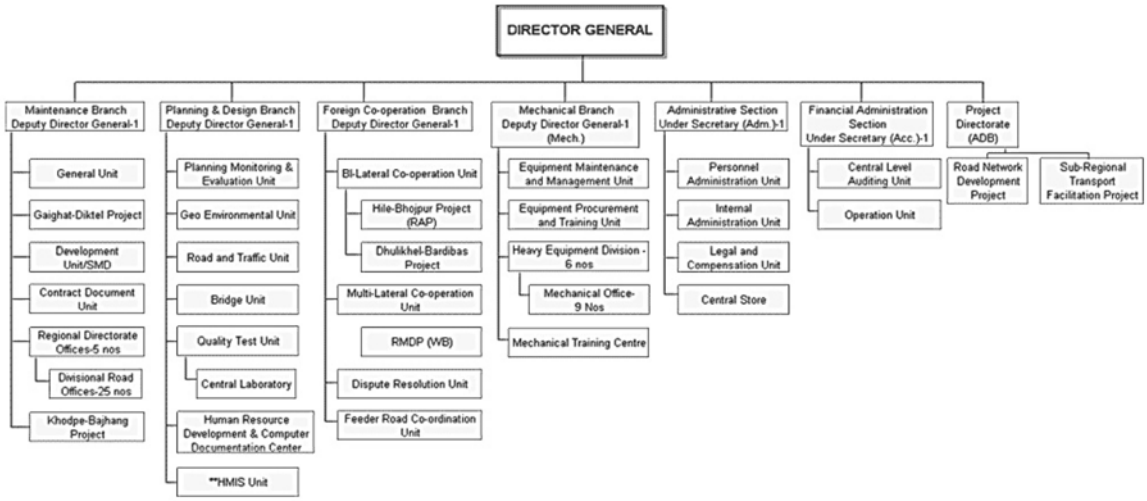
Source: MOSTE in 2014

Figure 2.3.13 Organization Chart of MOSTE

(2) Geo-Environmental and Social Unit, DOR, MOPIT

GESU is under Planning and Design Branch and is in charge of IEE for roads and bridges.

Since there are no laws and regulations concerning SEA, Environmental and Social Management Framework shall be applicable instead. The environmental assessment within SEA shall be conducted at IEE level.



Source: DOR

Figure 2.3.14 Organization Chart of DOR

(3) Department of Urban Development and Building Construction, MOUD

DUDBC under Ministry of Urban Development is initially responsible for formulation of urban policies, affordable housing plans for marginalized people, and maintenance of government buildings.

DUDBC is involved in the grievance mechanism such as compensation for the involuntary resettlement due to GESU's insufficient capacity and experience.

(4) Department of Environment, MOPE

DOE is one of the newly established departments under Ministry of Population and Environment (MOPE). The department is primarily mandated with the implementation of the Environmental Act, environmental regulations and standards in Nepal.

(5) Department of National Parks and Wildlife Conservation

The Department of National Parks and Wildlife Conservation is one of the 5 departments under Ministry of Forests and Soil Conservation and is in charge of the management of Shivapuri Nagarjun National Park and also handles conflict between people and wild animals.

Protected area in Kathmandu Valley, which is under the jurisdiction of this department, is Shivapuri Nagarjun National Park. The information regarding reserved forests, community forests and wildlife habitat areas are under the jurisdiction of the Department of Forests.

(6) Department of Forests

The Department of Forests is one of the 5 departments under Ministry of Forests and Soil Conservation and responsible for the sustainable management, utilization, protection and development of both national and private forests outside the protected area.

(7) Department of Plant Resources

The Department of Plant Resources under the Ministry of Forests and Soil Conservation is conducting and providing services in the field of research and development of plant resources in Nepal. It is a multidisciplinary organization comprising mainly of botanists, chemists and pharmacists.

Tree planting on roadsides and listing of rare plant species are under the jurisdiction of this department.

2.3.5 Disaster Prevention Sector

2.3.5.1 Local Government Administrative Organization

For administrative purposes, Nepal is divided into five Development Regions and these are Eastern, Central, Western, Mid-Western and Far-Western. Nepal has fourteen Administrative Zones, and each Administrative Zone is divided into seventy five Districts. Furthermore, each District consists of Municipalities and Villages. As of 2014, Nepal had fifty eight cities and 3,915 villages.

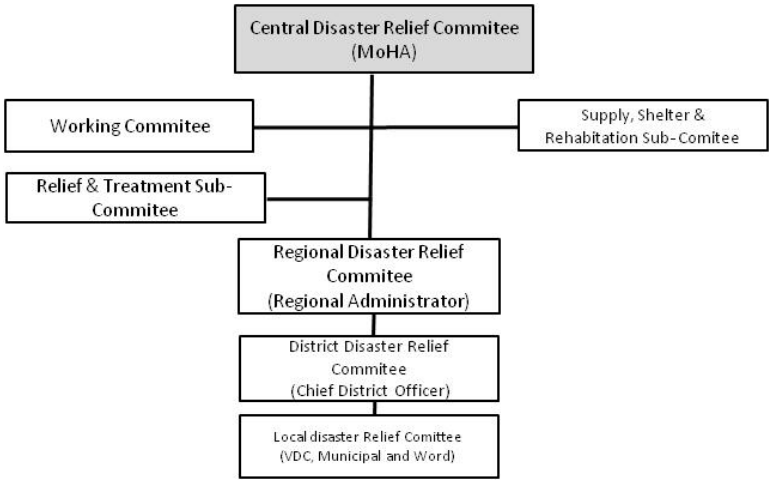
Source: MOHA HP

Figure 2.3.15 Administrative Organization Map (Nepal)

2.3.5.2 The Legal System

Natural Calamity Relief Act was enacted in 1982. This is a foundation of National Disaster Prevention Plan. In this law, the role of the central government on disaster management and local government roles and responsibilities are defined.

Based on this law, disaster prevention system in Nepal is organized as follows.



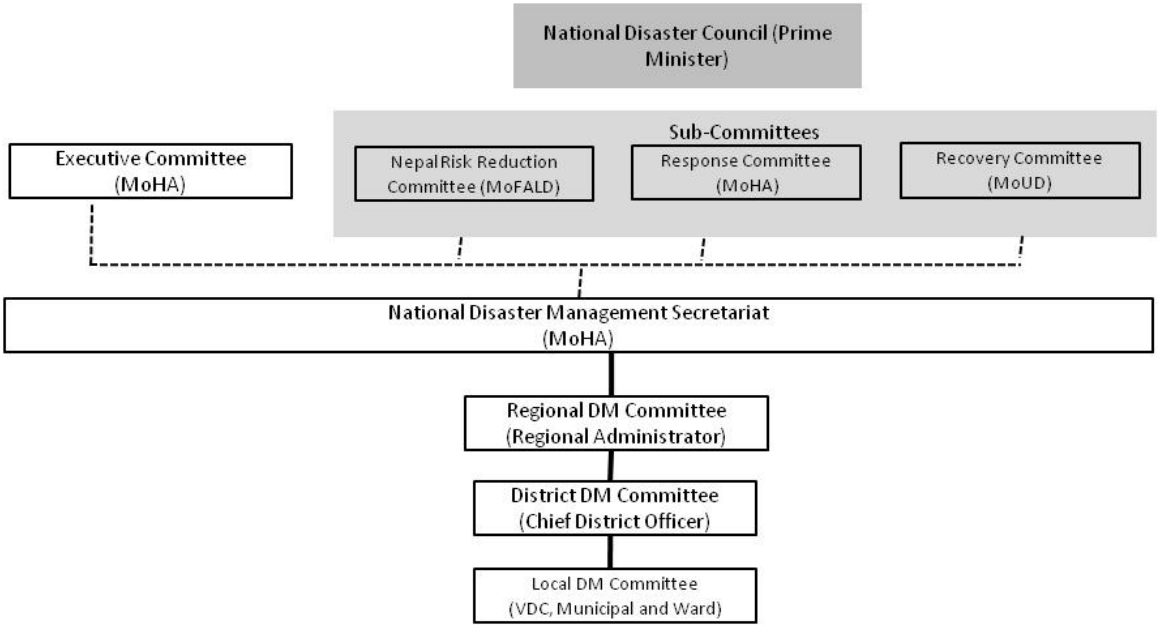
Source: Disaster Risk Assessment in Nepal P-118; NSET,GRIP

Figure 2.3.16 Disaster Response Framework in Nepal

But the Natural Calamity Relief Act's main aim was disaster response and there was no description of measures to be taken to reduce the damage caused by disasters under this law. Hence a new law named Disaster Management Act (DMA) was created in 2009. This law is expected to become effective from 2015.

According to the Disaster Management Act, the Executive Committee is to be formed by the Ministry of Home Affairs (MOHA) under the Nepal Disaster Council (NDC). NDC is the main organization for disaster response and is headed by the Prime Minister. Disaster response Sub-Committees are to be formed by MOHA, MOFALD and MOUD.

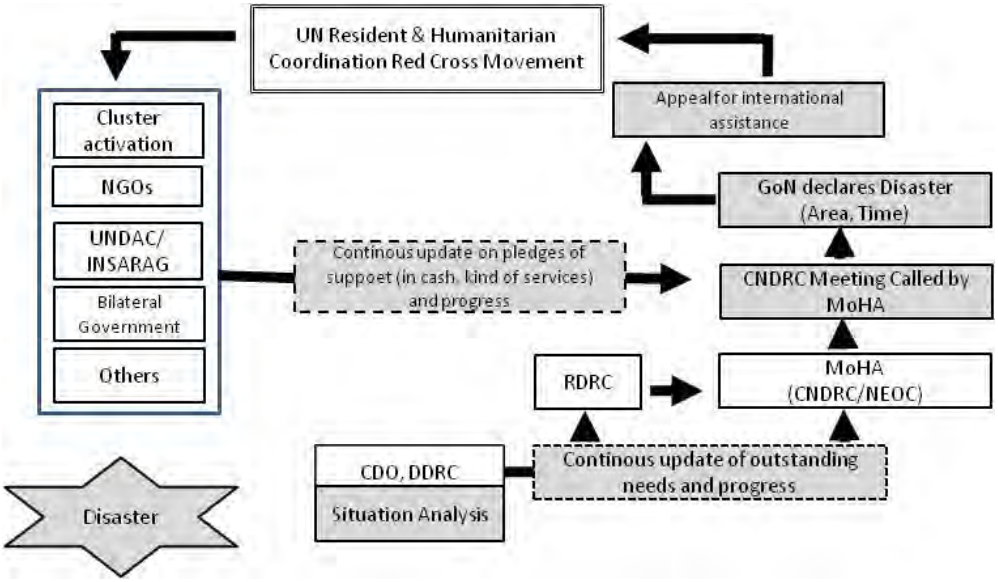
The law proposes the establishment of a National Disaster Management Secretariat.
The proposed organization chart for disaster management is as shown below:



Source: Report of NRRC

Figure 2.3.17 Disaster Management Framework in DMA

The national and international assistance and coordination structure during emergency is as follows.



Source: National Disaster Response Framework (NDRF),MoHA P-5

Figure 2.3.18 Disaster Management Framework in DMA

The coordination structure in Nepal is presented as below.

Table 2.3.16 The Coordination Structure in Nepal

Name of Clusters H	Health	WASH	Shelter	Food Security	Logistics	CCCM	Education	Protection	Telecommunication	Nutrition	Early Recovery Network
Cluster Leads (Government)	MoPH	MoUD	MoUD	MoAD	MoHA	MoUD	MoE	MoWCSW/NHRC	MoIC	MoHP	MoFALD
Cluster Coleads (Humanitatian Agencies)	WHO	UNICEF	IFRC/UNHABITAT	WFP/FAO	WFP	IOM	UNICEF/SC	UNHRC/UNICEF/UNFPA	WFP	UNICEF	UNDP

Source: National Disaster Response Framework (NDRF), MOHA P-5

2.3.5.3 Government Agencies for Disaster Management

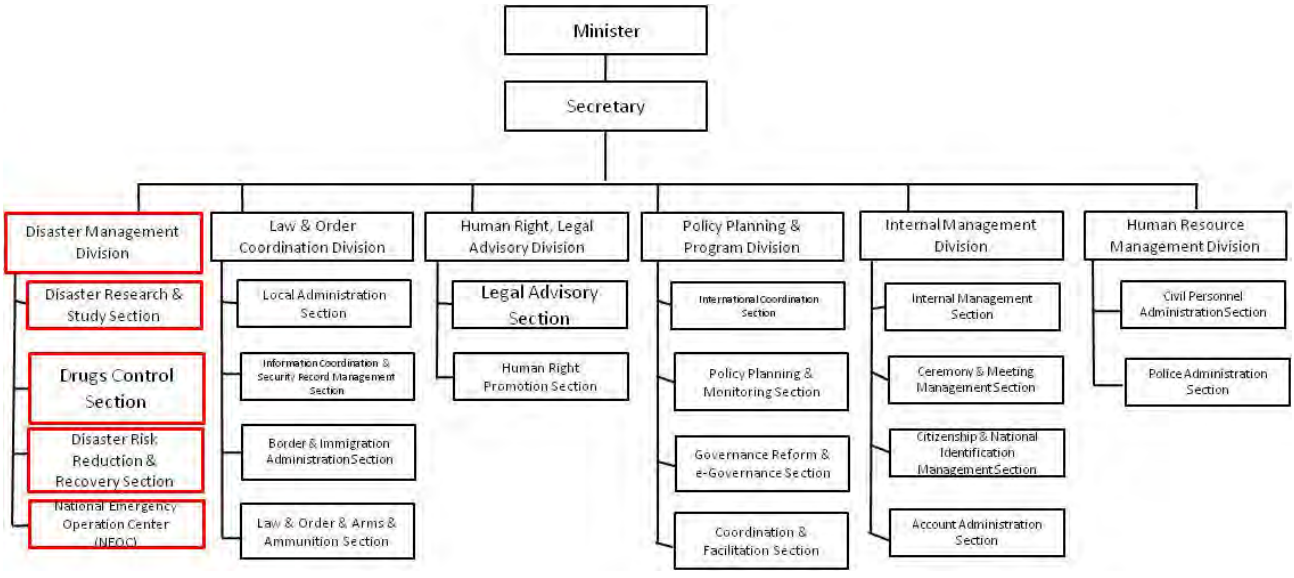
MOHA, MOFALD and MOUD are the main government agencies for disaster management in Nepal. These government agencies support the different platforms for disaster management and protection like Nepal Risk Reduction Consortium (NRRC). Minister of MOHA serves as the head of NRRC and Central Disaster Relief Committee (CDRC) during an emergency.

The District Administration Office (DAO) works under MOHA.

1) Ministry of Home Affaire (MOHA)

Natural Calamity Relief Act was established at 1982. This law forms the foundation for national disaster management.

The Ministry of Home Affairs (MOHA), through its Disaster Management Section under the Planning and Special Services Division, is the national agency responsible for disaster management in Nepal. Formulation of national policies and their implementation, preparedness and disaster mitigation, immediate rescue and relief works, data collection and dissemination, collection and distribution of funds and resources are the vital functions of the Ministry. Its network to cope with natural disasters is integrated by 75 Chief District Officers, one in each of the administrative districts, who act as the crisis manager in the event of natural disasters. The main functions of the department are to co-ordinate and carry out emergency preparedness and disaster management activities with the concerned agencies in an effective and efficient manner.



Source: JICA Study Team based on MOHA HP in 2014

Figure 2.3.19 Organization Chart of MOHA

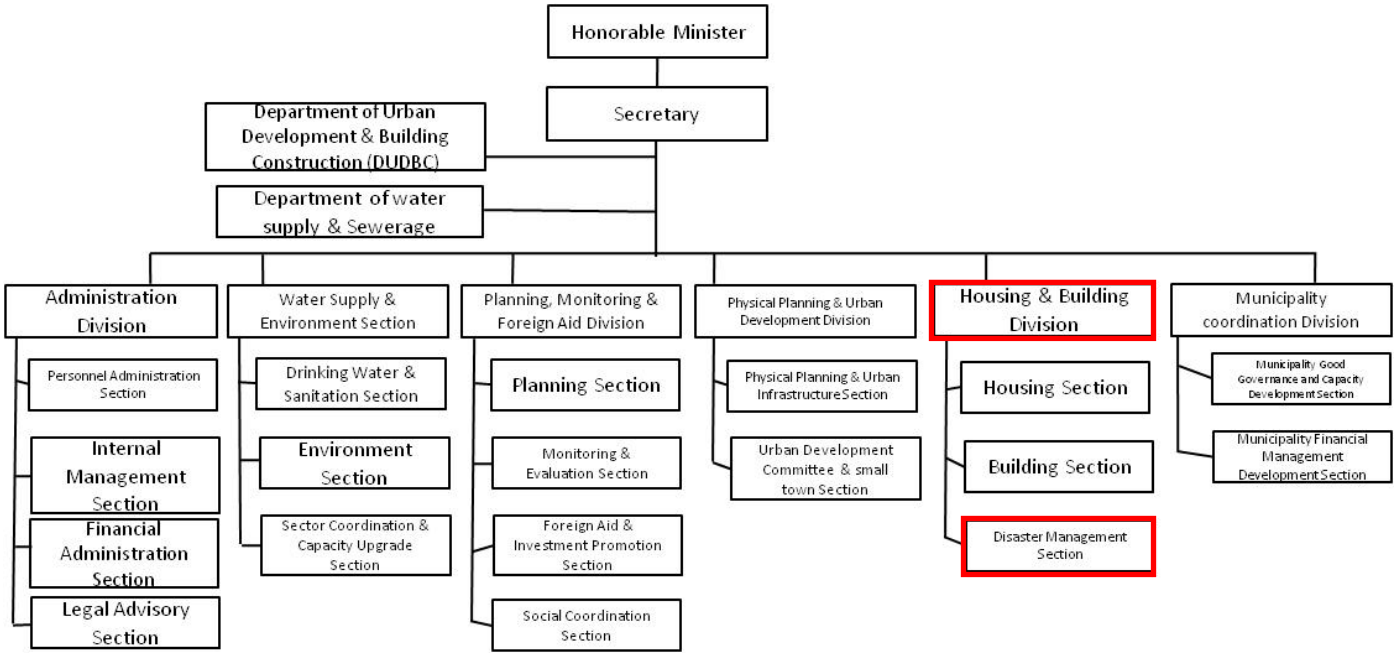
2) Ministry of Urban Development (MOUD)

In 2012, Ministry of Physical Planning and Works (MOPPW) became Ministry of Urban Development (MOUD) by government reorganization. Task of MOPPW in National Disaster Relief Act is mitigation of disaster and activity of MOPPW are risk analysis of redevelopment projects and educational activities for the construction of safe buildings.

Affiliated organizations of MOUD are the following:

- Kathmandu Valley Development Authority (KVDA),
- Kathmandu Valley Water Supply Management Board (KVWSMB),
- Kathmandu Upatyaka Khanepani Limited (KUKL),
- Town Development Fund (TDF),
- Nepal Water Supply Corporation (NWSDB),
- Singhdurbar Secretariat Reconstruction Committee,
- International Conference Hall Development Committee, and
- High Powered Committee for Integrated Development of The Bagmati Civilization.

Source: MOUD HP



Source: MOUD HP, http://www.moud.gov.np/images/org-chart-nep.gif in 2014

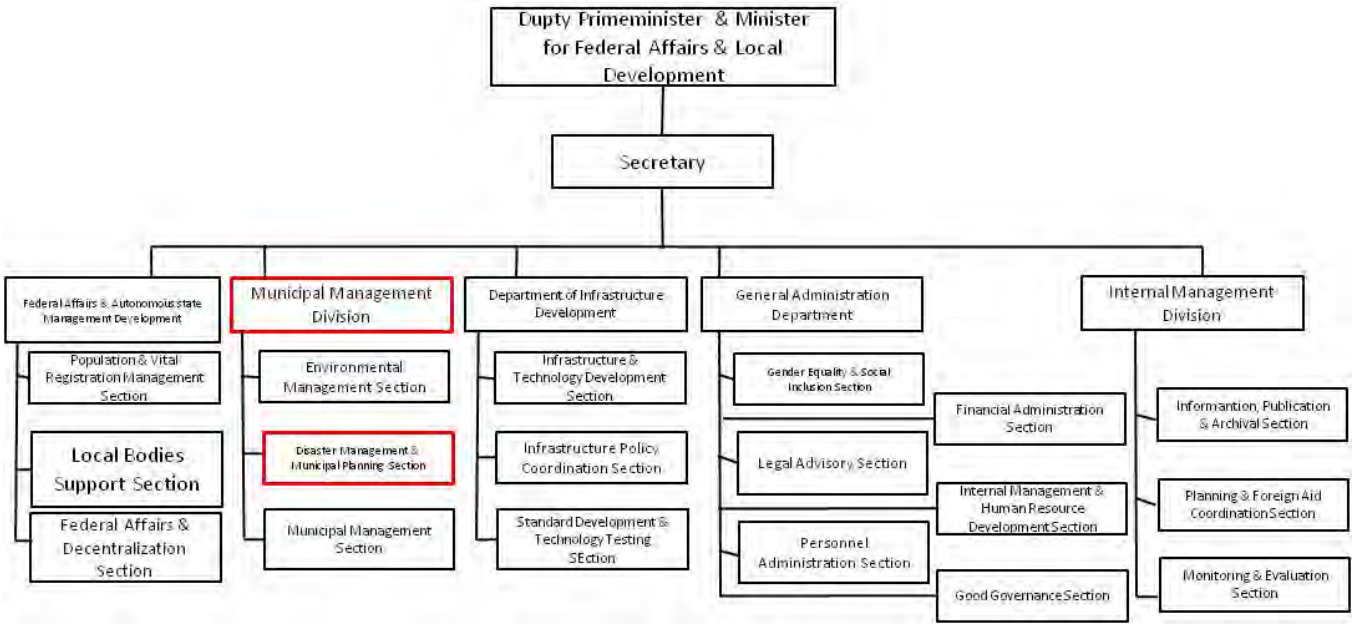
Figure 2.3.20 Organization Chart of MOUD

3) Ministry of Federal Affair and Local Development (MOFALD)

Ministry of Local Development is one of the ministries of the government with widespread network up to grass-root level (VDCs and Municipalities). As per the main guiding policy (Geeta) of local development, Local Self Governance Act, 1999, this ministry has been placed at the apex of a three tier structural framework and accredited with the role of coordination, cooperation, facilitation and monitoring and evaluation of activities undertaken by local bodies (75 District Development Committees, 58 Municipalities and 3915 Village Development Committees).

One of important tasks of MOFALD is disaster prevention within the community. In NSDRM, emergency response and mitigation are important tasks for MOFALD. Staffs of MOFALD are stationed in each district, city and village government and support the making of the plan for disaster protection.

In MOFALD, 'Disaster Management & Municipal Planning Section' controls every district, city and village disaster prevention section.

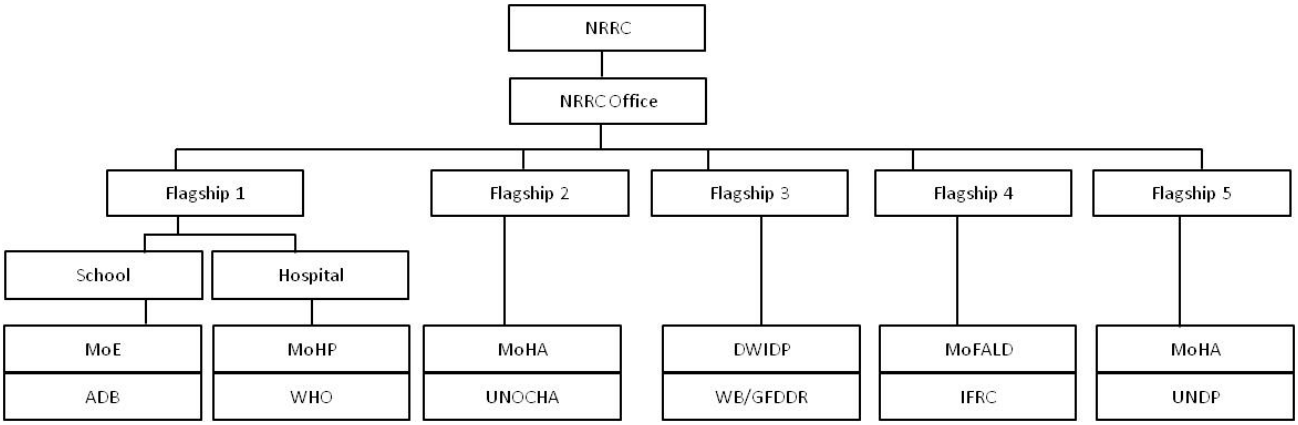


Source: MOFALD HP, http://www.mofald.gov.np/page.php?id=5; 16/05/2014

Figure 2.3.21 Organization Chart of MOFALD

4) Nepal Risk Reduction Consortium (NRRC)

The Nepal Risk Reduction Consortium (NRRC) is a unique arrangement that unites humanitarian and development partners with financial institutions in partnership with the Government of Nepal in order to reduce Nepal's vulnerability to natural disasters. Based on the Hyogo Framework and Nepal's National Strategy for Disaster Risk Management, the NRRC has identified 5 flagship priorities for sustainable disaster risk management.



Source: NRRC HP, http://www.un.org.np/coordinationmechanism/nrrc) in 2014

Figure 2.3.22 Structure of NRRC

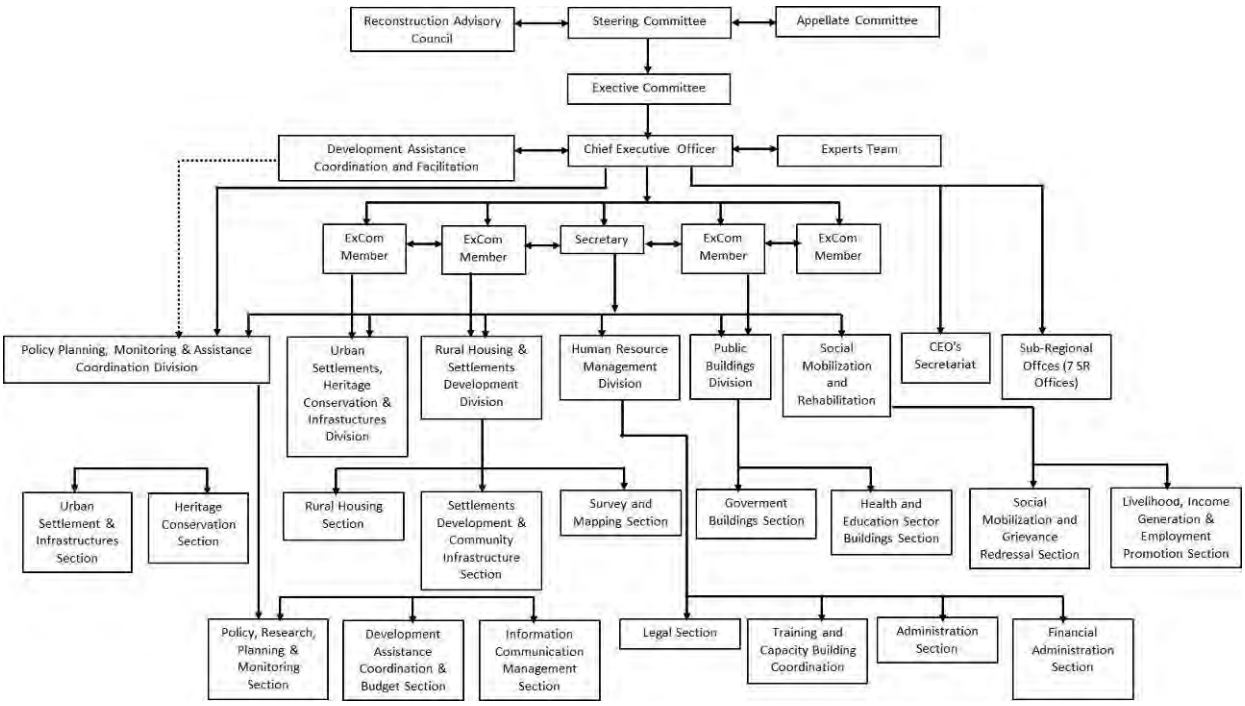
5) National Reconstruction Authority (NRA)

National Reconstruction Authority (NRA) is responsible for leading and managing the earthquake recovery and reconstruction program in a sustainable and planned manner for a safer and more resilient Nepal. NRA provides strategic guidance to identify the priorities for recovery and reconstruction. The most urgent and pressing needs of the affected people can be met in the short-

time. NRA has been established for five year period with a possible extension of one year during which all identified recovery and reconstruction activities are expected to be completed.

Roles and responsibilities of NRA are the following:

- Allocating reconstruction funds
- Approving plans, budgets and programs
- Relocation and rehabilitation
- Collaborating with key stakeholders
- Building implementation capacity
- Monitoring and quality control
- Ensuring accountability and transparency



Source: Post Disaster Recovery Framework (2016-2020) NRA and NRA HP http://nra.gov.np/

Figure 2.3.23 Structure of NRA

CHAPTER 3 REVIEW OF EXISTING PLANS AND ON-GOING PROJECTS

3.1 Existing Plan

3.1.1 Urban Development and Land Use

(1) National Land Use Policy 2012, MOLRM

The new Land Use Policy 2012 is a challenging policy for Nepal.

This policy seeks optimum utilization of land while preserving natural resources and cultural heritage, through classification of land and enforcement of land use control accordingly. The policy encourages land consolidation as opposed to land fragmentation and it also emphasizes on the legislative basis for the incentives and disincentives for the preservation of agricultural land. Settlements are encouraged in the safer locations – which are hazard free and where infrastructure provisions become viable and compact settlements are prioritized as opposed to scattered development.

Its Vision, Mission, Goal & Objectives are as follows:

Table 3.1.1 Outline of National Land Use Policy 2012

Vision	Achieve sustainable economic, social and environmental development of nation by optimum use of available land and source land.
Mission	Ascertain optimum result by classifying land by use, management and monitoring, to achieve sustainable social, economic and environmental development of nation by optimum use of available and land resource.
Goal	i) Classify the entire land based on structure, capacity, suitability and necessity. Land use plan at different levels will be completed for implementation, based on classification. In the case of a municipality, district headquarter and emerging municipality oriented VDC, the land use plan will be completed within 5 years. ii) Organizational and legal system will be in place within two years to implement all the subjects related to land use, regulation and management of land based on classification.
Objectives	i) Classify the land for optimum use of land and land resources. ii) Promote the conservation and management based on classification. iii) Manage the division of land & encourage planned urbanization. iv) Keep balance between development and environment. v) Conserve the special important land related to culture, history, tourism, religion etc. vi) Prepare the land use plan to reflect land use policy. vii) Determine the minimum valuation of land and land tax based on land use. viii) Manage proper use of land which is not in use.

(2) National Urban Development Strategy 2014 (NUDS), MOUD

NUDS was prepared out of the need to replace the inadequate NUP 2007 and also to give direction and to shape the work of the newly established ministry, MOUD. NUDS covers urban infrastructure, urban environment, urban economy, urban investment, urban financing, urban governance and urban land.

Table 3.1.2 Outline of National Urban Development Strategy 2014

Goal	• To complement the national urban policy vision and facilities, periodic and appropriate changes. • To provide strategic directions for the newly formed Ministry of Urban Development. • To define the scope of urbanization and urban development and to that extent indicate the areas that logically comes under the ambit of the Ministry. • To inform and facilitate the urban sector on all activities of other agencies of the government that bear on urban development including inter alia transport, agriculture, industry, trade, education and health, environment, water and sanitation services,

	culture, tourism, local development etc.
Objectives	a) Develop and elaborate the medium/long term strategic vision of a desirable and realistic national/regional urban system based on existing trends and resource potentialities, and proposed strategic initiatives. b) Establish benchmarks and standards for urban infrastructure, urban environment, urban planning and management, and urban governance. c) Identify key issues and prioritized initiatives and investment (project) required with regard to: ➢ urban infrastructure, ➢ urban environment, and ➢ realizing comparative advantages based on resource potentials. d) Identify key issues with respect to investment for urban development and strategies to augment urban financing and implementation. e) Suggest institutional framework and legal instruments to facilitate implementation and monitoring of NUP and proposed urban development strategies.

(3) 20 Years Strategic Development Master Plan (2015-2035) for KV, KVDA

KVDA drafted their Long Term Development Plan so-called "20 Years Strategic Development Master Plan (2015-2035) for Kathmandu Valley", which updates existing Long Term Development Plan of Kathmandu 2059 (2002). This master plan is based on the result of Comprehensive Disaster Risk Management Program (CDRMP) which was supported by UNDP. The Project on Urban Transport Improvement for Kathmandu Valley is conducted in line with the master plan.

Outline of the plan is summarized below.

Table 3.1.3 Outline of National Urban Development Strategy 2014

Vision	"To Promote Kathmandu Valley as a Livable City by Accentuating the Synergy of Nature, Lives and Culture"
Mission	"To Establish Kathmandu Valley as a SAFE, CLEAN, ORGANIZED PROSPEROUS and ELEGANT NATIONAL CAPITAL" The Mission Definition SAFE : Safety of peoples' life, including poor and vulnerable from multi hazards CLEAN : Free from noise, air, water, wastes and industrial pollution ORGANIZED : Systematic approach to land use, transportation, urban infrastructure planning and housing development PROSPEROUS : Economic development through the promotion of tourism and service industries ELEGANT : Beautiful through the conservation of historical, religious, cultural and social assets, both tangible and intangible
Issues to be concerned	1) Isolated approach not workable: • Absence of clear demarcation of rural and urban areas. • Necessity of harmonized coordination mechanism. 2) Disproportionate Population: • The disproportionate distribution of population has further aggravated the problems and created a big question mark for the management of these issues. • Imbalance of population volume among VDC & Municipality. 3) Inequitable Infrastructure: • The levels of infrastructure in the municipalities and in VDCs are not the same. • Necessity of planned urbanization with certain balanced infrastructure 4) Lesser Constraint Free Area: • Only 34% of constrain free area in KV and most of them are prime agricultural land • The constraint free areas is the prime agriculture area which is most prone to get exploited for potential built ups. • Required high density planed urbanization. 5) Inappropriate Vicinity: • No favorable land available for the urban expansion in the vicinity of

	Kathmandu Valley except some land in Banepa, Panauti, Dhulkihel. • The only option hence available is to manage the available space within the valley.
Strategy	**Strategy 1 Radical Institutional Reform** Until recently (2014), there were 114 bodies in the Valley, with responsibility for land use plan preparation and implementation, 1 Metropolitan City, 1 sub-metropolitan city, 3 municipalities, 3 DDCs, 45 urbanizing VDCs, 44 VDCs, 5 TDCs and 1 KVDA. Radical Institutional Reform within the valley is hence inevitable. A strategic authority is necessary, with responsibility and powers to prepare and implement a strategic development plan for the entire Valley that will provide a basis for other local bodies within the Valley to conduct local level planning in a coordinated and comprehensive manner. In order to prepare and implement integrated development plan, it's inevitable to coordinate with the several stakeholders including government administrative agencies, utility agencies, local municipalities and VDCs, NGOs/ INGOs and the KVDA will also have to work as Valley Planning Commission.
	Strategy 2 Two Levels of Planning KVDA shall prepare a strategic development plan based on Kathmandu Valley as a single planning unit. The strategic development plan will contain broad land use zones to: • protect areas deemed not suitable for urban development (at this point in time, or in perpetuity), and • control/restrict development to within certain categories or classes. This is an absolute necessity for effective risk sensitive land use planning. It will also provide a strategic framework to guide: • major infrastructure projects, roads in particular; and • Major building projects, such as commercial complexes, large apartment blocks, industrial areas etc. Based on the strategic development plan, the municipalities and VDCs shall prepare Local Area Plan. These plans are more detailed and prepared with satellite imageries or cadastral maps in the background.
	Strategy 3 : Risk Sensitive Color Zones for Risk Sensitive Land Use & Transportation Planning In Kathmandu valley, the municipalities have adopted different land use zone classifications according to their predominant use. The National Land Use Policy (NLUP), 2012, has identified seven land use zones to be made applicable in the entire nation. These are: a) Agriculture b) Residential c) Commercial d) Industrial e) Forests f) Public Use g) Others. The purpose of the identification of land use zones, be it municipality or the region, is more or less the same. The land use zones are identified to devise instruments for the social, economic and environmental development through the optimum utilization of land, more specifically for: a) commercialization of the agriculture through organized herbal, horticulture, livestock, fisheries farming; b) the identification of prime agriculture land for national food security; c) the development of potential urban area with suitable provisions for urban infrastructure; d) the identification and promotion of areas with tourism potential; e) the identification of forests, watershed, natural heritage, buffer zones and their conservation towards protection of wild life and bio-diversity, the identification of calamity prone zones and for the reduction of risks to the human, animals and properties; and f) increasing revenue through a use based taxation system.

(4) Other Related Planning and Policy

Outline of related urban development and land use policies are as follows:

Table 3.1.4 Outline of Related Planning and Policy

Policy and Plan	Outline
National Transport Policy 2001	The Policy aims at developing a sustainable urban transport system to improve the social and economic development of the country. At the broad national level, the Policy emphasizes the north-south connectivity linking China and India - that may also serve as an important trade and transit corridor between China and India in the future. Apart from the present East-West Highway, the policy proposes Mid-Hill Highway in the Hills and Hulaki Marg in the Southern Plains of Tarai connecting east and west of the country. The Policy prioritizes connectivity to all the 75 districts of the country, and stresses the social and administrative parameters despite low density and lagging economic justification for connectivity investment in many hinterland districts.
National Agricultural Policy 2004	The policy seeks to achieve sustainable agricultural development by transforming current subsistence agriculture system to commercial and competitive agriculture system. The policy emphasizes on increasing agricultural productivity, creating foundational basis for commercial and competitive agriculture, and conservation of natural resources. Apart from prioritizing technological input, research and institution building, the Policy discourages non-agricultural activities in the fertile agricultural land – while it aims to promote high value agriculture development pockets along the feasible locations of North South Highway and Feeder roads and in the remote areas. To develop such pockets, integrated agricultural infrastructure services areas are promoted through private sector participation. The collection centers near production area and well equipped modern whole sale market facilities are promoted near and in the cities – where large number of customers reside, with the private cooperatives. The Policy stresses on government purchase of the locally grown food grains in the food deficit hilly regions. Fragmentation of agricultural land is also discouraged – while encouraging its consideration. Special programs are stressed for marginal farmers having land less than half a hectare.
National Urban Policy (NUP) 2007	National Urban Policy (NUP) 2007 is the principal document for guiding the urban development sector. The policy aims to promote i) balanced urban structure by channeling investment to backward regions – especially to regional cities and intermediate towns, ii) development of safe and prosperous urban centers by increasing resiliency against environmental shocks and stresses as well as by harnessing local economic development potentials including mobilization of local resources and mainstreaming informal sector and iii) effective urban management through capacity development of local bodies, realizing appropriate legal and institutional arrangements and fostering integrated approach in urban development. The Policy became the cornerstone in guiding the subsequent urban environment and governance programs such as a Secondary Town Urban Environment Improvement project (STUEIP), Integrated Urban Development Program (IUDP), and Urban Governance and Development Program (UGDP) – especially in terms of prioritizing project municipalities and channeling investment. Already these three projects are implemented in 16 municipalities with an investment of about USD 230 million. Despite these efforts, overall implementation of NUP remains weak. The impending factors in implementation include lagging investment plan as well as inadequate investment in urban development; weak technical and financial management capabilities of local bodies; and ineffective institutional arrangement due to fragmented organization structure of central urban development agencies and local bodies in the separate line ministries including their roles and responsibilities. The criticism against NUP also includes its inability to generate or link with the various sector plans and programs, besides its inadequacy in terms of establishing and promoting economic linkage between the cities and that of cities with the surrounding hinterland.
Tourism Policy 2008	Tourism Policy 2008 seeks to establish Nepal as a premier tourism destination through conservation and promotion of natural, cultural, religious and historical heritages. The Policy takes tourism as a basic industry. By linking eco-tourism and trekking with the rural-cultural tourism, it aims to contribute to rural economy and

	reduce poverty. It stresses on increasing accessibility (comprising of air, surface and water transportation) and partnerships with private sector for developing facilities and amenities (such as hotels, restaurants, shops, travel, tours, and information and communication).
Industrial Policy 2011	Industrial Policy 2011 aims at sustainable and broad based industrial development by fostering industrial productivity, local human and material resources, competitiveness and comparative advantages. The Policy prioritized agro-forest industry, construction industry, and tourism industry. The policy has also emphasized the establishment of Special Economic Zone (SEZ), Industrial Villages comprising of micro enterprises, cottage and small industries that support the larger industries, and industrial Land Use Plan that contains industrial district, industrial corridor, industrial cluster and industrial village. The Policy proposes incentives for industrial investment along the Karnali Corridor. Especially micro-enterprises are waived of all forms of taxes. Income taxes are exempted to industries that are established in the least developed, un-developed and under developed classified districts. In addition, small, medium and large industries which employ natives in their workforce are further exempted from income taxes. This exemption is increased if women, *dalit* (the lowest caste) and disabled constitute 50 percent of the total work force. Investment in urban infrastructure is also exempted from income tax for a designated period of time.

Source: National Urban Development Strategy 2014

3.1.2 Road Development

As pointed out in the several reports prepared by international donors, one of the issues affecting the road sector in Nepal is the existence of many authorities related to the sector with overlapping or missing jurisdictions. For instance, planning documents such as transport master plans have been officially prepared by several authorities and each plan seems not to be synchronized the rest. Besides, it is noted that these plans are not prepared based on traffic demand analysis. It is strongly recommended that a unified master plan be prepared with justifications based on the future land use and traffic demand forecast.

(1) Vision Paper 2007, MOPIT

Vision Paper 2007 was prepared by Ministry of Physical Planning and Works (MOPPW), currently renamed to MOPIT.

This plan targets the overall infrastructure development plan in Nepal and is prepared based on strategies such as 1) Roads and Transport, 2) Water Supply and Sanitation, 3) Housing, Building and Urban Development, and 4) Kathmandu Valley, and does not focus on the transport sector.

The above point 3), Housing, Building and Urban Development, currently seems to overlap with the jurisdiction of KVDA established under Vision Paper 2007. The strategy for Kathmandu Valley is specified in the paper. Strategy related to the road sector is abstracted below.

Table 3.1.5 Strategy of Kathmandu Valley by MOPPW, 2007

Strategy of Kathmandu Valley – Healthy and Green City Kathmandu's Dream
Roads will be constructed along the corridor of Bagmati, Bishnumati and Dhobi Khola.
Greeneries will be expanded through tree plantation along the roads, riverbanks and public spaces.
Planned urban development programs will be launched to check uncontrolled urbanization.
In order to relieve traffic congestion, junction improvement, road upgrading and network expansion programs will be launched.
Based on the land use plan, Kathmandu Valley will be developed as the administrative, cultural and tourism center. Similarly satellite cities will be developed on the periphery of Kathmandu Valley.

Source: Vision Paper 2007, MOPPW

Based on the above strategy, the programs for Kathmandu Valley is also stated in the Vision Paper 2007 as summarized below. The necessity of the programs (projects) is only qualitatively stated based on the strategy without backup by technical analysis such as traffic demand forecast.

Table 3.1.6 Programs for Kathmandu Valley by MOPPW, 2007

Short-term Programs (1 year)	Achieved as of 2015
- Black topping of widened Soaltee mod-Kalanki Road.	Done
- Start widening of Kalanki-Naghudunga Road.	-
- Start construction of 3km long track road on the northern part of the Ring Road.	-
- Continuation of physical improvement of the Ring Road by clearing illegal encroachments.	-
Mid-term Programs (3 years)	
- Opening of new track road from Ring Road (Golf Course) to Bagmati (Guwheshori).	-
- Completion of widening of Kalanki-Naghdunga road.	-
- Completion of 3km long track road on the northern part of the Ring Road.	-
- To reduce the traffic jam in Kathmandu, construction of Chobhar Bridge, Godavari Bridges (2 nos), Bishnumati Bridge, Bagmati Bridge (Shankhamul), Bagmati Bridge (Sundarijal), Bagmati Bridge (Buddhanagar) will be started.	-
- Completion of survey and design of the proposed Outer Ring Road.	-
- Construction of a road along Dhobi Khola corridor will be started.	Done
- Widening of Kathmandu-Bhaktapur road will be started.	Done
- Continuation of junction improvement and provision of traffic light in the urban road of Kathmandu.	-
Long-term Programs (20 years)	
- Completion of extension of track road along the Ring Rod	-
- Completion of road along the river corridors of Bagmati, Bishnumati and Manohara	-
- Black topping of 27km long Ring Road after widening it to four lanes	-
- Construction and improvement of 116km radial road under rod network system of Kathmandu	-
- Opening of dead end roads	-
- Construction of a middle Ring Road in Kathmandu	-
- Construction of Kathmandu-Hetauda fast track	-

Source: Vision Paper 2007, MOPPW

(2) Road Sector's Plans under DOR

1) 20 Year Road Plan

20 Year Road Plan was drafted by DOR in 2001 to identify the development program from 2002 to 2022 but the authorization by the government has not been made so far.

2) 10-Year Priority Investment Plan (PIP)

Sector Wide Road Program & Priority Investment Plan, so called 10-Year Priority Investment Plan (PIP), was prepared by DOR in 2007 for the period from 2007 to 2017 comprising maintenance, upgrading and some new construction of an expanded Strategic Road Network (SRN) in Nepal. In this plan, the capacity of the urban roads inside the Ring Road area was not studied and the access roads to the valley were studied and the improvement of the following roads was proposed:

- Kathmandu - Terai Fast Track
- Bagmati Corridor
- Hetauda Bypass
- Dharke - Bhimdhunga - Sitapaila

- Gongabu - Kolphu - Galchhi

3) Business Plan (2010-13)

Business Plan (2010-13) was prepared with the support of ADB in 2011 referring to the above mentioned "20 Years Road Plan (Draft), 2001" and "PIP, 2007". This plan is the latest overall development plan of DOR including Kathmandu Valley.

The target outcomes for the valley are summarized in the following table. The budget allocation for these outcomes (projects) is also shown in this plan. However the logical explanation based on the technical analysis such as traffic demand forecast and the designated urban development plan are not presented in the plan.

Table 3.1.7 Target Outcomes / Results for Business Plan Period

Outcome /Results	Major Program	Target
Kathmandu valley Road Extension	Road network strengthening, upgrading, construction and maintenance continued.	➢ Kalanki-Nagdhunga Road widened. ➢ Ring Road (Gulf course)-Bagmati Road constructed. ➢ Construction of Bagmati Corridor Road and Ring Road. ➢ Track management and extension continued. ➢ Four-lane road extension from Kathmandu to Bhaktapur completed.
	Kathmandu Valley Urban Road Development Program	➢ Improvement of high volume traffic roads within KTM Valley.

Source: Business Plan, DOR, 2011

The above plans propose concrete projects for the future development. However the technical justification to support the necessity of the projects is not mentioned.

(3) District Transport Master Plan (DTMP), DOLIDAR

In 2013, DTMPs were prepared for the three DDCs (Kathmandu/Bhaktapur/Lalitpur DDC) in the valley supported by Department for International Development (DFID).

These master plans focus on the listing of the existing road assets and the guidelines for the road maintenance/improvement showing the quantitative resource input for these works. Due to rapid increase in traffic demand, the new road network (new construction) will be requisite and it is recommended to update DTMPs based on the comprehensive master plan. As mentioned above, the existing development plans are not focusing on Kathmandu Valley and not prepared based on the technical analysis such as traffic demand forecast. The comprehensive transport master plan shall be prepared with the following roles.

Expected Role of Comprehensive Transport Master Plan
1) Master Plan shall be officially authorized by GON.
2) SRN shall be developed based on Master Plan.
3) DTMPs shall be updated based on Master Plan and LRN shall be developed under DTMPs

3.1.3 Disaster Prevention

The existing plans, handbooks and manuals for disaster prevention in Kathmandu Valley are classified into three categories as follows:

- Disaster Mitigation, Hazard Risk Assessment (Seismic Intensity, simulation of natural disasters etc.).
- Disaster Risk Management Planning Guideline and guidance on disaster preparedness and response planning.

- Plan of emergency activities, layout plan of warehouses for stockpile and restoration of public facilities.

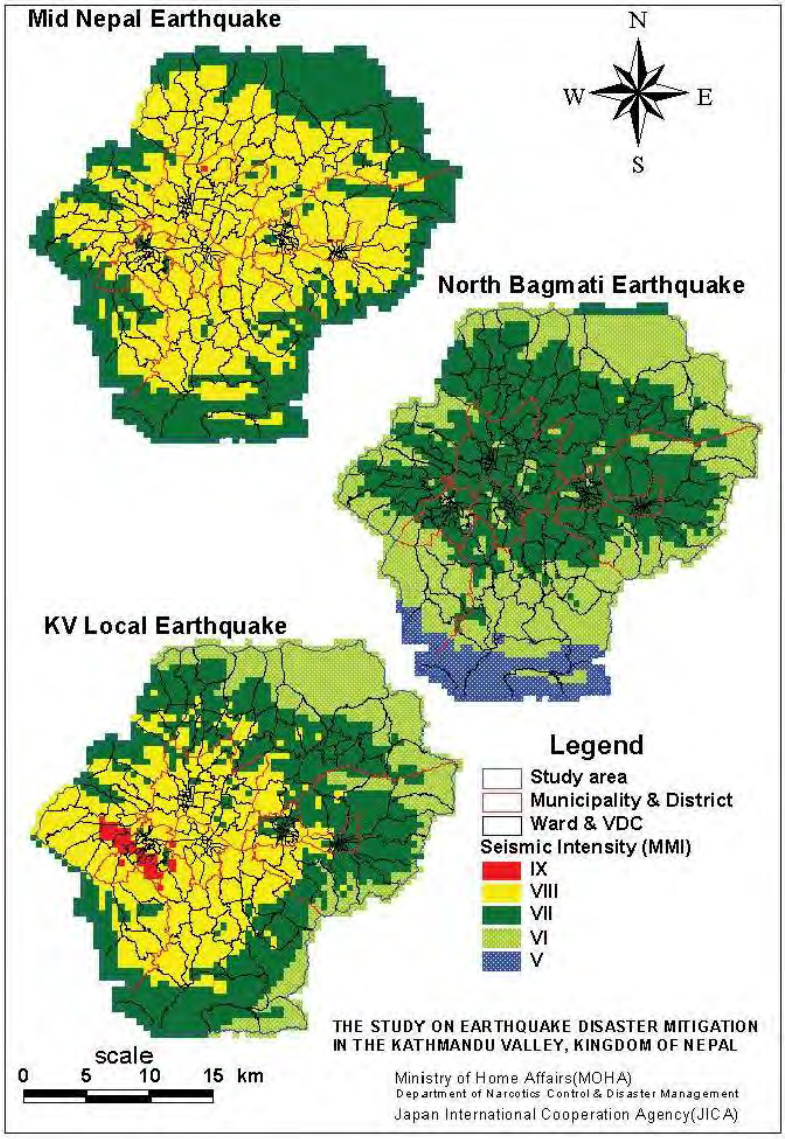
(1) Existing Plan for Hazard Risk Assessment

Since 2002, surveys for hazard assessment and risk assessment that targets the whole of Nepal and Kathmandu Valley have been carried out.

1) The Study on Earthquake Disaster Mitigation in the Kathmandu Valley

Table 3.1.8 Outline of the Study

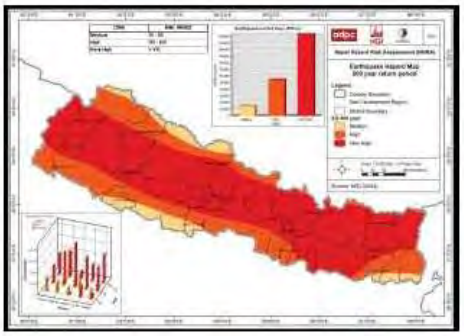
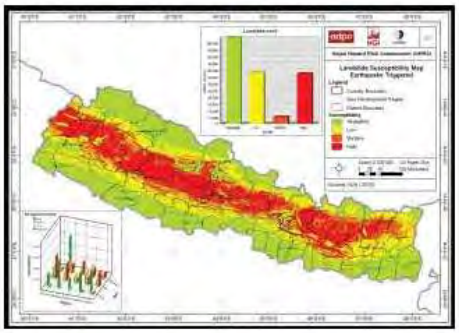
Title	Blueprint for Kathmandu Valley Earthquake Disaster Mitigation (JICA) (2002)
Scenario Earthquakes	1834 Earthquake (magnitude8.4)
	Mid Nepal Earthquake (magnitude8.0)
	North Bagmati Earthquake (magnitude6.0)
	Local Earthquake (magnitude5.7)
Earthquake Disaster Scenario	
Scenario Earthquakes	Seismic Intensity Solid rock area (mountainous area) VII (MMI(Modified Mercalli intensity scale)) Lowlands area (basin) VIII (MMI)
Building Damages	➢ Around 50% (128,000 units) of residential buildings were damaged. ➢ Around 20% (53,000 units) of the all buildings were heavily damaged.
Casualties	➢ Most of the death toll of 18,000 (around 1.3% of Kathmandu Valley) resulted from the collapse of houses. Severely wounded persons were 53,000 (around 3.8% of Kathmandu Valley) ➢ Most of the 147,000 injuries were caused by building collapse and objects falling from buildings or within buildings (such as furniture).
Fire, Blockage and Debris	➢ One of the serious problems was that buildings along roads and highways collapsed onto the roadway and blocked access to many places, especially in the recently developed core and commercial areas. ➢ Already retrofitted schools were safe and generally suffered only slight damage.
Medical Care and Hospitals	➢ Serious injuries requiring hospital care reached 53,000 and other injuries stood at 94,000.
Homeless, Refugees, Shelters	➢ Around 500,000 people were left homeless and they gathered in shelters or open spaces, searching for their families and relatives. ➢ Almost 10,000 people stayed in temporary shelters for a long time.
Education and schools	➢ 60% of the public schools were damaged, because their buildings were very poorly constructed and vulnerable. ➢ Over 40,000 school children were affected.
Roads, Bridges and Airport	➢ There were not many incidents of damage or cracks on highways and roads, except blockage by collapsed buildings in densely populated areas. ➢ The airport also suffered slight damages. Except for recovering from the power blackout, the airport's functionality was restored in a few days and it became useful in the transportation of necessary materials and resources from outside of the Valley.
Other	➢ Damage to water pipelines affected a total of 80% of the users in municipal areas. ➢ Damage to power lines was concentrated in Kathmandu Municipality. Many power cables, mainly low voltage lines, were cut by the shaking of the ground and supporting poles.
Seismic Intensity	

Seismic Intensity 1) Mid Nepal Earthquake VIII(MMI) 2) North Bagmati Earthquake VII(MMI) 3) KV Local Earthquake VIII,IX(MMI)	

2) Nepal Hazard Risk Assessment

Table 3.1.9 Outline of the Study

Title	Nepal Hazard Risk Assessment (World Bank) (2011)
This Report is submitted by Asian Disaster Preparedness Center (ADPC) to the World Bank & MOHA to highlight the issues and progress in the execution of Nepal Hazard Risk Assessment (NHRA) project as a part of the project deliverables.	
Hazard Assessment	This Report discusses five major hazards including Earthquake, Landslides, Floods and Epidemics. Especially three categories (Earthquake, Floods and Landslides) are very important. The details of the three categories output are as follows. Earthquake Landslides

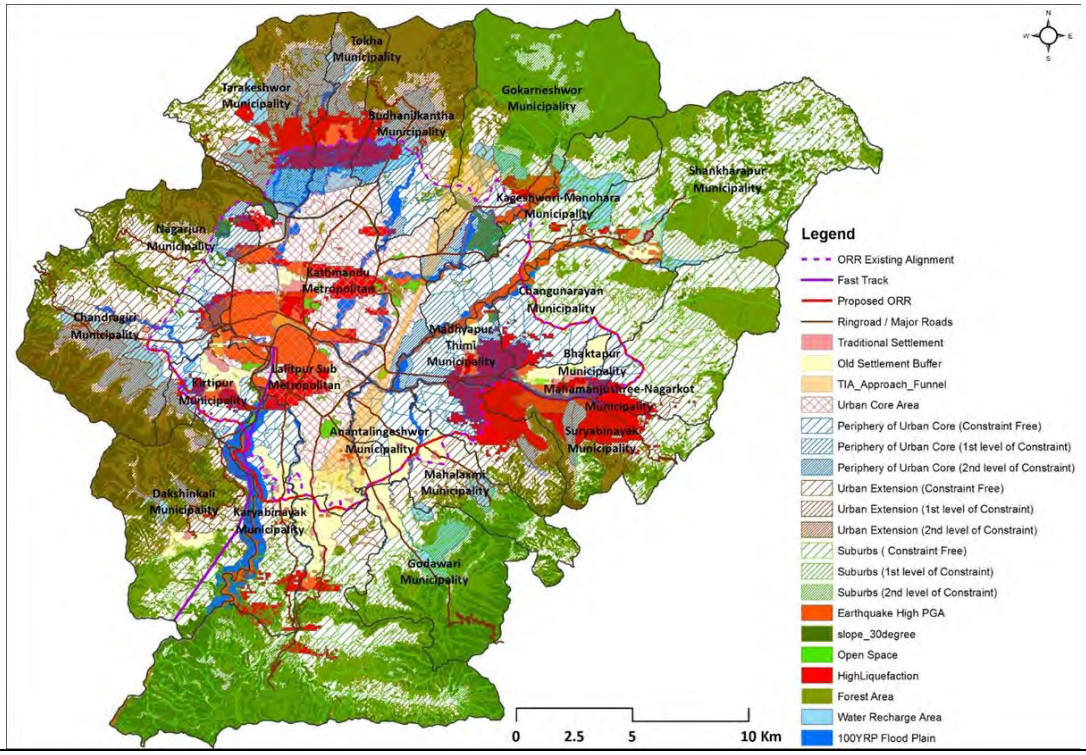
	   Floods (source: Nepal Hazard Risk Assessment)
Suggestion	Eight suggestions of Nepal Hazard Risk Assessment: A. Policy on institutional mandates and institutional development. B. National disaster management act. C. Hazard, vulnerability and risk assessment. D. Multi-hazard early warning systems. E. Preparedness and response plans. F. The integration of DRR into development planning. G. Community based DRM. H. Public awareness, education and training.

3) Comprehensive Disaster Risk Management Programme (CDRMP)

Table 3.1.10 Outline of the Study

Title	Comprehensive Disaster Risk Management Programme (CDRMP) (UNDP) (2011-2017)	
Program aims	The program aims to strengthen the institutional and legislative aspects of disaster risk management (DRM) in Nepal by building the capacities of MoHA, MoFALD, other partner ministries, departments and local governments as well as empowering vulnerable communities toward increased resilience.	
Program Objective	CDRMP contributes for United Nations Development Assistance Framework 2013-2017 (approved by the Government of Nepal) Outcome 7 - "People living in areas vulnerable to climate change and disasters benefit from improved risk management and are more resilient to hazard-related shocks". More specifically, it contributes to achieve the following four outputs of the United Nations Development Assistance Framework (UNDAF):	
	UNDAF Output 7.1	Government officials at all levels have capacity to lead and implement systems and policies to effectively manage disaster risks
	UNDAF Output 7.2	Urban Populations are better able to prepare for and manage hazard and climate change adaptation risk
	UNDAF Output 7.3	Vulnerable populations have increased knowledge about disaster risk management and capacity for climate change adaptation and mitigation of risks
	UNDAF Output 7.4	National preparedness and emergency systems are able to effectively prepare for and respond to hazard-related disaster
Outcome	National Building Codes (NBC) Implementation and Risk Sensitive Land Use Planning	

	(RSLUP)
	: Under this component, CDRMP aims to support the Kathmandu Valley Authority (KVA) and the DUDBC for safer building construction practices in Kathmandu Valley municipalities and VDCs. It also supports policy revision and implementation. This component contributes to Country Programme Action Plan (CPAP) output 7.2.

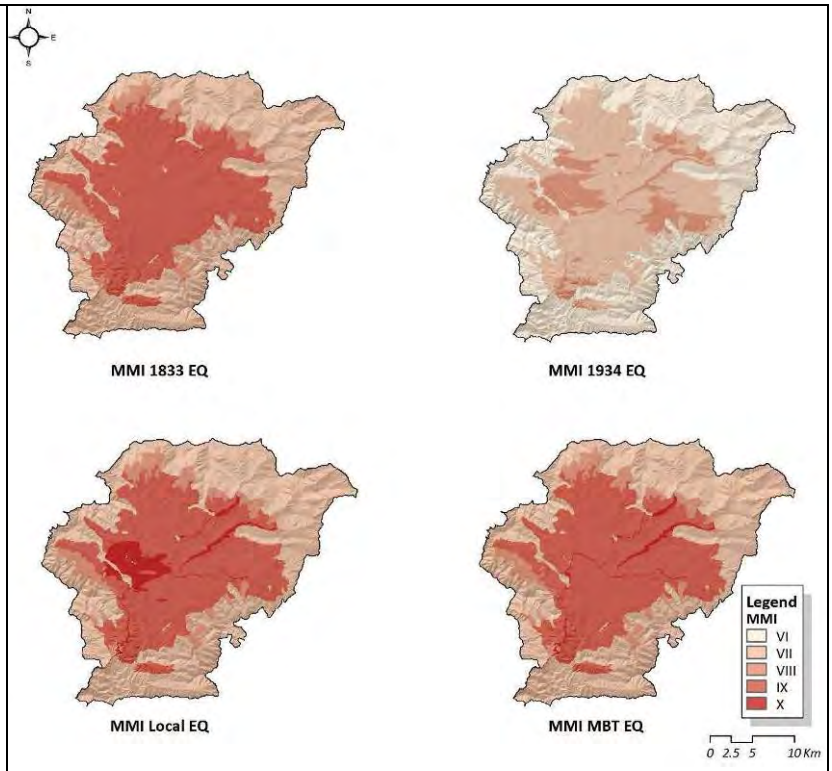


Source: Comprehensive Disaster Risk Management Programme and RSLUZ_FEB_5_2015 Power Point (UNDP)

4) Comprehensive Study of Urban Growth Trend and Forecasting of Land Use in the Kathmandu Valley

Table 3.1.11 Outline of the Study

Title	Comprehensive Study of Urban Growth Trend and Forecasting of Land Use in the Kathmandu Valley(UNDP) (2014)	
Scenario Earthquakes	Scenario I	1833 Sindhupalchok Earthquake (magnitude7.8)
	Scenario II	1834 Nepal Bihar Earthquake (magnitude8.4)
	Scenario III	Main Boundary Thrust MBT (magnitude8.0) It is an active thrust in the Nepal Himalaya. It is assumed that an earthquake would be possible from the thrust zone of MBT.
	Scenario IV	Chobhar Local Earthquake (magnitude6.5)
Seismic Intensity		

Seismic Intensity 1) 1833EQ X(MMI) 2) 1934 EQ VII or VIII(MMI) 3) MBT EQ IX or X(MMI) 4) Local EQ IX or X(MMI)	

Source: Comprehensive Study of Urban Growth Trend and Forecasting of Land Use in the Kathmandu Valley (UNDP)

(2) Disaster Risk Management Planning Guideline

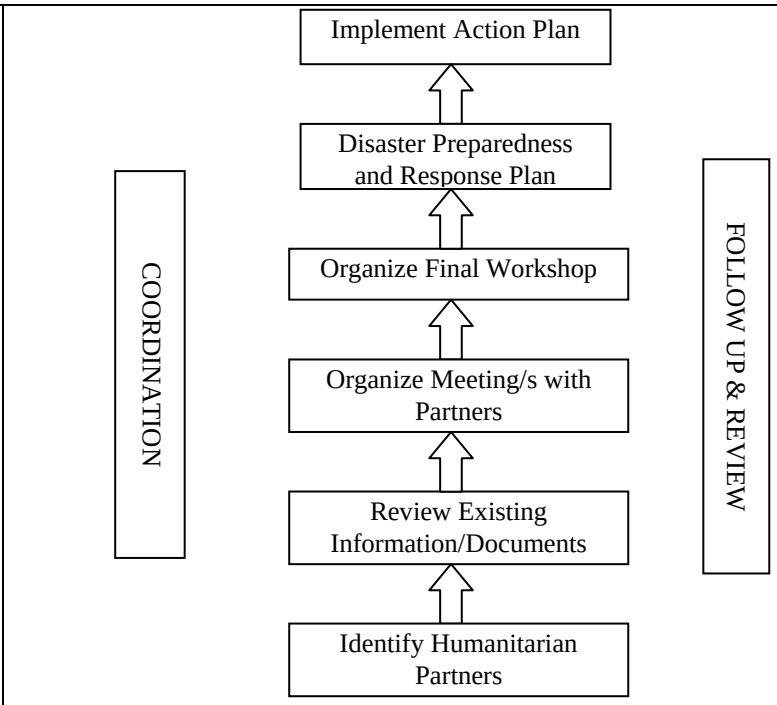
MOHA published 'Guidance Note Disaster Preparedness and Response Planning 2011' and 'National Disaster Response Framework (NDRF)'. MOFALD publishes 'Local Disaster Risk Management Planning Guideline-LDRMP)' and 'District Disaster Management Plan-(DDMP). NDRF and DDMP are responsible for district level planning. LDRMP is responsible for municipalities and VDCs.

75 districts in the whole country have already prepared DDMP and MOHA has started to integrate these guidelines.

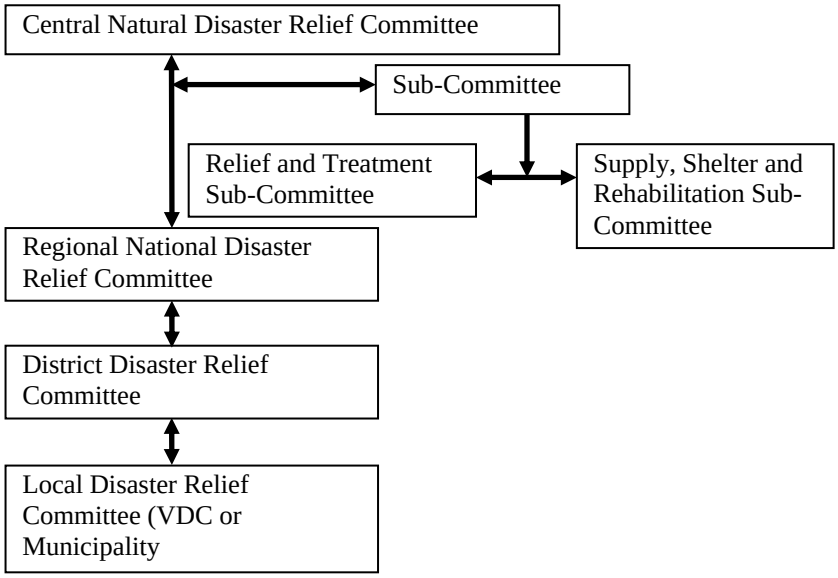
1) Guidance Note Disaster Preparedness and Response Planning (GNDPRP)

Table 3.1.12 Outline of the Guideline

Title	Guidance Note Disaster Preparedness and Response Planning (MOHA;2011)
How to Use	The Guidance Note 2011 is aimed at assisting Government officials, the Red Cross Movement, I/NGOs and UN agencies who will be engaged in the disaster preparedness and response planning process at the district level. This document is an important resource material for all DDRC members to manage disaster preparedness planning initiatives in the district annually. The end product of the planning process is the Disaster Preparedness and Response Plan (DPR Plan). The Guidance Note 2011 is organized in two major parts. **First: Disaster Preparedness Planning** **Second: Scenario Based Response Planning**
Planning Processes	Conceptual Framework for Disaster Preparedness Planning



The legal Framework



Source: Guidance Note Disaster Preparedness and Response Planning

2) District Disaster Management Plan (DDMP)

Table 3.1.13 Outline of the Plan

Title	District Disaster Management Plan (MOFALD;2013)
Content	DDMP is composed of three sections. The contents of DDMP are the following: **Section - 1** **preliminary** 1. Short name and start 2. Definition 3. Objectives of the Directory 4. Implementation of the Directory **Section - 2** **Formulation & Implementation of Disaster Management Plan** 5. Initial preparation

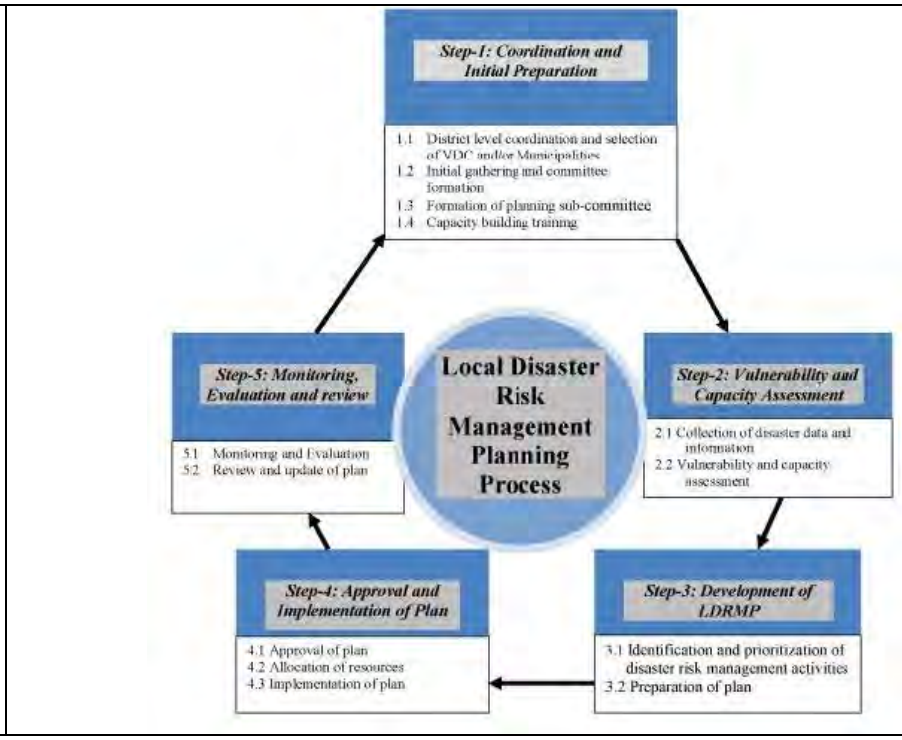
	5.1 Initial assembly at District level & Plan Formulation Committee formation 5.2 Management of initial Manpower 6. Disaster Risk & Capacity Analysis 6.1 Initial Study & Risk Analysis 6.2 Social & Economic Risk Analysis 6.3 Analysis of District Capacity 6.4 Degree of Danger , Risk & Lateral picture preparation 7. District Disaster Management Plan Preparation 8. Approval of Plan 9. Budget Arrangement 10. Implementation of Plan 11. Monitoring & Evaluation 12. Review of Plan & Cauterization **Section - 3** **Miscellaneous** 13. Management of Manpower & Resources for the Implementation of the Plan 14. Responsibility of Ministry 15. Responsibility of District Development 16. Responsibility of Municipality and VDC 17. Obligation of related Sectors 18. Change & Manipulation 19. Be Invalid

Source: District Disaster Management Plan

3) Local Disaster Risk Management Planning Guideline (LDRMPG)

Table 3.1.14 Outline of the Guideline

Title	Local Disaster Risk Management Planning Guideline (MOFALD,2011)
Introduction	"National Strategy for Disaster Risk Management (NSDRM), 2009" has given special priority to preparedness and risk reduction activities in the field of disaster management. It has become necessary for responsible disaster management stakeholders to take initiatives in building disaster resilient communities by mainstreaming disaster risk reduction (DRR) issues into development plans. Under these circumstances and bearing in mind the need to develop disaster risk management from the central to local level and mainstream it with development policy and programs at all levels, and also in order to ensure the notion of sustainable development, the "Local Disaster Risk Management Planning Guideline, 2068" has been approved and put into effect by exercising the power granted by the Articles 234, 235 and 265of the Local Self Governance Act, 1998.
Process	Local Disaster Risk Management Planning Process



Source: Local Disaster Risk Management Planning Guideline

(3) Project for Protection from Natural Disasters

Projects for the purpose of lifesaving and evacuation in emergency situations during disasters e.g. at the time of an earthquake are planned. Projects related to the road network and emergency transport are especially considered as shown below. Projects for mitigating natural disasters are planned by Nepal Risk Reduction Consortium (NRRC). In this study, the focus will be mainly on those projects that the NRRC promoted.

1) About NRRC

NRRC is a unique body that unites the Government of Nepal, the international financial institutions of the Asian Development Bank and World Bank, development partners and donors, the Red Cross/Red Crescent Movement, and the United Nations in the Steering Committee of the NRRC. NRRC works to bridge the spectrum of activity of development and humanitarian expertise, supporting the Government of Nepal to implement a long term Disaster Risk Reduction Action Plan. Five Flagship areas of immediate action for disaster risk management in Nepal were identified:

Flagship-1: School and hospital safety
Flagship-2: Emergency preparedness and response capacity
Flagship-3: Flood management in the Kosi river basin
Flagship-4: Integrated community-based disaster risk reduction
Flagship-5: Policy/Institutional support for disaster risk management
(source: NRRC)

Out of the above five items, Disaster Prevention Sector was especially involved in the planning of projects on emergency logistics (Flagship-2).

2) Flagship-2 Emergency Preparedness and Response

Coordinated by the Ministry of Home Affairs and the Red Cross, Flagship 2 is focused on

strengthening the Government of Nepal's preparedness and response capacity at the national, regional and local levels. This work will save lives and facilitate a quick post disaster recovery. Under Flagship-2, the following priorities have been identified:

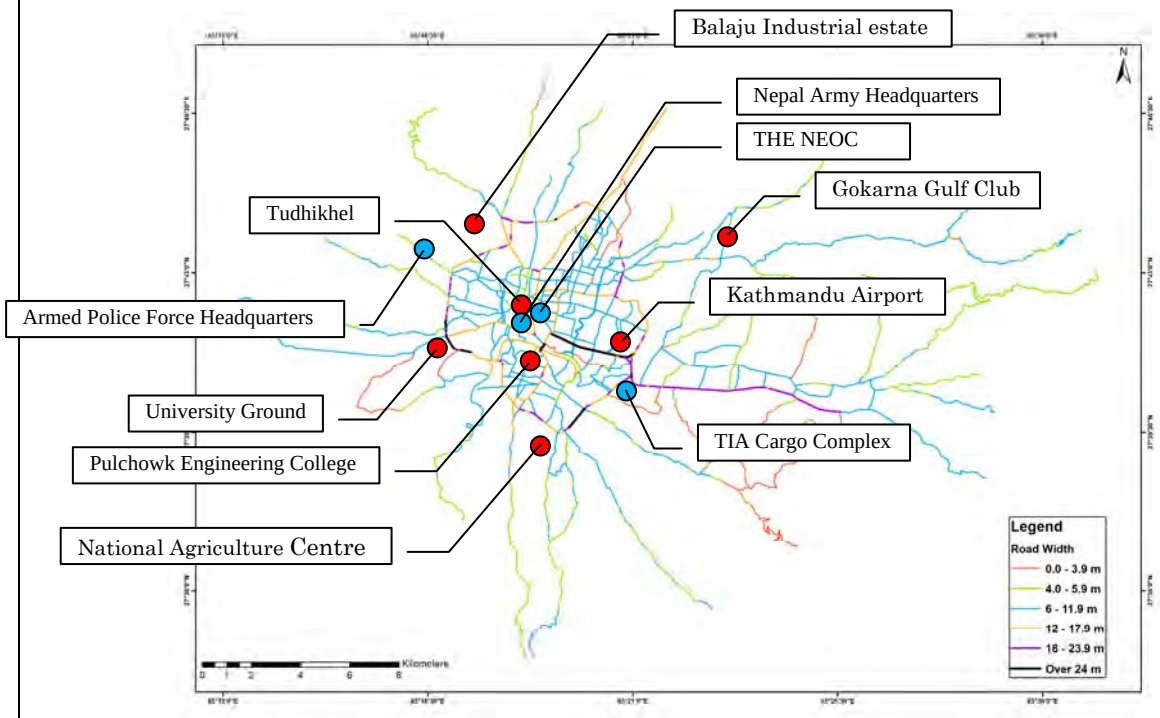
(1) Institutional Capacity Building of First Responders
(2) Disaster Preparedness and Response Planning
(3) Warehousing, Infrastructure, Logistics and Stockpiling Support
(4) Preparedness for the facilitation of International Assistance
(source: NRRC)

Disaster Prevention Sector must focus on priority (3). Because the plan of project 'Warehousing, Infrastructure, Logistics and Stockpiling Support' will be a connected road network especially the emergency transport function.

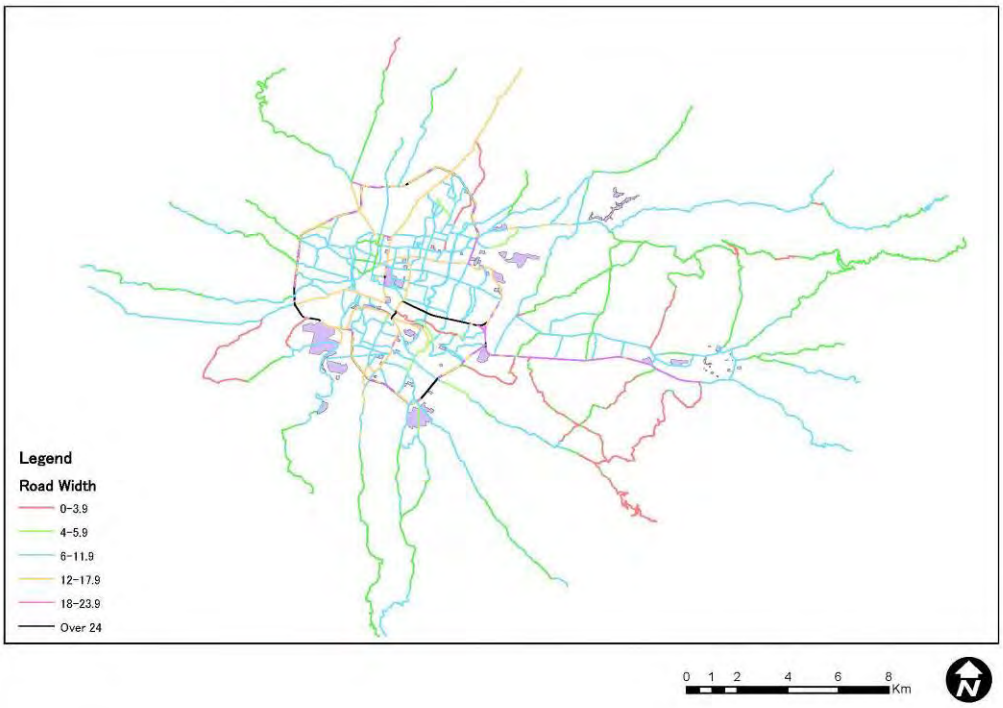
Project list of (3) include the following items.

Table 3.1.15 Project List

Title		Key Activities/Targets
No.	Project Name	
1	Warehousing & Stockpiling	1) Seismic assessment and construction of Temporary warehouses (8 Mobile Storage Unit which can store 2800 MT/locations to be established in seven locations at **University Ground, Kathmandu Airport, Tudhikhel, Gokarna Golf Club, Balaju Industrial estate, Pulchowk Engineering College and National Agriculture Center.** 2) Temporary warehouses (500 MT) to be installed in five locations at Gajuri/Dhadhing, Dhulikhel/Kavre, Banepa/Kavre, Kulekhani/Makwanpur, and Dhachhinkali/Kathmandu 3) Build five government regional warehouses in Sunsari, Hetauda, Pokhara, Surkhet and Dhangadhi 4) Stockpiles are to be stored in sea containers (20 feet long) located at **the NEOC, TIA Cargo Complex, Nepal Army Headquarters, and Armed Police Force Headquarters** for emergency response. 5) Stockpile bailey bridges at Nepal Army camps at Tribhuvan International Airport (TIA) for emergency response



2	Site De-confliction and IDP site planning for 83 Open Spaces in the Kathmandu Valley	Nepal has a very high risk of seismic activity and is ranked as the eleventh most at risk country with Kathmandu rated as the highest at risk city in the country. The number of casualties, injured and displaced persons from an earthquake could vary considerably depending on magnitude of the earthquake.



source: JICA Study Team based on USAID Report

3	Tribhuvan International Airport, Geotechnical Study	In partnership with the Civil Aviation Authority of Nepal (CAAN), the Nepalese Army (NA), and the Tribhuvan International Airport (TIA), the U.S. Army Corps of Engineers (USACE), the Federal Aviation Administration (FAA) of the U.S.

Source: JICA Study Team

3) Nepal Food Security Cluster (DRAFT) Contingency Plan, July 2011 (Scenario: Earthquake in the Kathmandu Valley)

This contingency plan details preparedness and response actions to enable the FSC to adequately and effectively meet the food security needs of a population affected by a large scale earthquake in the Kathmandu Valley. Such a disaster has been highlighted as a major risk for Nepal by the Inter-Agency Standing Committee (IASC), and the working scenario based upon which all clusters are conducting contingency planning is given below.

IASC Scenario for a major earthquake centered in the Kathmandu Valley
Key impact

- An earthquake measuring Magnitude 8 on the Richter scale and centered on the Kathmandu Valley hits the Himalayan region.
- In Kathmandu Valley, 44,000 deaths would occur,103,000 injured and a planning figure of 900,000 would be displaced

Challenges in response

- Limited capacity of the airport to handle incoming assistance
- Security concerns for the incoming **relief assistance by road**
- Serious concerns regarding the safety and security of the seat of the government
- The local response capacity of the army/police/fire departments severely hampered
- Limited capacity of the government to coordinate national as well as international assistance
- Flexibility required in customs/immigration procedures to facilitate disaster response
- Haphazard, spontaneous recovery effects would start within a couple of weeks; huge shortfall of skilled labor and building materials
- Overwhelming congestion in available open spaces
- Coordination mechanisms unclear

The objectives of this Contingency Plan are two-fold as follows.

1) To put in place preparedness measures to enable the FSC to carry out its responsibilities in the event of an emergency, in a rapid, appropriate and effective manner;
2) To detail Standard Operating Procedures which can be followed by the Cluster in the event of an emergency, which highlight key stages and accountability and effectiveness measures in the process

4) Draft Contingency Plan for Camp Coordination and Camp Management (CCCM) 2011/12

The Camp Management and Camp Coordination (CCCM) Cluster aims at assisting and protecting internally displaced persons (IDPs) both in conflict and natural disasters when they are located in camps/camp-like settlements.

Key impacts

44,000 people killed; 103,000 people injured; 900,000 people severely affected or displaced; airport severely affected (requiring several hours to restore Air Traffic Control); major bridges on the main rivers rendered unsafe; administrative buildings severely damaged; more than half the government employees not reporting to work for nearly a week; communications network in the valley interrupted for three weeks; water supply for nearly two-thirds of the population affected.

Types of Settlements

Urban Self-Settlement:

Internally displaced persons from an urban background may decide to occupy unclaimed properties or land, or settle informally in local open spaces.

Self-Settled Camps

IDPs may decide to settle in camps, independently of assistance from local government or the aid community. Self-settled camps are often sited on state-owned or communal land, usually after limited negotiations with the local population over use and access.

Planned Camps

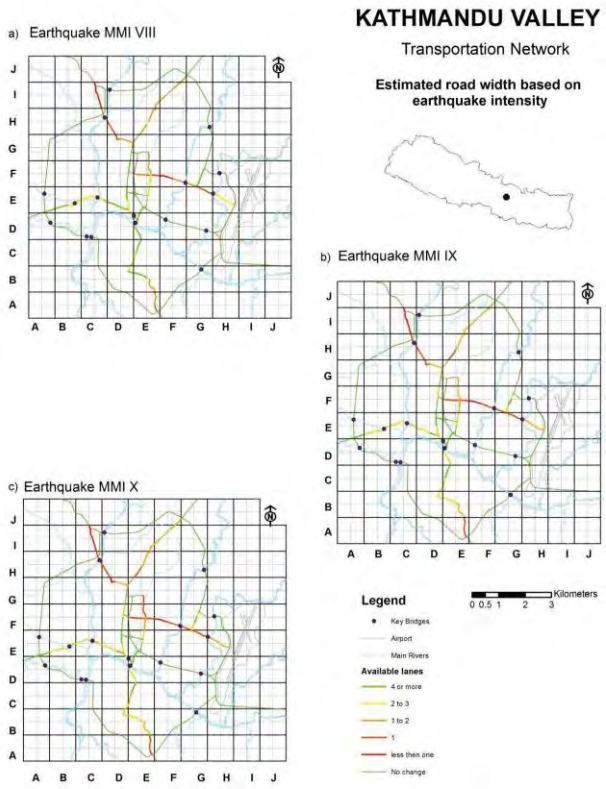
IDPs may decide to find accommodation or purpose-built sites where minimal infrastructure is provided, including water supply, food distribution, non-food items distribution, education and health care, usually exclusively for the population of the site. These planned camps are usually established after the initial response phase.

Collective Centers

IDPs may decide to shelter in transit facilities located in pre-existing structures, such as community centers, town halls, gymnasiums, hotels, warehouses, disused factories, and unfinished buildings. They are often used when displacement occurs inside a city, or when there are significant flows of displaced people into a city or town.

5) Vulnerable Transportation Networks and Earthquakes: A Case Study of the Kathmandu Valley, Nepal (by Mr.Krista Carroll; NSET)

This report is very important for our study team. Because this study's seismic intensity is focused road blockage based on three earthquake intensities. According to this report, scenario Earthquake MMI IX will occur, only Tribhuvan HWY can be used for emergency transport. Other roads will be blocked and some road networks cannot be used. Disaster prevention sector then tries to overlay this information to emergency warehouse locations.



3.2 Existing Project

3.2.1 Road Development and Traffic Management

(1) Kathmandu Valley Urban Road Development Program

In 2012, GON decided to improve the road network in the valley to alleviate the traffic congestion by implementing the Kathmandu Valley Road Improvement Project under DOR. The right of way except SRN was fixed by Kathmandu Valley Development Committee in 1977, updated in 1994 and 2007 (KVDA in charge since 2011). KVDA was assigned to clear the right of way in coordination with DOR and Municipalities and started to clear the right of way of main arterial/radial road based on prevailing rules and regulations.

Accordingly, DOR and Municipalities started to improve and widen the targeted roads. Based on annual program prepared by DOR, KVDA and Municipality, Ministry of Finance and NPC made available needed resources to KVDA, DOR and Municipalities for compensation, road improvement etc. as per approved program. It is an ongoing program of the Nepal Government.

In order to promote development on land with less accessibility by road, Kathmandu Valley Urban Development Committee developed Guided Land Development (GLD) Plan in 1989 stating the right of way for each road. According to GLD program, new roads were built and continue to be built. It has facilitated to open the inaccessible land for development, hence promoted to increase the density of habitat in the valley.

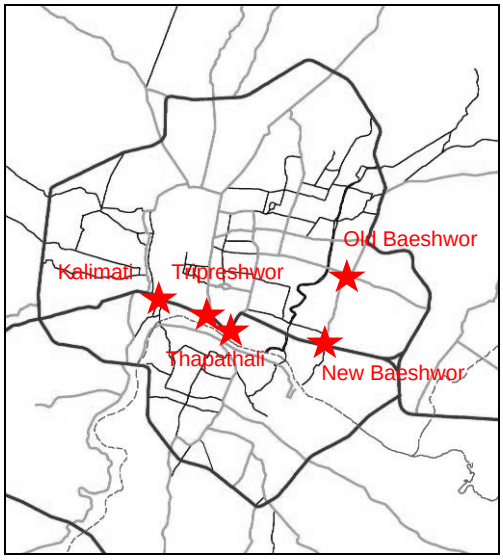
Table 3.2.1 Target Length of Road Widening by KVDA

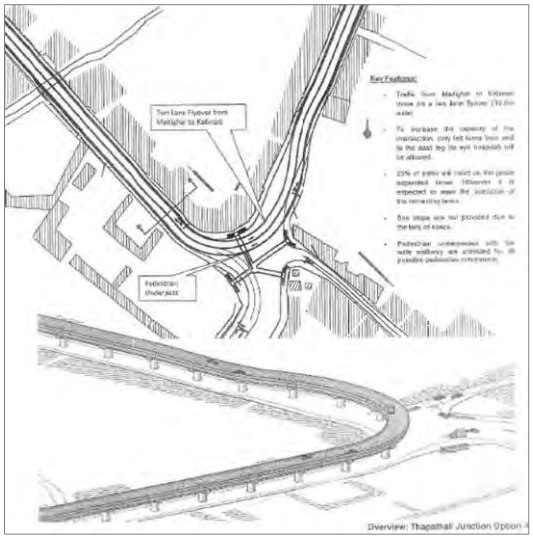
District	Fiscal Year	Length (km)
Kathmandu	FY 2011/12	36.00
	FY 2012/13	26.40
	FY 2013/14	62.40
Lalitpur	FY 2012/13	11.50
	FY 2013/14	16.60
Bhaktapur	FY 2013/15	6.30

Source: District Offices of KVDA, Sep. 2014

(2) Grade Separated Intersection Design

In 2011, DOR conducted conceptual design works to construct flyovers at 5 major congested intersections (Old Baneshwor Chowk, New Baneshwor Chowk, Thapathali Chowk, Tripureshwor Chowk and Kalimati Chowk). According to DOR in 2014, the road widening project (Kathmandu Valley Urban Road Development Program) had the first priority and the traffic congestion was alleviated by the program and hence the flyover project was suspended in 2012.





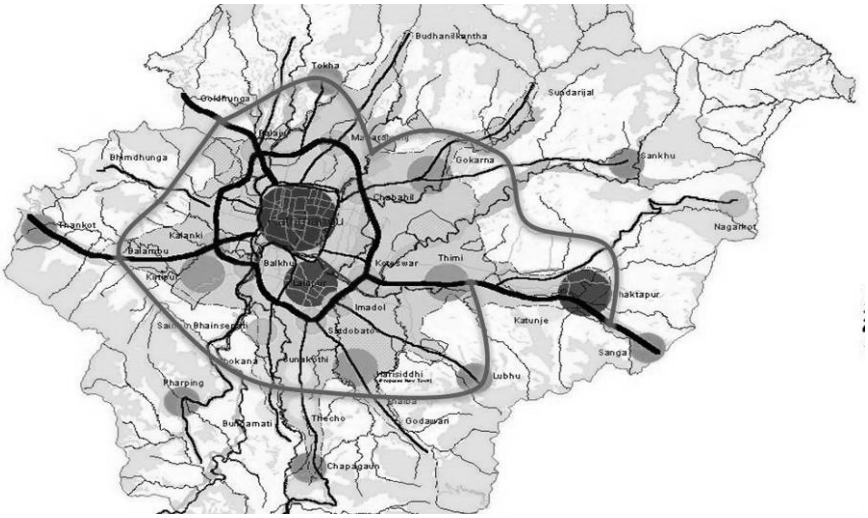
Source: Design Report, DOR, 2011

Figure 3.2.1 Location of Intersections and Proposed Thapathali Intersection

JST suggests that the flyover project should be implemented due to recent rapid increase in the traffic volume. However JST points out that the proposed flyover at Thapathali (See above figure.) has quite sharp radius (around R=40m) with steep cross fall (super elevation) and it is technically not recommended in view of driving safety. Alternative measures will be required.

(3) Ring Road Improvement Project

The existing Ring Road has a 2-lane carriageway which was constructed in the 1970s supported by the Government of China (GOC). Due to the rapid increase in traffic demand, the capacity of the Ring Road is going to be saturated resulting into serious traffic congestion mainly at the intersections. In 2011, widening of the Ring Road was pledged between GON and GOC and construction works started from Sta.10+600 to Sta.20+995 (10.39km length) of the southern section of the rind road. The proposed total number of lanes is 8 consisting of 4-lane for main road and 4-lane for the service road along the main road. The general features of the proposed Ring Road are shown in the following table.



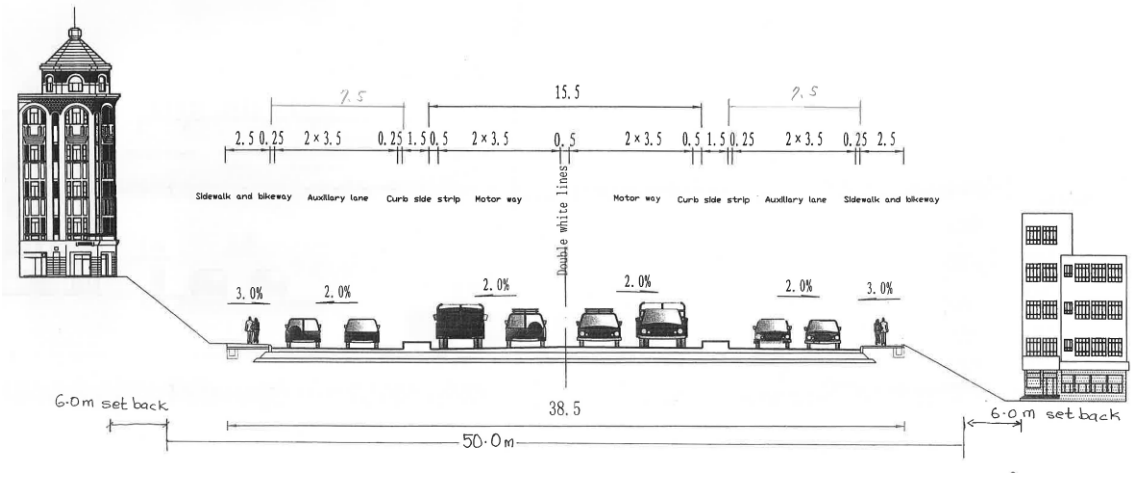
Source: KVDA, 2014

Figure 3.2.2 Alignment of Ring Road and Outer Ring Road

Table 3.2.2 General Features of Proposed Ring Road

Items	Main Road	Service Road
Design Speed	50km/h	20km/h
Number of Lanes	4-lane (dual 2-lane)	4-lane (dual 2-lane)
Right of Way (ROW)	50m	
Setback	6m on both sides	
Road Width	15.5m	7.5m on both sides
Desirable Vertical Gradient	5.5%	8.0%
Type of Pavement	Asphalt Concrete	

Source: Design Drawings of the Improvement Project of Kathmandu Ring Road, TSDI, 2012

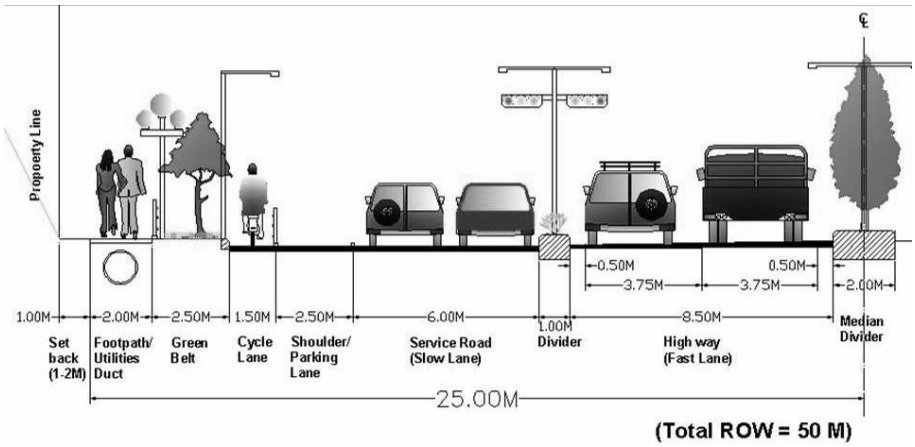


Source: Design Drawings of the Improvement Project of Kathmandu Ring Road, TSDI, 2012

Figure 3.2.3 Typical Cross Section of Ring Road

(4) Outer Ring Road Construction Project

Outer Ring Road was proposed to mitigate the urban development externality and reduce the growth inequality between the City Center area and the suburban area in the Valley based on the recommendation of the JICA Master Pan of 1993. Accordingly the feasibility study was conducted by DOR and NEPECON (Nepal Engineering Consultancy Services) in 2000 proposing 66km length of the peripheral road outside the existing Ring Road. The alignment of the Outer Ring Road was reviewed based on the actual land use and the nodal points decided by the cabinet and the proposed alignment has 72km length. The proposed number of lanes is total 8-lane consisting of 4-lane for main road and 4-lane for the service road along the main road as well as the on-going Ring Road Project.



Source: KVDA, 2014

Figure 3.2.4 Typical Cross Section of Proposed Outer Ring Road

The required land for the Outer Ring Road will be obtained by the land readjustment (pooling) system instead of the conventional land acquisition method initiated by KVDA. The total required land corridor is 550m consisting of 50m for the road and 250m of land on either side of the road for the land readjustment. According to KVDA in 2014, obtaining land of 550m width along the whole stretch of the alignment is proving difficult and KVDA is going to change the land acquisition method by combining the land readjustment method for the nodal points (major towns) and also applying the conventional method of land acquisition for the rest of the alignment between the nodal points.

(5) Suryabinayak-Dhulikhel Road Widening Project

Arniko Highway is part of the Asian Highway (AH-42) which connects Kathmandu Valley with the Eastern suburb. The road widening of Arniko Highway from Koteshwor to Suryabinayak (10km length) was completed in 2011 supported by JICA Grant Aid. The number of lanes after the widening is 4-lane of the main road with service road. The detailed design of the widening section from Suryabinayak to Dhulikhel (16km length) has been conducted. Early implementation is expected by the relevant authorities.

(6) Nagdhunga Tunnel Construction Project

The basic design of the Nagdhunga Tunnel is being conducted by JICA and the construction of the tunnel will be implemented using JICA loan. The tunnel is located at Thankot Path along the mid-hill highway through the valley which connects between Kathmandu Valley and Terai Plain as a national logistic hub road. The project will be completed in 2021.

(7) Kathmandu-Hetauda Fast Track Project

The proposed route of the project will connect directly between Kathmandu Valley and Terai Plain running along the border with India.

The existing connection, Tribhuvan Rajpath, is a narrow and winding mountainous route and periodically suffers from road blockade by land slide.

The economic losses of the blockade are quite serious and GON decided to construct a direct connection to ensure a redundant access for the national logistic route. The project is expected to be implemented under the scheme of PPP (Public Private Partnership) on BOT (Build, Operate and Transfer) under MOPIT.

3.2.2 Road and Public Transport

Concerning public transport development, any kind of authorized master plan by the government is currently not existed. Kathmandu Sustainable Urban Transport Project (KSUTP) by Ministry of Physical Planning and Works, Nepal and Asian Development Bank is sole on-going project for public transport. The project covers comprehensive schemes for promotion of public transport, improvement of safety, efficiency of traffic movement and environment focusing the central area of Kathmandu.

(1) Kathmandu Sustainable Urban Transport Project (KSUTP)

The final report on KSUTP was submitted by Ministry of Physical Planning and Works, Nepal and Asian Development Bank on 15thApril, 2010. The recommendations of Asian Development Technical Assistance (TA) for Sustainable Urban Transport in Kathmandu are divided into four components:

Component A: Improve operation of public transport
Component B: Implement a traffic management plan for the central area of Kathmandu

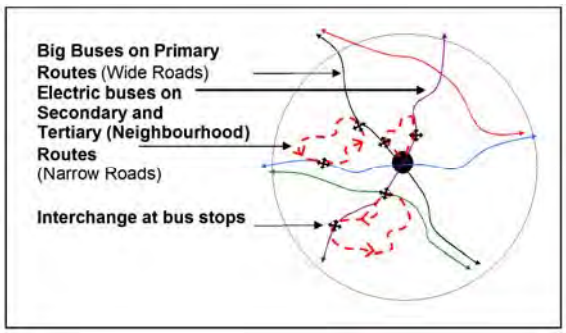
Component C: Introduce pedestrian areas within the old town of Kathmandu, with links to transport facilities
Component D: Improve the air quality within the city

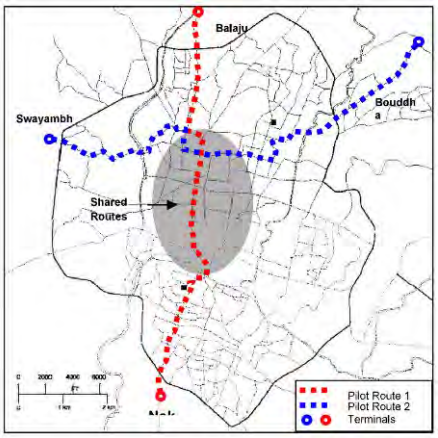
Source: Final report on Kathmandu Sustainable Urban Transport Project, April 2010, ADB

Figure 3.2.5 Image for Target, Public Transport City

■Component A: Improve operation of public transport

-It was proposed to set up the hierarchy of bus transport network consisting of Primary Routes, Secondary Routes and Tertiary Routes shown in Figure 3.2.6.
-Primary Routes are along wider main roads and operated with larger buses.
-Secondary Routes are along main roads that are less wide and operated with medium sized buses (Mini buses).
-Tertiary Routes are along the narrow roads and operated with smaller sized buses (mainly electric vehicles such as safa tempo or slightly larger and modernized electric buses).
- Possible alignments for Pilot Routes are shown in Figure 3.2.7.





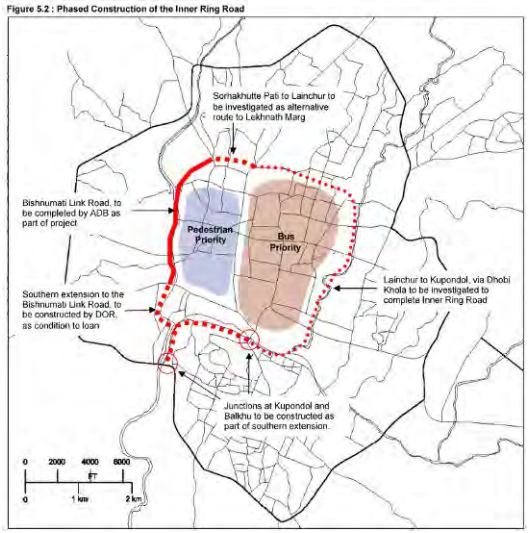
Source: Final report on Kathmandu Sustainable Urban Transport Project, April 2010, ADB

Figure 3.2.6 Hierarchy of Bus Network

Figure 3.2.7 Possible Alignments for Pilot Project

■Component B: Implement a traffic management plan for the central area of Kathmandu

- The objective is to improve traffic circulation within the central area of Kathmandu while providing an alternative route for vehicles to pass through.
- Figure 3.2.8 shows that completion of the Inner Ring Road will allow the introduction of pedestrian priority zone within the Historic Core and bus priority in the central area.
- Figure 3.2.9 shows a location in which a new set of traffic signals and CCTV cameras will be installed.



Source: Final report on Kathmandu Sustainable Urban Transport Project, April 2010, ADB

Figure 3.2.8 Traffic Management in the Central Area

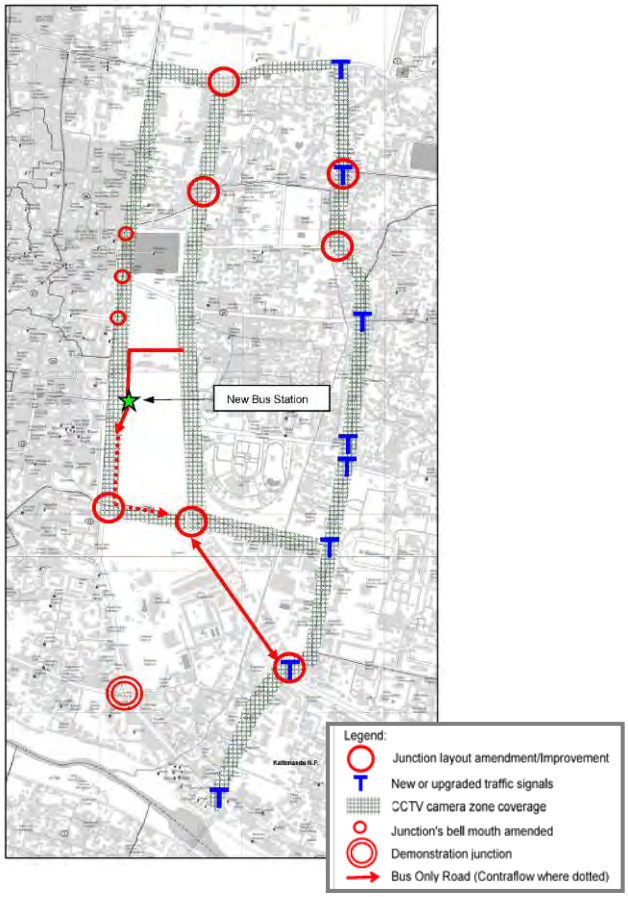
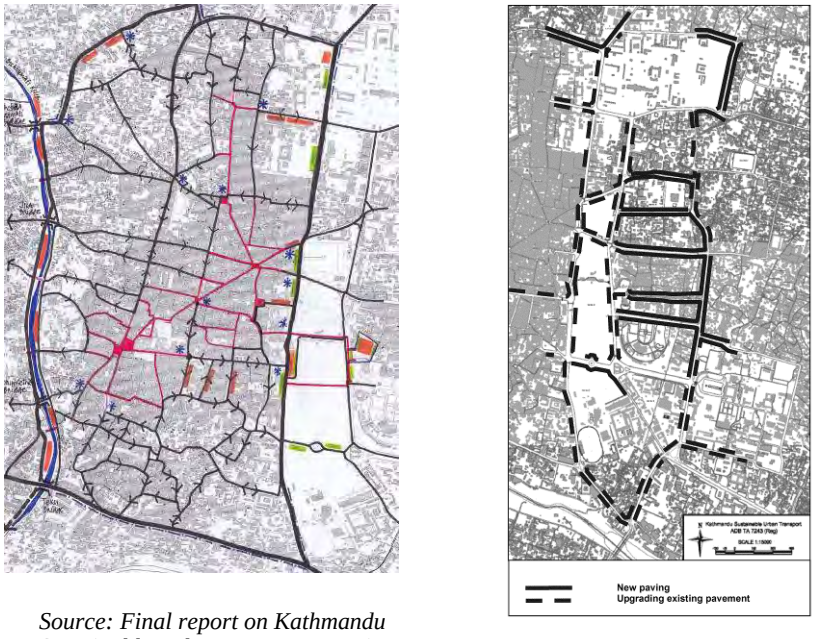


Figure 3.2.9 Traffic Management in the Central Area

■Component C: Introduce pedestrian areas within the old town of Kathmandu, with links to transport facilities

This part of the project has two sub-components: pedestrianisation of the historic core, and improved safe access for pedestrians between the historic core and public transport facilities.
Furthermore, pedestrian access between major destinations in the central area will be improved by sidewalk resurfacing.

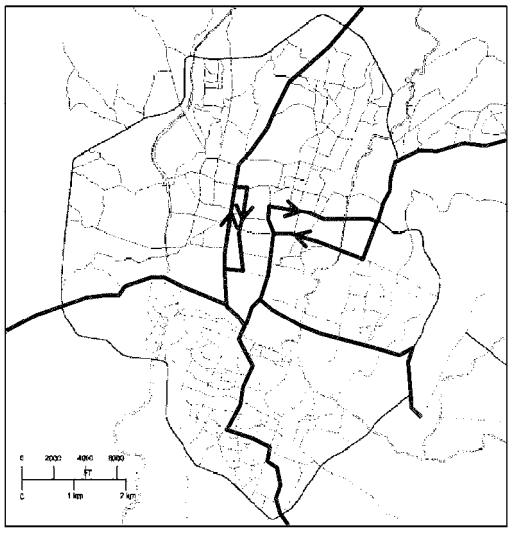


Source: Final report on Kathmandu Sustainable Urban Transport Project, April 2010, ADB

Figure 3.2.10 Pedestrianisation and Improvement of Sidewalk

■Component D: Improve the air quality within the city

- Reintroduction and extension of the Trolley Bus Service.
- Improved Emission and Mechanical Testing.
- Improved Fuel Quality.
- Reduction to the Number of Vehicles.
- Air Quality Monitoring.
- DOTM has a major responsibility of implementing component D together with the Traffic Police and MOSTE. Capacity building will be necessary.



Source: Final report on Kathmandu Sustainable Urban Transport Project, April 2010, ADB

Figure 3.2.11 Possible Routes for the Trolley Bus Service and Suggested Trolley Bus

(2) Projects under KSUTP

1) Road

The Project Implementation Units (PIUs) have been established in the related authorities as summarized below.

1) DOTM: for public transportation components

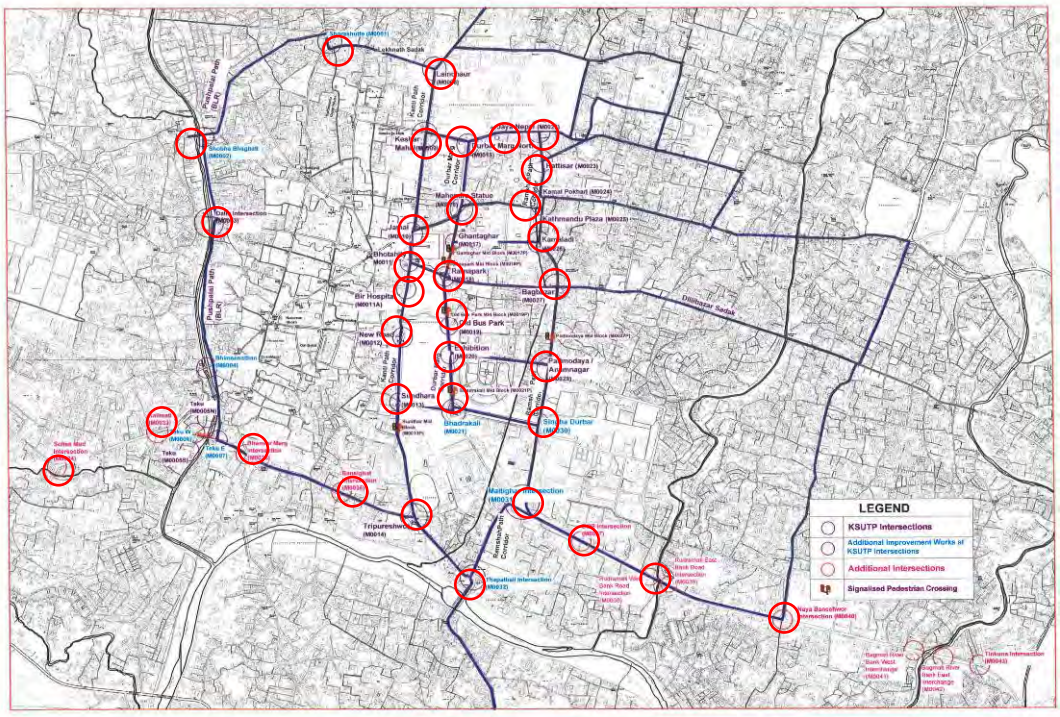
2) DOR: for traffic management works, traffic police for traffic control and enforcement aspects

3) KMC: for pedestrianisation and PPP components

4) MOSTE: for air quality components

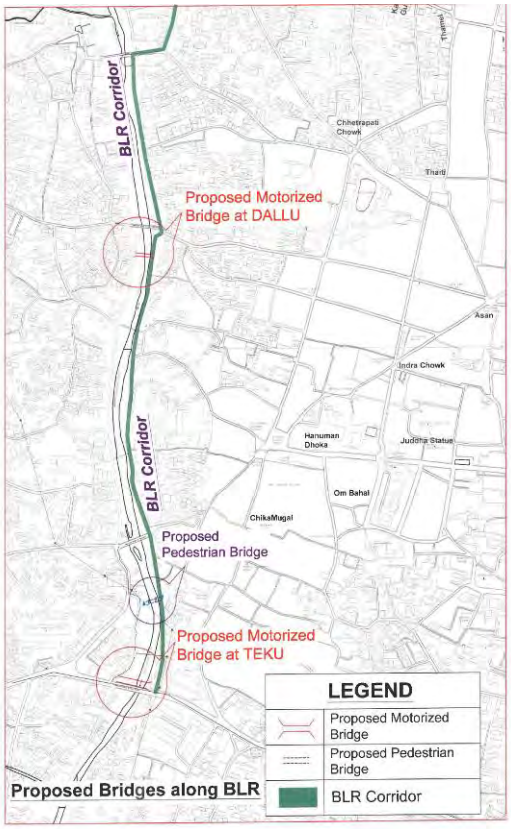
The following works are on-going under DOR components:

- Improvement of 32 intersections including signalization at 22 locations
- Installation of 6 pedestrian signals at the mid-blocks of the city center
- Installation of CCTVs at 25 strategic locations for traffic surveillance
- Establishment of a Traffic Management Center (TMC) for centralized control of all the signalized network and on-line operation
- Construction of 2 bridges over Bishnumati River



Source: ADB, 2014

Figure 3.2.12 Location Map of Improvement Intrrsections by KSUTP



Source: ADB, 2014

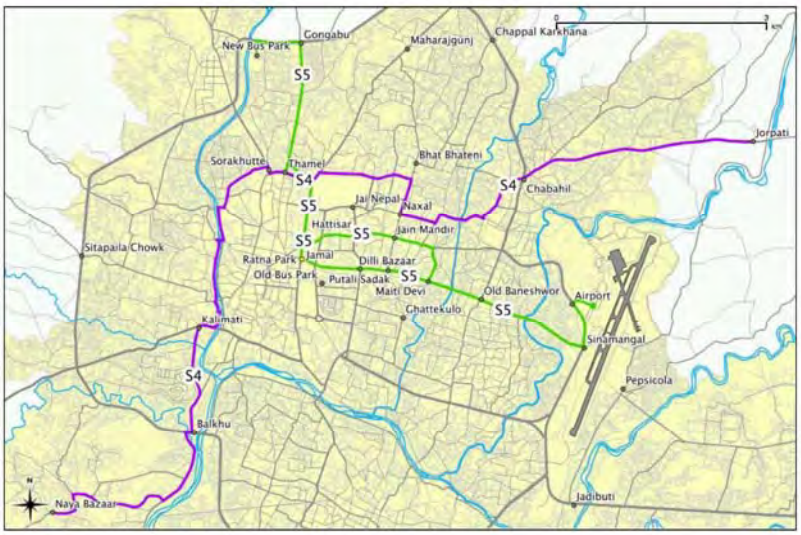
Figure 3.2.13 Location Map of Bridges by KSUTP

2) Public Transport

The following studies and reports are issued under KSUTP.

3) Selection of Pilot Routes, March, 2013, Project Management and Coordination Office, KSUTP, MOPIT

The objective of implementing of contracted service on pilot routes is to demonstrate the ablity of the contracting mechanism to allow public transport entrepreneurs to operate profitability, whilst providing safe and affordable transport at improved level of service for public transport users and reducing green gas and particulate emissions. After analyzing and evaluating potential routes, two routes shown in Figure 3.2.1were recommended.



Source: Working Paper, Selection of Routes, Project Coordination Office ,March 2013

Figure 3.2.14 Selected Pilot Routes by the Study

4) Restructuring Pilot Routes, June 2013, Project Management and Coordination Office, KSUTP, MOPIT

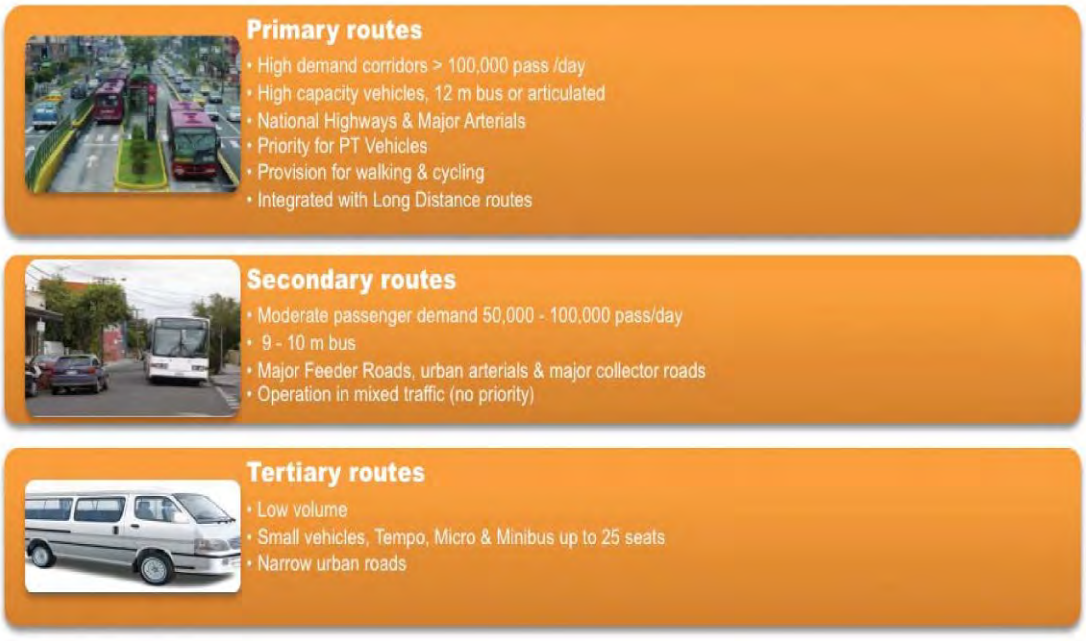
(i) Objective

Restructuring of the route network is aimed at addressing the inefficiencies and correcting the imbalance between supply and demand within the system. Routes restructuring includes reallocation of vehicle types so that the most appropriate type of vehicle operates each route.

(ii) Development of a route hierarchy

Three kinds of route are proposed:

- 8 Primary Routes were proposed, with a combined length of 131km.
- 16 Secondary Routes were proposed, with a combined length of 178km.
- 40 Tertiary Routes were proposed, with a combined length of 264km.

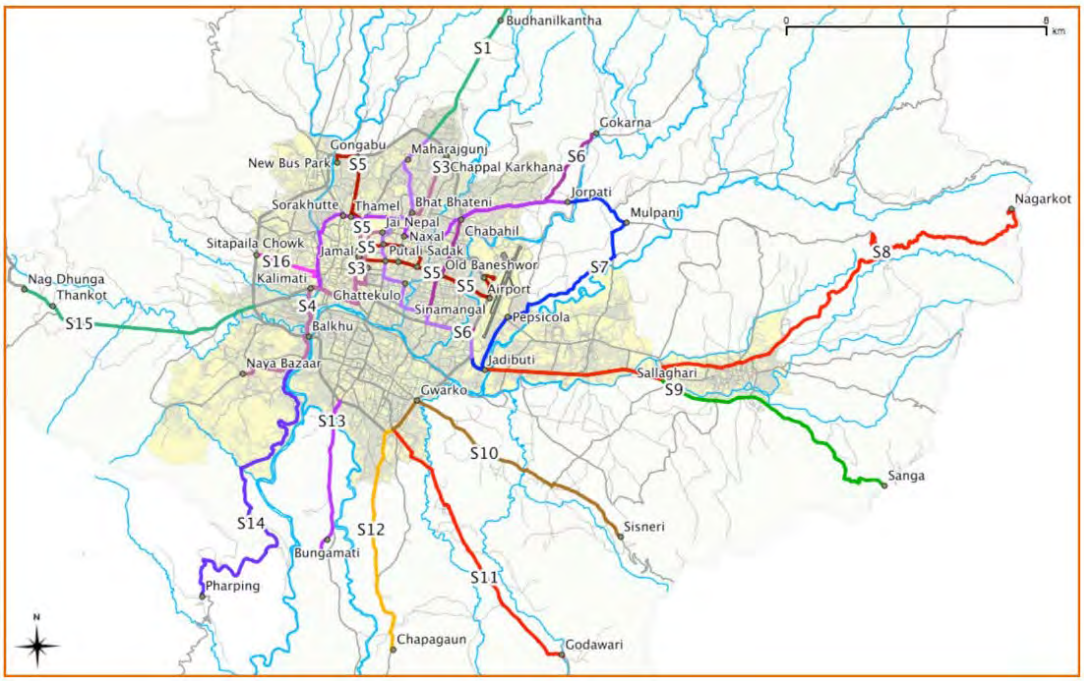


Source: Report on Public Transport Restructuring, February 2014, ADB

Figure 3.2.15 Route Hierarchy

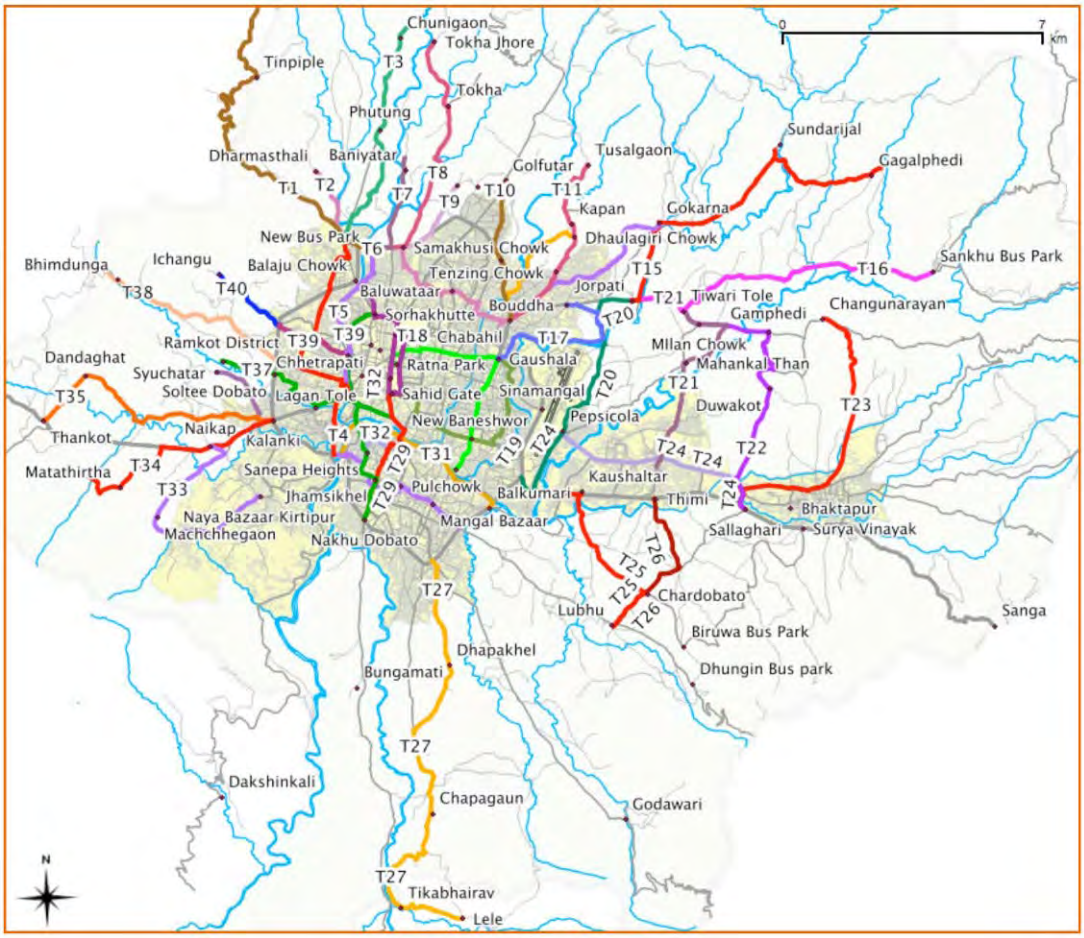
Source: Report on Public Transport Restructuring, February 2014, ADB

Figure 3.2.16 Primary Routes



Source: Report on Public Transport Restructuring, February 2014, ADB

Figure 3.2.17 Secondary Routes



Source: Report on Public Transport Restructuring, February 2014, ADB

Figure 3.2.18 Tertiary Route

(iii) Governance and institutional model

- For transport operators to provide a modern and efficient transport system, it is necessary for the current fragmented structure of small independent operators to be replaced with larger operating entities capable of procuring and managing a fleet of public transport vehicles. Corporate management of revenue will remove the incentive for undesirable fare maximizing behavior.
- Strengthen the existing, and establish new, public sector institutional structures to budget and disburse funds for public transport services and infrastructure, develop policy, formulate strategies, undertake tactical planning and contract with the private sector for provision of public transport services.

(iv) Route contracting

- Implement bus service contracting as a mechanism to ensure appropriate service levels and allocate risk between the public and private sectors.

5) Institutional Strengthening of Department of Department of Transport and Management (DOTM), Oct. 2013

Project Management and Coordination Office, KSUTP, MOPIT Kathmandu Sustainable Urban Transport (KSUT) project includes various dimensions of transport management. It cannot be implemented without proper legal base and adequate institutional capacity of the prime agencies involved. Thus, the success of KSUT project is only possible when the implementing units have clear rules and regulations, missions, objectives, institutional capacity and capability to perform

effectively. Among all the institutions that are involved in the pursuit of traffic and transport management, there is overlapping in the roles and responsibilities and many weaknesses are also apparent in the policy and the regulation which have not been updated to suit to the changing situation.

CHAPTER 4 PRESENT LAND USE AND DEVELOPMENT CONDITION

4.1 Outline of Land Use in Kathmandu Valley

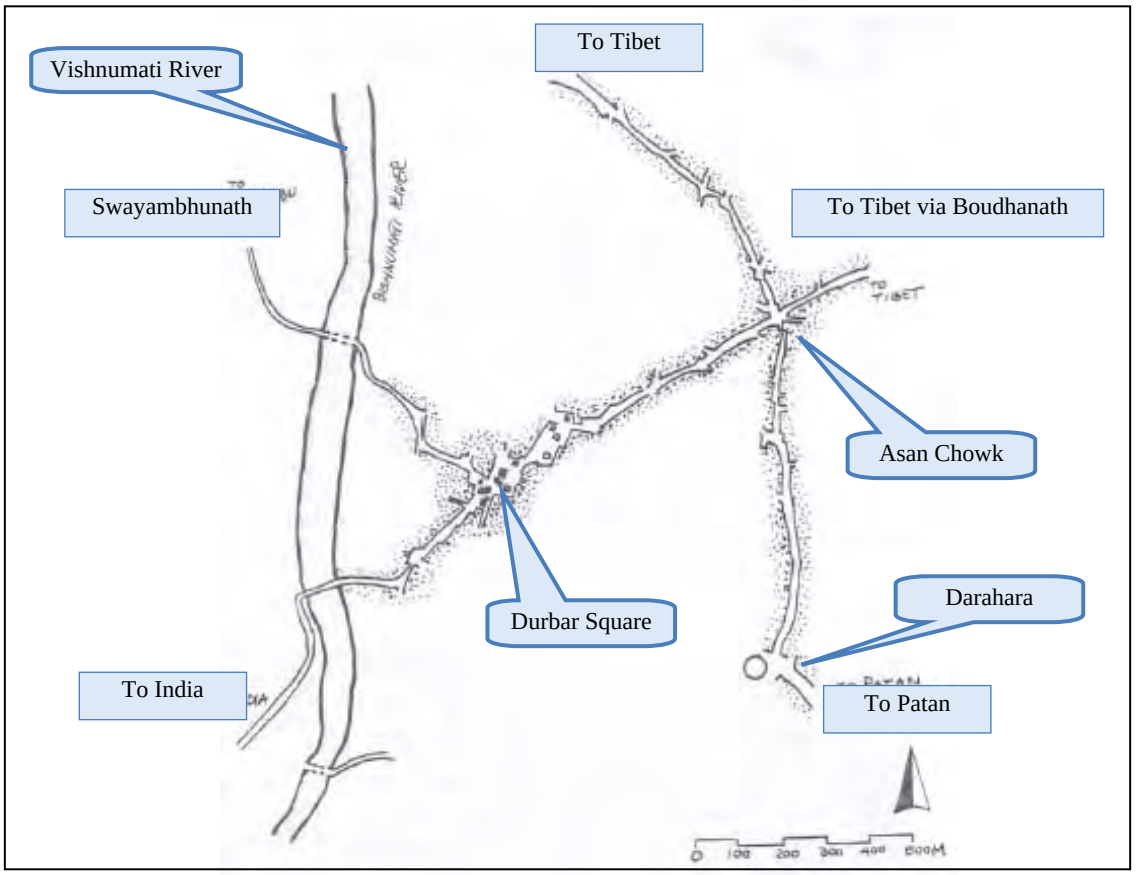
4.1.1 Historical Growth in Kathmandu Valley

(1) Ancient History

It has to be mentioned that the history of ancient Nepal is the history of Kathmandu Valley. There are two reasons for this. One is the lack of historical records for the other parts of Nepal and the other is that the colorful past of this beautiful valley easily out dazzles what is known about elsewhere. There is also the fact that the name of the country is taken from what Kathmandu used to be known in earlier times – Nepal Valley.

The ancient history of Kathmandu is based on mythology. According to Swayambhu Purana, the present-day Kathmandu was once a lake called Nagdaha. The hill where the Swayambu Stupa rests had lotus plants with beautiful lotus flowers abloom. One story says that the god Manjusri cut a gorge at a place called Kashapaal (later called Chobhar Gorge) with his Sword of Wisdom and drained away the waters in order to establish a city called Manjupattan which was located midway between Swayambhu and Gujeshwori (near what is today the Kathmandu Airport), and proclaimed his disciple Dharmakarma as the ruler of that city.

Gopalraj Vansawali, a genealogy of Nepalese monarchs, states that Gopalas, Mahispalas, Aabhirs and Kiratas had ruled Kathmandu Valley before Licchavis. Very few historic records of this era exist.



Source: Joshi PS 2004

Figure 4.1.1 Grids Superimposed by Mallas

(2) Medieval History

During this era, Kathmandu was ruled by Licchavis (4th to 9th century) and Mallas (13th to 8th century). The city grew largely during this time. Most of the historic temples, monasteries, and buildings were built during this era. The city served as an important transit point in the trans-Himalayan trade between India and China.

During the Lichchavi era, they brought in the first golden era of Nepalese art and culture. They were also the ones who introduced the Hindu caste system into the valley. Among the 48 Licchavi rulers, Mana Deva I, who ascended to the throne in AD 464, was a ruler of considerable talent and abilities. He consolidated the kingdom in all directions with his powerful army and political tact. Besides this, he was also a patron of the arts. Pagoda-roofed structures came into vogue. Sculptors fashioned exquisite images of their gods and kings. It was during this same period that the Changunarayan and other temples were built. Other notable masterpieces include the Reclining Vishnu of Budhanilkantha, the gilting of the roof of Pashupatinath Temple, the struts of Hanuman Dhoka and the Basantapur Tower, the Uku Bahal in Patan, and the Indreshwar Mhadev Temple at Panauti. The Lichchavi era was followed by Malla era.

During late Malla era, the valley of Kathmandu consisted of four fortified cities, namely Kantipur, Lalitpur, Bhaktapur, and Kirtipur, which served as the capitals of Malla confederation of Nepal. These states competed with each other on arts, architecture, aesthetics, and trade, which resulted in massive development. The Newar people – the indigenous inhabitants of Kathmandu Valley - came to dominate most forms of artistry during this time, both within the valley and throughout the greater Himalayas. Highly sought after, they travelled extensively throughout Asia, creating religious art for their neighbors, as in the case of Arniko and the group of artists he led to Tibet and China. The kings themselves were directly involved or influenced construction of public buildings, squares, temples, water spouts. Prominent architectural buildings of this era are Kathmandu Durbar Square, Patan Durbar Square, Bhaktapur Durbar Square, former durbar of Kirtipur, Nyatapola, Kumbheshwar, Krishna temple, etc.

Source: Joshi PS 2004

Figure 4.1.2 Grids Superimposed by Mallas

(3) Early Modern Era

The termination of Malla Confederation by the Gorkha Kingdom in the mid-18th century marks the beginning of the modern era. Kathmandu was adopted as the capital of their Gorkha Empire, and the empire itself was dubbed as Nepal. During the early phase of this era, Kathmandu saw a continuation of its culture. New buildings in Nepali architecture such as the nine-story tower of Basantapur were built during this era. Trade declined during this era because of continuous wars with neighboring nations. The alliance of Bhimsen Thapa with France against Great Britain led to the development of modern military structures in Kathmandu such as modern barracks. The change in policy from anti-British to pro-British during the Rana regime saw the first development of western architecture in Kathmandu. The most prominent buildings of this era are Singha Durbar, Kaisar Mahal, Shital Niwas, the old Narayanhiti Palace, etc. New Road was the first modern commercial road built during this era.

(4) Land Use Change in the Modern Era

Urban growth of Kathmandu Valley started with the construction of two highways and the international airport in the 1950s to 1960s. Construction of the Ring Road and radial roads in the 1970s accelerated urban development along these roads. Rapid urban area expansion along the radial road caused encroachment on rich farmlands and the spread of the built-up area without appropriate infrastructure such as service roads, water supply, sewerage, and electricity.

Development activities in recent years were mainly in farmlands located just outside of the Ring Road and shrubs in the peripheral area of Kathmandu Valley. Due to economic reasons and weak development control by the local government, most of the development activities were not well-planned.

In the recent past, five to seven thousand buildings were constructed every year in Kathmandu Valley. Most of these buildings were built in the rural area. MOPIT is expecting that 60% of the area of Kathmandu Valley would be urbanized by the year 2020, with most ignoring the land use plan and building permission procedures.

4.1.2 Laws and Regulations

(1) Town Development Act (1988)

The Town Development Act (TDA) is intended to facilitate the reconstruction, development, and expansion of urban areas throughout Nepal, by means of a series of measures giving municipalities and town councils the authority to (among others): i) prepare and enforce land-use plans and building by-laws; ii) demolish any non-permitted works; iii) freeze land transfers for a period of up to two years; and iv) undertake guided land development, land pooling and sites and services programs with the consent of 51% of property owners.

At the same time, the MOPPW submitted the Draft Kathmandu Valley Development Authority Act to the cabinet to establish an authority to manage urban planning and development in the valley, however, it was not approved.

Thus, the TDA provides the legal basis for the establishment of the KVTDC within the MOPPW. However, in undertaking development control and monitoring activities, the KVTDC can only act with the collaboration of the local government, which reportedly is not always forthcoming.

(2) Local Self-governance Act (1999)

The Local Self-governance Act of 1999 is Nepal's decentralization act, giving municipalities and VDCs the authority to raise funds by taking loans and levying taxes, and carry out town development plans and housing programs.

(3) Kathmandu Valley Development Authority Act (2012)

After the revised Kathmandu Valley Development Authority Act was promulgated in March 2012, the Kathmandu Valley Development Authority was established by reorganization of KVTDC in April 2012.

(4) Building Act (1997), National Building Code (1996), and Kathmandu Valley Building By-laws (2007)

The Building Act of Nepal came into force in 1997, applicable for all municipalities and villages in Nepal. Building Act (1997) categorizes all buildings into four types according to the standards in the Nepal National Building Code.

The extensive Nepal National Building Code has 23 volumes, which cover all the above categories of buildings, approved by the cabinet in 2003. Municipalities and Village Development Committees can issue building permits. Monitoring of all categories of buildings should be done by the municipalities and Town Development Committees.

Besides the building code, there are building by-laws in each municipality. As per the Local Self-Governance Act (1999), municipalities are given authorities to prepare and implement building by-laws in their respective areas. The Kathmandu Valley Building By-laws (2007), which is meant for the municipalities in Kathmandu Valley and emerging towns, were revised in 2007 to accommodate the changing urban context of the valley. These changes included plot ratio, ground coverage, and set back.

The Ancient Monuments Conservation Act (1957) also stipulates historical conservation areas and regulates building codes for the area.

(5) Apartment Ownership Act (1997) and Apartment Ownership Regulation (2003)

Promulgation of the Apartment Ownership Act (1997) paved way for the private sector to intervene into the housing sector. It covers a wide range of ownership rights, rights of customers, operational management, buyer's duties, and developer's liabilities. It is compulsory to form a user committee of apartment owners for the proper operation and maintenance of the apartments and their premises.

4.2 Urban Expansion and Development Trend

4.2.1 Expansion of Urbanized Area

(1) Land Use Change in Kathmandu Valley

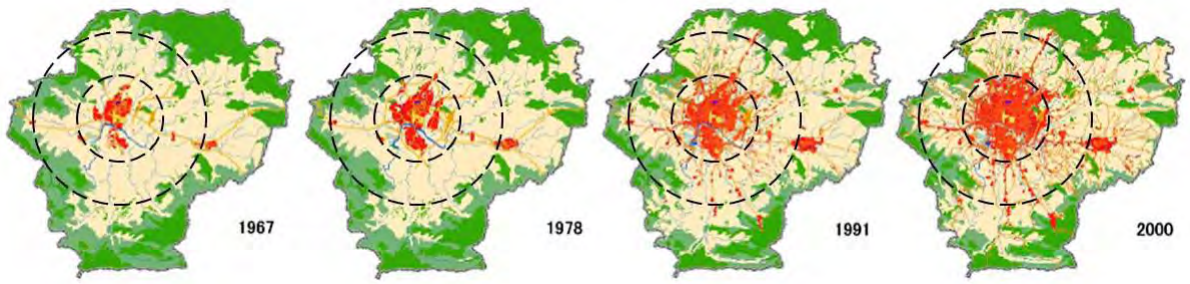
The clearest trend of land use change is the continuous increase of the urban/built-up areas in the valley. The percentage of urban/built-up area had a noticeable increase, from 2.94% (2010 ha) of the total land in 1967 to 24.7% (16,216 ha) in 2011.

Unplanned rapid urbanization is the major issue of the development of Kathmandu Valley. The figures below clearly show this situation.

Table 4.2.1 Land Use Statistics

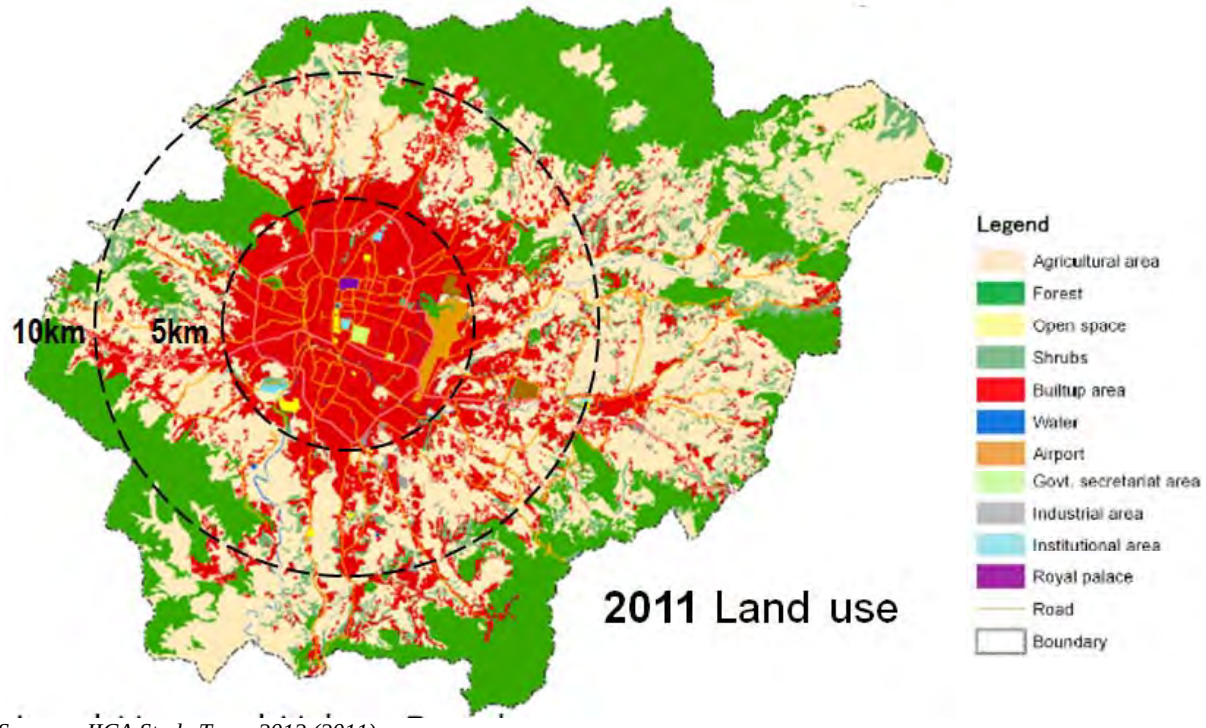
Land Use Type	1967		1978		1991		2000		2011	
	ha	%	ha	%	ha	%	ha	%	ha	%
Shrubs	13,563	19.81	12,124	17.71	8,129	11.87	7,150	10.44	33,67	5.13
Forest	15,800	23.08	16,311	23.82	13,887	20,29	13,301	19.43	18,156	27.66
Water	1,337	1.95	1,380	2.02	1,341	1.96	1,266	1.85	235	0.36
Urban/built-up area*	2,010	2.94	3,362	4.91	6,313	9.22	9,717	14.19	16,216	24.70
Open space	100	0.15	95	0.14	135	0.20	171	0.25	105	0.16
Agricultural area	35,648	52.07	35,186	51.40	38,653	56.46	36,853	53.84	27,567	41.99
Total	68,458	100.00	68,458	100.00	68,458	100.00	68,458	100.00	65,646	100.00

*Includes built-up areas, industrial areas, roads, airport, institutional areas, government secretariat areas and the Royal Palace.
Source: Thapa & Murayama 2009 (1967-2000) and JICA Survey Team 2012 (2011)



Source: Thapa & Murayama 2009 (1967-2000)

Figure 4.2.1 Land Use Change in Kathmandu Valley from 1967 to 2000



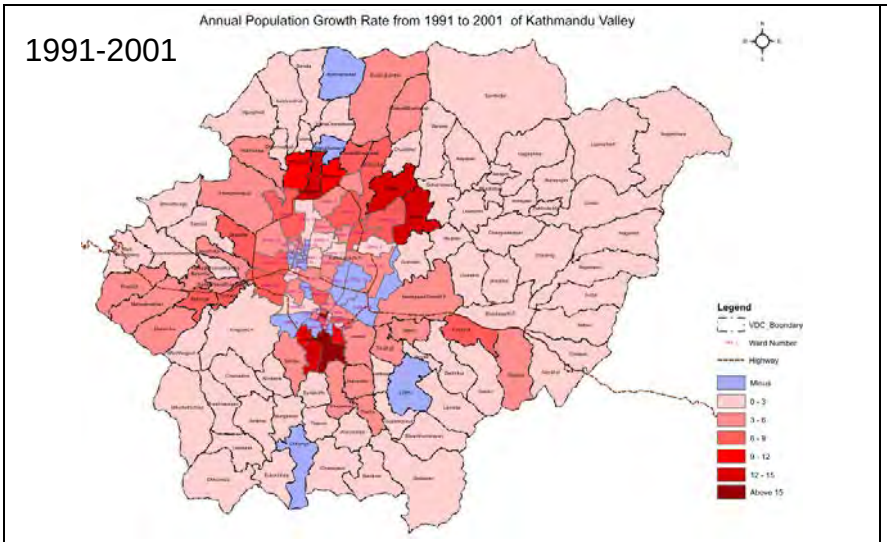
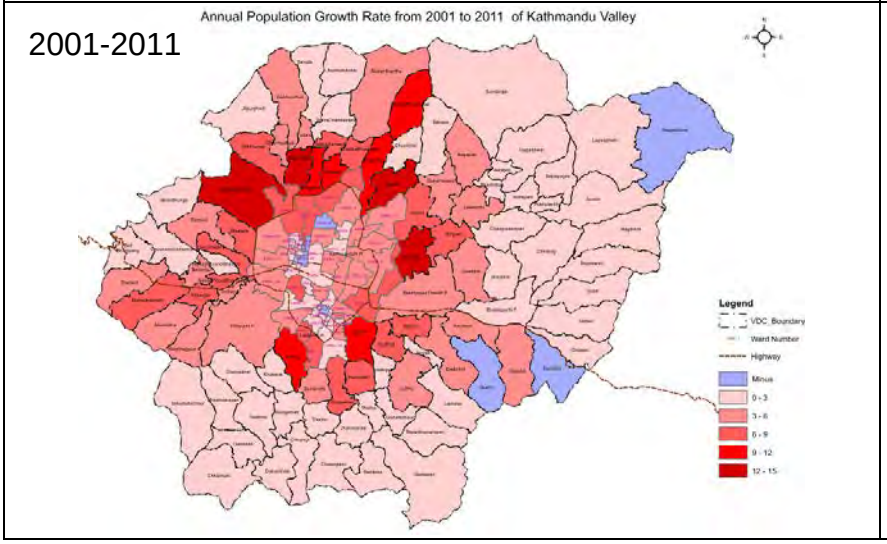
Source: JICA Study Team 2012 (2011)

Figure 4.2.2 Land Use in Kathmandu Valley in 2011

4.2.2 Population distribution

(1) Change of Population Growth Rate

Annual population growth rate at the VDC and ward levels from 1991 to 2001 and from 2001 to 2011 are shown in the maps of Figure 4.2.3 below.

	・Rapid population growth happened just outside the Ring Road during 1991-2001 to north, north-east and south.
	・High population growth spread widely outside of the Ring Road, especially in north and east. ・4 VDCs shows more than 12% annual growth rate in last decade.

Source: JICA Study Team

Figure 4.2.3 Population Variation in Kathmandu Valley

During these two decades, population growth in the northern and southern areas outside of the Ring Road showed high growth rate of over 8% per annum. Other areas along the Ring Road, two highways and some radial roads toward the periphery of the Valley also showed higher growth. On the other hand, some wards showed continuous decrease in the core area, such as wards 23, 24, 27, and 30 around the Kathmandu Durbar Square.

Although the population growth trend may continue during the next decade, higher population growth VDCs might be spread out within a certain distance from the Ring Road such as the eastern area of the airport, and the north fringes or southern part of the valley. However, these are just expected figures made from unplanned population growth without any development concept or vision of the valley.

(2) Changes in Population Density

The average population densities of each district are shown below. Kathmandu District shows the highest population density among the three districts, followed by Lalitpur District. Average population growth rate of the valley has been over 4.0% since 1991.

The population density of Kathmandu Municipality increased from 85% in 1991 to 136% in 2001 and 204% in 2011.

Table 4.2.2 Population Densities of Districts and Municipalities (persons/ha)

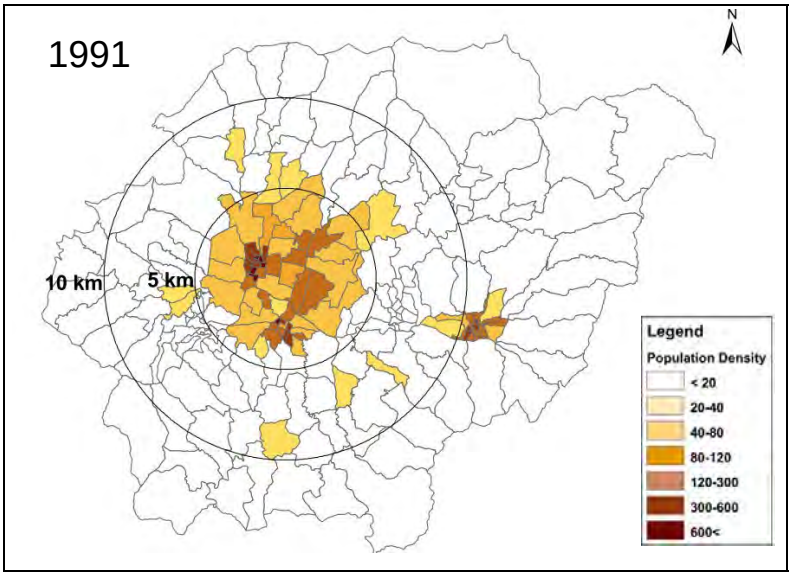
	1991 Population Density	**2001** Population Density	**2011**(Estimate) Population Density	**2022** (Projection) Population Density
Bhaktapur District	14.1	18.2	25.5	36.4
Bhaktapur N.P.	93.2	110.6	128.0	150.1
MadhyapurThimi N.P.	28.7	43.0	75.8	141.6
Lalitpur District *	18.7	24.7	35.7	58.0
Lalitpur N.P.	77.3	107.6	148.9	208.3
Kathmandu District	16.2	25.7	44.1	78.9
Kathmandu N.P.	84.8	135.9	203.6	317.6
Kirtipur N.P.	21.2	27.7	44.8	76.0
Total *	16.2	24.1	37.6	67.2

(* This data does not include those outside of the valley, which is the southern part of Lalitpur District.)
Source: Census & JICA Study Team

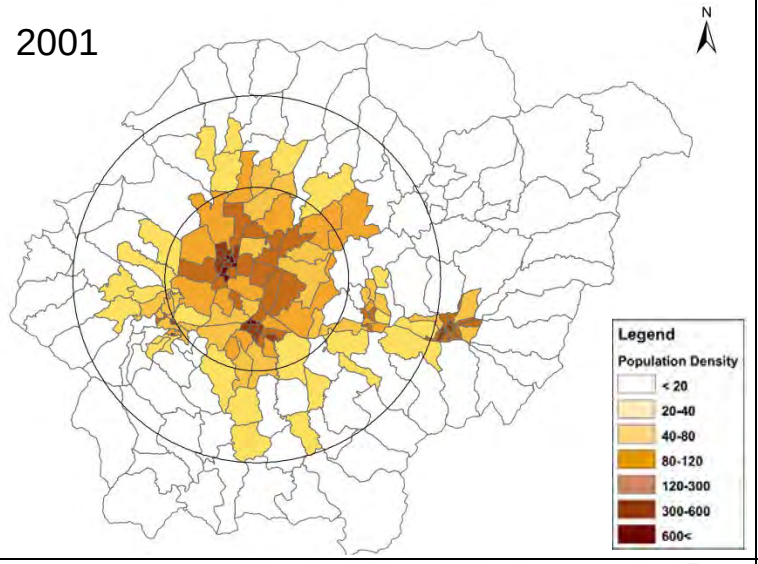
The population density maps at the VDCs and wards in Municipalities are shown in figure 4.2.4 below describing the population growth trend in Kathmandu Valley.

In 1981, there were few areas with population densities of over 80 person/ha. Those were core areas and surrounding areas of Kathmandu, Bhaktapur and Lalitpur. A decade later (1991), major population settlements were still within the Ring Road and Bhaktapur.

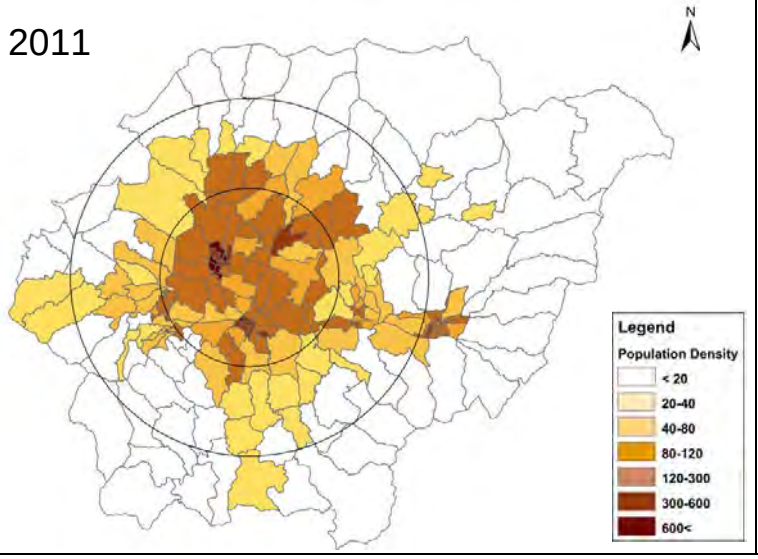
However in 2011, in most of the areas inside of the Ring Road, population density has jumped to more than 160 person/ha and some areas reached 200 person/ha. Population density outside of the Ring Road also went up to over 80 p/ha along radial roads especially toward Gokarna, Tokha, Techo and Thaiba, in the north, north-east and south respectively.



- Most of the area inside the Ring Road already accommodate more than 40p/ha.
- Some VDCs which cover old settlement area shows more than 20p/ha



- Over 20p/ha area spread out from the Ring Road along radial roads connecting city center to old settlement.
- Just inside area of the Ring Road showed population concentration over 80 p/ha.



- Population density in most of the area inside the Ring Road jumped up over 120 p/ha.
- Over 40 p/ha area spread out from the Ring Road.
- Over 20 p/ha areas are also expanding to fringe area of the Valley

Source: JICA Study Team

Figure 4.2.4 Population Density Change in Kathmandu Valley

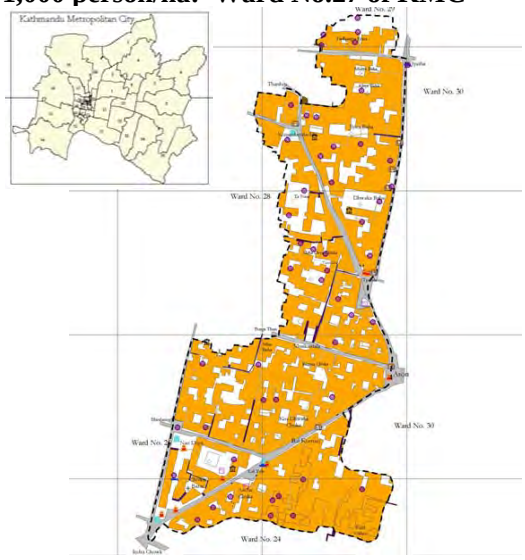
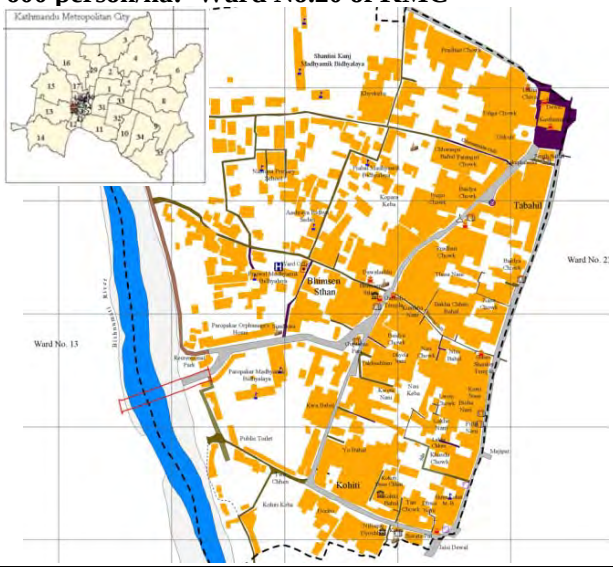
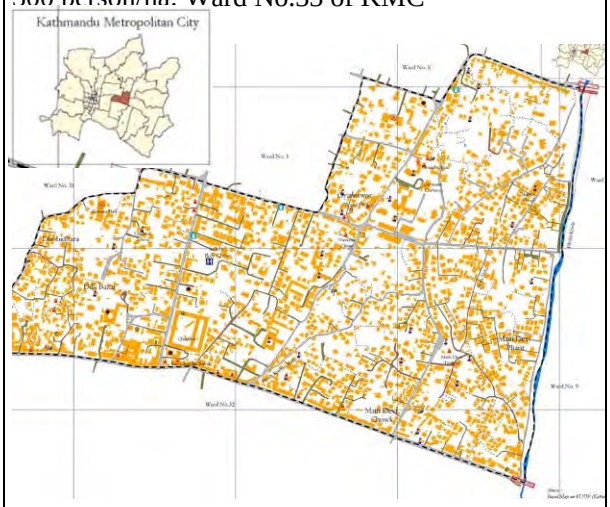
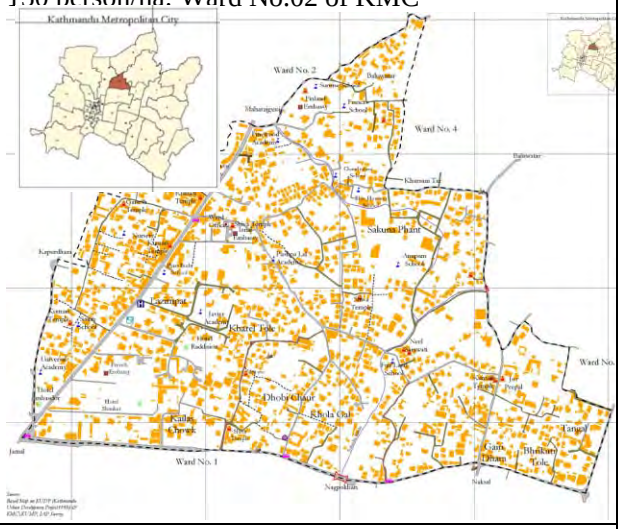
(3) Typical Population Density in Kathmandu Valley

In Kathmandu Valley, several types of development patterns can be observed.

The most characteristic type is the old town area around Durbar Square. This area has over 1,000 person/ha population density. Buildings stand right up next to each other and have common squares. Streets and squares are connected to each other like a web by passage.

Surrounding areas of old town has over 600 person/ha density. Newly developed areas with small size plot show about 300 person/ha population density, while areas with large plot size show around 150 person/ha.

Regarding the distribution of the increasing population, the land use plan should consider population density together with land use zoning. During the future M/P study, it should be discussed with stakeholders.

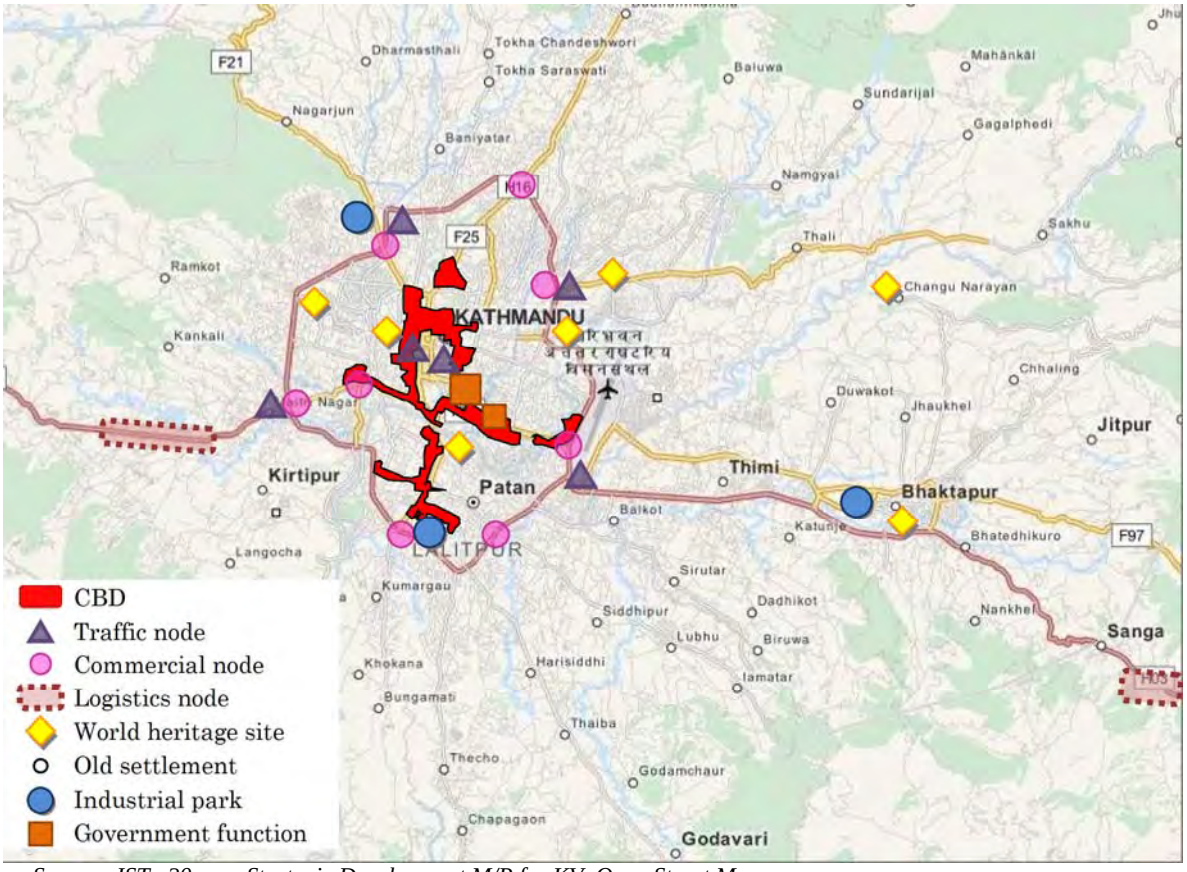
1,000 person/ha: Ward No.27 of KMC	**600 person/ha: Ward No.20 of KMC**
	
1,014.7 person/ha, Asan, Indrachowk This area is the heart of Kathmandu historic area located in the inner city. This area developed along ancient highway with small size and average 4 to 5 stories buildings. Open spaces in this area limited, narrow streets and common patio with religious monuments.	674.8 person/ha, Bhimsen Sthan This Ward is situated in a historic part of Kathmandu between Durbar Square and Bishnumati river. This area also has many historic buildings and ceremonial places This area has some bigger open spaces such as school, play ground and the river area, so that population density is lower than Ward No. 27.
300 person/ha: Ward No.33 of KMC	150 person/ha: Ward No.02 of KMC
	
317.4 person/ha, Dhili Bazar area This area is enclosed by Dhobi Khola river in the east and an affluent section of Kathmandu. Most of the buildings area detached and 2 to 4 stories height. Education is a strong point of the ward, and there are seven secondary schools and two high school level campuses. Various social organizations, NGOs operate in the ward.	166.8 person/ha, Lazimpat area This area located in the northern part of Kathmandu. There are several embassies and government functions situated. Also high rank hotels are also one of major functions in this ward. Most of the plots have large area with garden, and have average 2 stories building.

Source: JICA Study Team

Figure 4.2.5 Typical Population Density in Kathmandu Valley

4.2.3 Distribution of Major Land Use and Function

Figure 4.2.6 shows existing urban function distribution in Kathmandu Valley.



Source: JST, 20 year Strategic Development M/P for KV, Open Street Map

Figure 4.2.6 Existing Urban Function Distribution in the Valley and its expansion

(1) Commercial and Business function

The red area in Figure 4.2.6 shows location of the commercial center and business center in the Valley. Largest area is world heritage "Durbar Square" and its peripheral area which is one of the oldest settlements and main tourism destination of Kathmandu Valley. This situation causes traffic congestion in city centre. Many shopping centers were constructed in recent years within and along the Ring Road to sell commodities to neighboring areas.

Small scale commercial activities can be seen everywhere in the Valley. Many of the buildings along streets have small shops on their ground floors, especially in the historic area of Kathmandu.

(2) Government Function

The brown area in figure 4.2.6 shows government function center of Nepal. Most of the ministries are located in the Singha Durbar Square. Department offices, such as DOR, DUDBC, Survey Department and so forth, are located near Singha Durbar especially near the Arniko Highway. DUDBC has planned and is relocating government offices in and out of the Singha Durbar. Some government functions are planned to relocate outside of KMC.

(3) Institutions (Governmental, Social & Educational function)

Most embassies, UN agencies and other donor agencies are located within the Ring Road, especially along North-south corridor. Embassies are located mainly in Kathmandu, UN and other donors are located mainly in Lalitpur.

Educational facilities in Kathmandu are small scale except university or collage.

(4) World Heritage

The seven monument zones which were designated as World Heritage Sites in the early 1979 by UNESCO exist Kathmandu Valley. Details are explained in 2.2.3.5.

(5) Housing Development

Purple color areas in figure 4.2.6 show land pooling project sites. Many of them are located near the Ring Road and along radial roads from Ring Road to the fringe areas of the Valley. Blue square dots show private apartments and housing development project sites. High rise apartment developments can be seen in Kathmandu Municipality and Lalitpur Municipality area, and also housing development can be seen along the radial roads outside of the Ring Road.

(6) Logistics

Logistics functions are located along the road at the following locations; west of Kalanki Junction, Banepa area and Ring Road. Forwarders are using ROW of highways for transhipment because of no appropriate logistics facilities in the Valley.

(7) Brick Kiln and Clay Digging Site

One of major land use industries is brick production industry. Brick is a primary building material in many parts of Nepal, especially in Kathmandu Valley and plains of Terai.

The brick industry in KV has a long history. Bricks are preferred as the wall material due to its abundant usability and availability of clay deposits for brick making found on the agricultural land at the foot of the Valley. The availability of water and proximity to the market augment the number of brick kilns in the Valley.

The recent development boom in KV causes rapid growth of demand for bricks. Although more than a hundred brick kilns are operating in KV, their production is not sufficient to fulfill the current growing demand. They are expanding their factories outside of the Valley because of strong demand pressure.

Another pressure to move out is the rent cost for the factories and agricultural land where they get clay deposits. Due to the recent land price increase, the rent cost is excessively high for the brick production. For those reasons, most of the brick factories are planning to move out of the Valley. The development should be controlled on those future vacant lands where the factories are currently located.

Source: JICA Study Team, Google Earth

Figure 4.2.7 Location of Clay Site for Brick Kiln

4.3 Present Urban Development Method

4.3.1 Current Land Development Method (Public & Private)

In Nepal, there are three types of urban development method: (1) sites and services program (2) guided land development and (3) land pooling program. These are established in accordance with the provisions of Town Development Act 1988. The three methods have been utilized for implementation of land development and infrastructure development in Kathmandu Valley.

(1) Sites and Services Program

Sites and services program is a well-known scheme of land development that has evolved through the 1960s and 1970s in response to the growing need for affordable housing in urban areas throughout the developing world. In Kathmandu Valley, this scheme was introduced for the provision of affordable low cost housing for low-ranking civil servants and the general public in 1973. It involves either public land or the acquisition of private vacant land by the government. Until now, two projects of sites and services program with a total area of 37 ha in Kuleshwor and Galfutar were already completed.

Although this scheme is one of the best methods from the view point that there are no cost recovery problems, the alienated compensation from the market price, and the requirement of resettlement of original land owners has delayed the implementation and has increased resentment from the land owners.

(2) Guided Land Development (GLD)

GLD is a method for improvement and development of access roads through the land contribution of

the land owners. The development scheme in Nepal was established in 1988. This process is undertaken by the KVTDC through coordination with private land owners and residents. With their approval and inputs, the KVTDC prepares and then implements a road layout plan utilizing a proportion of private land. Instead of compensating for the land, the landowners are provided the benefit of access roads and utilities.

By the late 1990s, more than 320 km out of 475 km proposed access roads had been opened up under the GLD program approach. Since then, numerous other GLD projects have been undertaken by KVTDC throughout Kathmandu Valley.

GLD can only be implemented when all land owners along its route agree to provide land for the road. It is also difficult to implement where some land owners have access already provided by the existing road and hence have nothing to gain by contributing land for the new road, and small plots which would become too small for their intended use if a portion was taken for the road. In addition, GLD has been successful only in new road developments and widening of existing roads. It is not effective in improving the condition of the plot and provision of public services such as schools and open space.

(3) Land Pooling Program (LP)

LP program is an urban development measure having two fundamental concepts: i) land value increasing through development and ii) sharing of development profits with land rights holders and public bodies. LP program in Nepal was established in 1988.

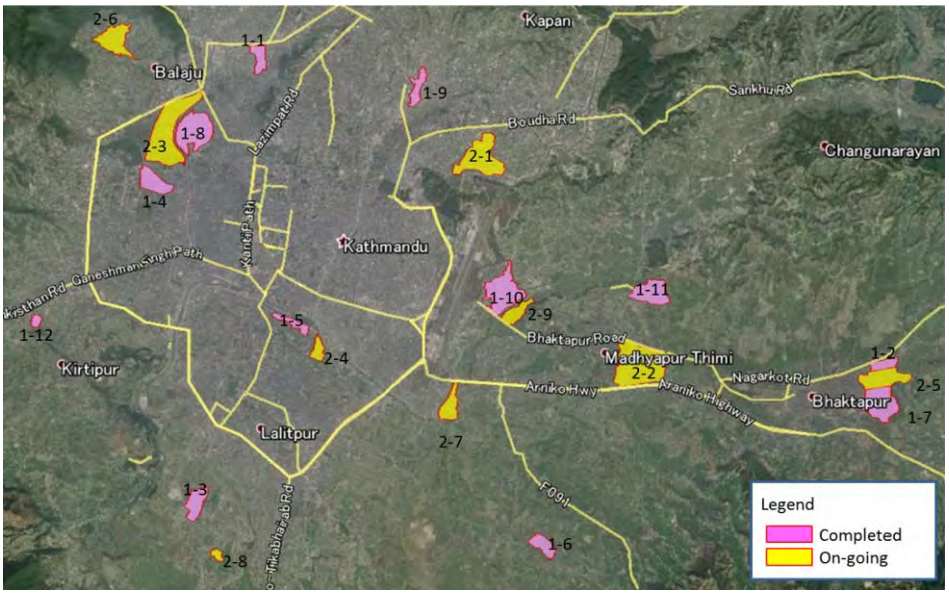
In LP programs, scattered undeveloped or underdeveloped privately-owned land parcels are consolidated and then readjusted in a manner agreed by KVTDC with the owners, and in accordance with a similarly agreed plan for the provision of infrastructure, public utilities, and services prepared by the KVTDC in coordination with the appropriate agencies. The readjusted plots remain the property of the owners, with the relative increase in land value accruing as a result of the improvements again offsetting the price of the privately donated land. Although certain up-front costs are incurred by the KVTDC in this process, the bulk of all land development costs is funded through the sale of the serviced plots generated by a portion of the private land.

Thus, LP program has the advantage of improving accessibility to public services for landowners, and saving investment budgets of public bodies. It is expected that use of the LP program will be promoted further for the improvement and expansion of urban areas in Kathmandu Valley.

Outline of current and planned LP projects in Kathmandu Valley are explained as follows:

1) Current LP Projects in Kathmandu Valley

The first LP project started at Gongabu in Kathmandu Valley 1988. To date, 12 projects with a total area of 259 ha were completed and 10 projects with a total area of 406 ha are on-going. Most of LP projects have been implemented in vacant land and agricultural land. The location and summary of completed and on-going LP projects are shown in Figure 4.3.1 and Table 4.3.1.



Source: JICA Study Team

Figure 4.3.1 Location of LP Projects in Kathmandu Valley

Table 4.3.1 Summary of LP Projects in Kathmandu Valley

No.	Project Name	Project Period	Area (ha)	No. of Plots	Implementer
Completed Project					
1-1	Gongabu	1988-1996 (8 years)	14.35	700	TDC, Kathmandu
1-2	Kamal Binayak (I)	1991-1996 (5 years)	7.37	400	TDC, Bhaktapur
1-3	Sainbu Bhaisepati	1991-2002 (11 years)	28.09	611	TDC, Lalitpur
1-4	Dallu	1991-2002 (11 years)	20.15	1,120	KVTDC, Laltipur
1-5	Bagamati Phant (Jwagal Area)	1992-2001 (9 years)	10.02	560	TDPIC
1-6	Lubhu	1993-1996 (3 years)	13.68	720	TDPIC
1-7	Libali	1995-1998 (3 years)	34.09	1,800	Bhaktapur Municipality
1-8	Naya Bazar	1995-2002 (7 years)	42.74	2,320	Kathmandu Municipality
1-9	Chabahil Gopi Krishna	1995-2002 (7 years)	10.22	259	TDPIC
1-10	Sinamangal	1995-2002 (7 years)	46.51	1,970	TDPIC
1-11	Sinchitar	1996-2003 (7 years)	26.71	1,400	TDPIC
1-12	Kirtipur (I)	2004-2008 (4 years)	5.44	300	N/A
	Total		259.37	12,160	
On-going Project					
2-1	Bagamati Nagar	Sep 2003-	63.40	2,800	KVDA
2-2	Chamati	2003-	73.28	3,170	N/A
2-3	Kamerotar	2004-	45.80	2,520	N/A
2-4	Bagamati Phant (Shankhamul)	2008-	7.12	N/A	N/A
2-5	Tumucho Dugure Chokha	2008-	30.53	1,500	N/A

2-6	Ichangu Narayan (RANIBAN)	2006-	30.94	1,625	KVDA
2-7	Manohara Phant	2006-	90.27	N/A	N/A
2-8	Sainbu Nakhudol	2008-	17.96	N/A	N/A
2-9	Dibyashowri	2009 (planned)	28.14	N/A	N/A
2-10	Dhobikhola Karidor	N/A	18.25	N/A	N/A
	Total		405.69		

Source: KVDA

As an example of on-going LP projects in Kathmandu Valley, outline of Ichnagu Narayan LP project is summarized hereunder. Ichung Narayan LP project has been implemented by KVDA since 2006. The project area is located at the urban fringes in the northwestern part of Kathmandu Valley. In the project, although the budget for the up-front cost for implementation was funded by TDC, the entire budget will be recovered through sale of the serviced plots. The average land value after the implementation has increased to about 8 times the original value before project. The available budget of 472 million NPR exceeds total expenditure of 282 million NPR. Thus, the LP project is self-financed.

Regarding land use plan, the road network in the LP project consists of small service roads of 8m, 6m and 4m in width. The LP project does not contribute to major urban facilities such as arterial roads. As a result, the average land contribution ratio is kept at the low level of 27.3%.

The access road development and social housing project, however, are implemented by DUDBC as a supportive project.

The project frame and current condition of Ichnagu Narayan LP project are shown in the following Table 4.3.2, Figure 4.3.2 and Figure 4.3.3.

Table 4.3.2 Project Frame of Ichangu Narayan LP Project

i) Land Use Plan

Category		Original Lands		Plan	
		Area (m^2)	Rate	Area (m^2)	Rate
Public Lands	Road	7,200	2.3%	61,975	20.0%
	Open Space	-	0.0%	9,064	2.9%
	Others	71	0.0%	-	0.0%
	Sub-total	7,271	2.4%	71,039	23.0%
Private Lands		302,114	97.6%	219,573	71.0%
Serviced Plots		-	0.0%	18,773	6.1%
Total		309,385	100.0%	309,385	100.0%

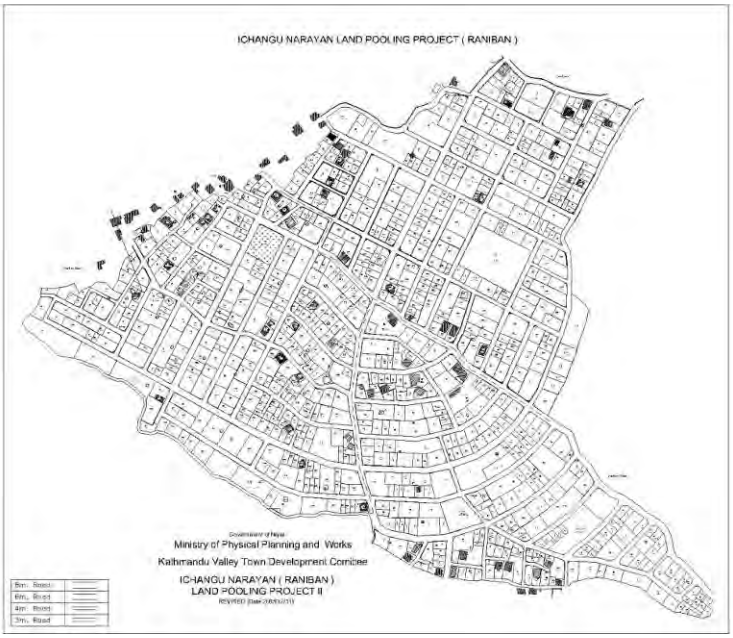
Items	Land Contribution	
	Area (m^2)	LC Ratio
LC for Public Lands	63,768	21.1%
LC for Serviced Plots	18,773	6.2%
Total	82,541	27.3%

iii) Expenditure

Items	Amount (NPR)	Remarks
Construction Works	279 mil.	Road, Drainage, Water Supply, Electricity, etc.
Consultancy Works	1 mil.	
Compensation	1 mil.	
Miscellaneous	1 mil.	
Total	282 mil.	

Items	Amount (NPR)	Remarks
Sales of Serviced Plots	472 mil.	25,157NPR/m^2 x 18,773m^2
Total	472 mil.	

Source: JICA Study Team based on Information from KVDA



Source: KVDA

Figure 4.3.2 Land Re-plotting Plan of Ichangu Narayan LP Project

	
New Buildings in LP Project Area	**Site of Open Space in LP Project Area**
	
Social House by DUDBC in LP Project Area	**Access Road by DUDBC outside of LP Project**

Source: JICA Study Team

Figure 4.3.3 Current Condition in Ichangu Narayan LP Project

2) Plan of LP Projects for Outer Ring Road Development

KVDA is preparing detailed plans for LP projects integrated with the Outer Ring Road development. The Outer Ring Road development project consists of two major components: i) development of the highway with a Right of Way (ROW) of 50 metres width for 4 lanes and ii) urban development of planned settlements along the corridor within a range of approximately 250 meters from the main road. For the development project, KVDA is going to apply the LP program to implement the planned settlement involving existing landowners and secure land for the ROW of Outer Ring Road through land contribution. At present, KVDA is conducting the survey and studies as follows:

- Model plan of LP program.
- Townscape plan for Outer Ring Road.
- Technical evaluation of the alignment of the Outer Ring Road.
- Study of intersections development of the Outer Ring Road.
- Detailed Planning for LP program area.
- Fixing of center line of the Outer Ring Road in the areas where the LP program will not be applied.
- Analysis of impact on traditional settlements.
- Improvement of existing radial roads.
- Analysis of impact in social and economic situation and physical infrastructure in Kathmandu Valley.
- Preparation of visual animation model of the Outer Ring Road and its growth corridor.

- Preparation of land re-plotting software.

In the detailed planning report, six LP projects with the total area of 1,700 ha are proposed as shown in Table 4.3.3, Figure 4.3.4 and Figure 4.3.5.

However, some issues causing delay in the implementation were reported from KVDA as follows:

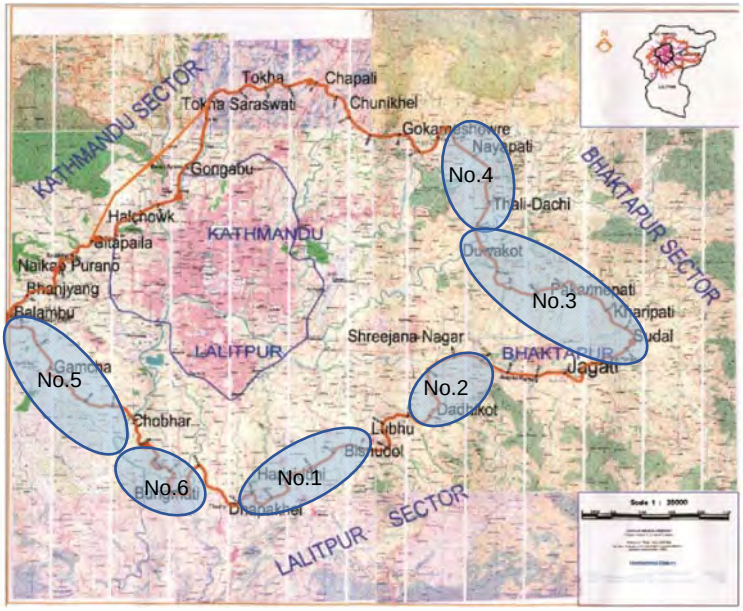
- Uneasiness about the sudden and drastic change in the current agricultural occupation and lifestyle to existing residents and landowners who are living in the peripheral area of the alignment of the Outer Ring Road.
- Environmental change and land speculations which will bring complexities in the project implementation.
- Misunderstanding of the LP approach might cause hesitation by many of the land owners to sign the agreement for LP projects.

The reluctance to agree to LP project might be caused by a technical issue as well as people's misunderstanding. In the plan, huge areas for the right of way for the highway are to be created from the land contribution of LP program. However, it may not be easily acceptable to the landowners since they are being requested to provide land for a facility which will benefit all citizens in Kathmandu Valley.

Table 4.3.3 LP Projects for Outer Ring Road Development

No.	Name	Area (ha)	Length of ORR (km)
1	Harshiddhi to Lubhu Area	250	11.3
2	Naya Thimi to Dadhikot Area	204	3.78
3	Bhatedhikuro to Thali Danchhi Area	548	10.0
4	Sandol to Thali Danchii Area	251	4.0
5	Satungal to Chovar Area	450	6.6
6	Chovar to Harishiddhi Area	N/A	N/A
	Total	1,703	35.68

Source: KVDA



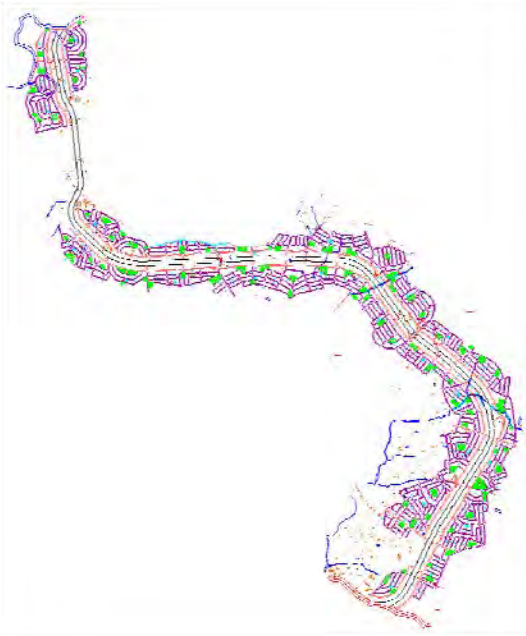
Source: KVDA

Figure 4.3.4 Location of LP Projects for Outer Ring Road Development

No. 1: Harshiddhi to Lubhu Area

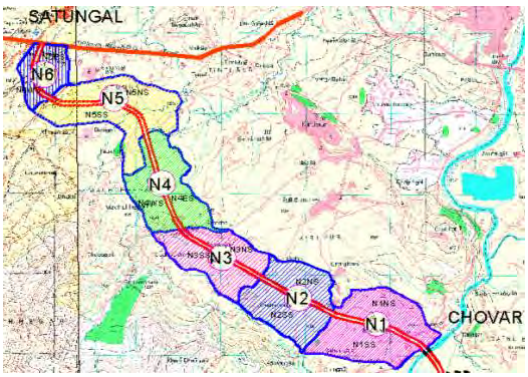
No.2: Naya Thimi to Dadhikot Area

No.3: Bhatedhikuro to Thali Danchhi Area



No.4: Sandol to Thali Danchii Area

No.5: Satungal to Chovar Area



Source: KVDA

Figure 4.3.5 Draft Plans of LP Project for Outer Ring Road Development

4.3.2 Mechanism and Issues of Current LP Program in Nepal

In Kathmandu Valley, there are some achievements of LP program. However, current LP projects have been seen as housing projects isolated from urban management hence it is necessary to improve

the current LP program for future urbanization. The mechanism and issues of the current LP program are analyzed in this section.

(1) Legal Basis of LP Program

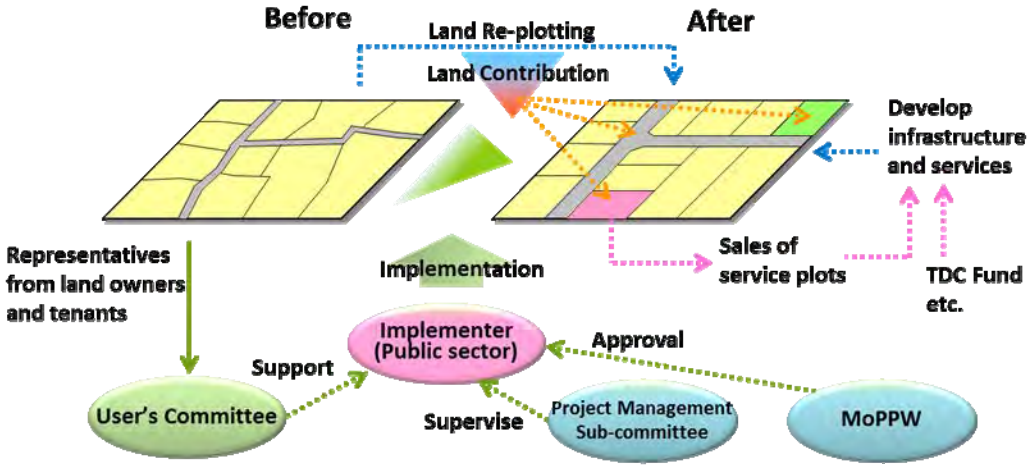
LP program in Nepal is implemented under the legal basis of the article No. 12 of the Town Development Act 1988, Land Act 1964 and the Bylaw 2003. The implementation activities such as site selection, feasibility study, project approval, construction, land re-plotting and monitoring are guided by the LP Manual 2004 which was formulated by DUDBC with the technical assistance of JICA in 2004.

(2) Mechanism of Current LP Program

LP program in Nepal is constructed as an urban development method to develop land, infrastructure and service facilities in vacant plots and agricultural land based on the concept of landowner's participation and self-financing, initiated by the government. The features of the mechanism are as follows;

- Selection of project site through the consultation of local bodies and government considering the feasibility and suitability.
- Development of land, infrastructure and service facilities without building.
- Implementation by public sectors.
- Self-financing by the sale of serviced plots created through land contribution.
- Secure necessary public space by land contribution without land acquisition by the government.

The basic scheme is illustrated in the following Figure 4.3.6. The details of mechanism and implementation process are summarized in Table 4.3.4, Figure 4.3.7 and Figure 4.3.8.



Source: JICA Study Team

Figure 4.3.6 Basic Scheme of LP Program in Nepal

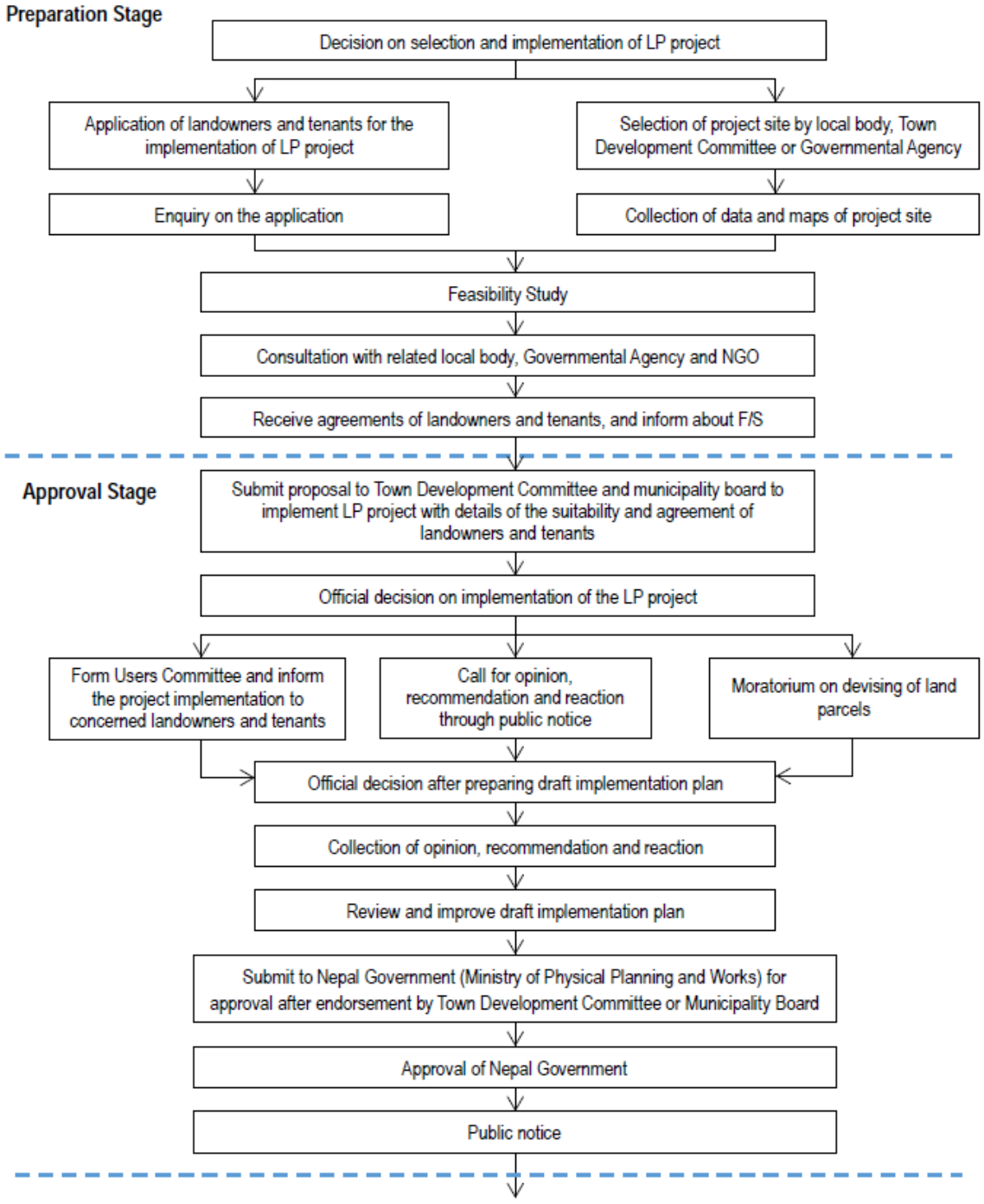
Table 4.3.4 Mechanism of Current LP Program in Nepal

Items	Explanation	Remarks
Objective of LP program	• To improve urban environment with landowner's participation and self-financing	
Scope of LP project	• Development of infrastructure and public services • Land development	Building activities are defined as out of LP project.
Selection of project site	• Selection through the consultation of local bodies and government considering the feasibility and suitability	No coordination with urban plan from a viewpoint of

		urban management
Implementer	• Public sector: KVDA, Municipality, Town Development Committee • Private sector: Not applicable	
Approval and supervision	• Approver: Ministry of Physical Planning and Works (after endorsement by Town Development Committee or Municipality Board) • Supervisor: Project Management Sub-committee organized by stakeholders from Town Development Committee and Municipality	
Agreement of land right holders for project approval	• Agreement of 51 % or more of land owners and tenants in the project site is required under the Town Development Act.	The agreement ratio was revised from 75% by the amendment of the Town Development Act in 2007.
Financing	• Initial development budget is mobilized from the following resources; - Contribution of Nepal government and local government - Investment of agencies related to Nepal government (DOR, Nepal Electricity Agency, Telecommunication Corporation, Water Supply Department, etc.) - Contribution or debt from donors - Debt from financial institutions such as Town Development Committee Fund, commercial banks and provident fund - Proceeds of serviced plots generated through the land contribution from private land in the LP project area. • The principal and interest of the debts have to be paid off after selling off service plots.	Most of the initial development budget for LP projects in Kathmandu Valley were provided from the Town Development Committee Fund. There are only two projects using other financial resources as follows; - Naya Bazar LP project: ADB fund - Chabahil Gopikrishna LP project: debt from National Commercial Bank
Land re-plotting method	• Conversion from land to land • All public land such as road and open spaces are created from the land contribution of private land owners in the project site. • For the project budget, serviced plots can be created from land contribution.	Land re-plotting in Nepal does not include conversion from land to building floor.
Protection of land rights	• Land right holders keep the original land right certificate throughout the project implementation. • Approval of LP map (re-plotting plan) by Project Management Sub-committee secures legal right of the re-plotting • After construction, the project implementer distributes temporary land certificates.	
Technical requirements for land use planning	• Technical standards and recommendation are provided by the LP manual as follows; - Minimum road width: at least 6m width for residential area, and 8m width for administration area, commercial and industrial area - Recommended size of block: 130m to 140m in length and 35m to 40m in width for housing blocks - Minimum open space: 300 m^2 and 12m width for an open space, and allocate 3-6% of project area for open spaces	
Technical requirements for land re-plotting planning	• Technical standards and recommendation are provided by the LP manual as follows; - Minimum area of land parcel: 80m^2 (30m^2 for lowest income community as special case) - Minimum width and depth of land parcel: 6m width and	Minimum area, width, depth and the ratio in each LP project are fixed based on the proposed population density.

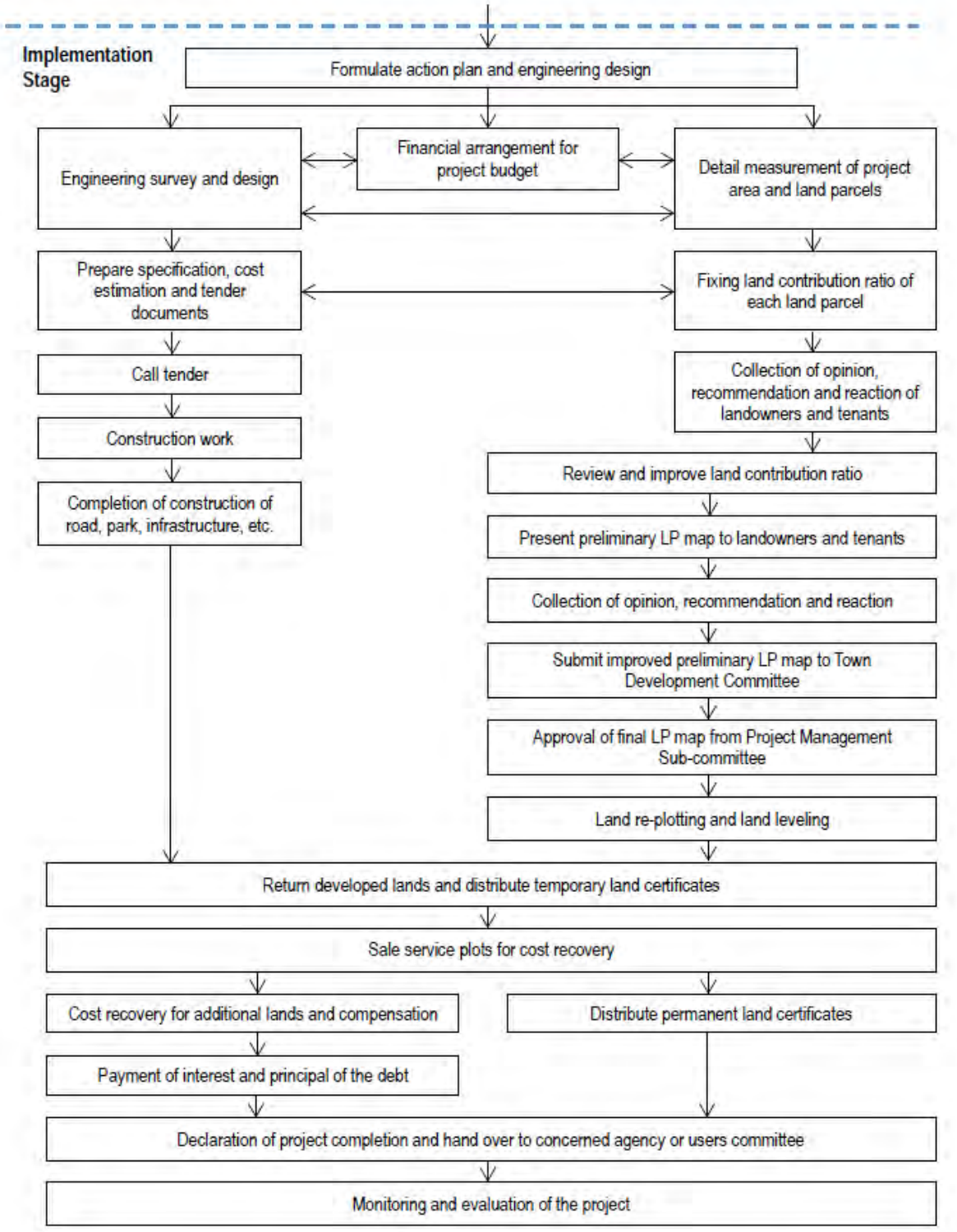
	12m depth - Ratio of width and depth of land parcel: 1:2.5 to 1:3.0 - Land contribution ratios of each land parcel are classified in consideration of the road width, other services and facilities connecting before and after.	

Source: JICA Study Team based on the Town Development Act 1988 and the LP Manual 2004, Nepal



Source: LP Manual 2004, Nepal

Figure 4.3.7 Implementation Process of LP Program (1/2)



Source: LP Manual 2004, Nepal

Figure 4.3.8 Implementation Process of LP Program (2/2)

(3) Issues of Current LP Program for Future Urbanization

Aiming to apply LP program for future urbanization in Kathmandu Valley, the issues of current LP program in Nepal are analyzed hereunder.

1) Absence of Urban Planning

According to the LP Manual, LP project site is selected through the consultation of local bodies and government considering the feasibility and suitability based on the level of consensus among the

land right holders, the urbanization demand, the land condition and physical development plans. However, most of the LP projects in Kathmandu Valley are implemented as a housing project in vacant plots and agricultural land due to the financial feasibility. They are identified as an isolated project from a view point of urban management such as conservation of natural resources, integration with major urban facilities development and control of the urban density. There is no adequate coordination system between LP project and urban planning.

2) Absence of Opportunity for Private Sectors' Implementation

According to the Town Development Act 1988, LP projects can be implemented by public sector such as KVDA, Municipality and Town Development Committee. Although land right holders can join the User's Committee as a member to support the project implementation, there is no stipulation for the private implementer in the Act. The absence of opportunity for private sectors will be an obstacle to further expansion and development of urban areas in view of human powers and finance.

3) Need a Scheme for Major Urban Facility Development

The current LP program focuses on development only for land, infrastructure and service facilities to improve accessibility to basic urban utilities. It has not been much utilized for development of major urban facilities such as arterial roads. Although the creation of public space without land acquisition is the advantage of LP program, current LP program focuses excessively on it and all public spaces are created from the contribution of private land without government investment. In the plan for the Outer Ring Road Development, huge areas for the right of way for the highway are to be created from the land contribution of LP program. However, it will not be easily acceptable to the landowners since they are required to provide the land for the facility which will benefit all citizens in Kathmandu Valley. It is essential to establish a new scheme to combine the LP program with urban facility development.

4) Lack of Effective Use of Land Re-plotting for Large-scale Building

The land re-plotting system implements re-locating and re-shaping of land plots for the individual use. However, it has not been used for combining land parcels for large-scale buildings. All building activities in the project area are implemented by the landowners and tenants out of the scope of the LP project. LP program is not entitled to implement buildings and land right conversion from lands to building floor. To use LP program for large-scale buildings, it is necessary to modify land re-plotting system.

5) Lack of Financial Support and the Resources

At present, there is no subsidy system for LP project. Most of the budget of the LP project basically must be created and recovered from the sale of serviced plots contributed from private land. The increment in the development profit due to increase in the land value belongs to the landowners and tenants in the project site. There is also no collection system of development profit from private landowners. This closed profit sharing will be a hindrance for the spreading of the LP program.

4.4 Issues on Land Use

(1) Land use and urban development issues

1) Necessity of urbanization control

Clear land use plan is required to protect prime agricultural land and natural resources from urbanization. Technical assistance for revision of land use map and building by-laws are required.

2) Necessity of environmental protection measure

Mountain slopes, river banks and agricultural fields should be clearly defined as protection or conservation zone.

3) Need for relocation plan for urban functions

Together with new town development plan, relocation policy and plan to relocate certain urban functions shall be required to ease concentration of traffic and functions in the city center.

4) Need for guideline on land pooling and new town development project

To strengthen the road and transportation network in KV, land pooling system shall be revised. Capacity development is necessary to implement LP smoothly and speedy. Town Development Act 1988 also shall be revised to deal with the issues of new town development.

5) Necessity of population density plan

Population density plan for land use is required to allocate increasing population in KV.

(2) Regulation and institutional issues

1) Necessity of any comprehensive guiding framework

Because of unstable government, Kathmandu Valley does not have a clear comprehensive guiding framework of urban development for all ongoing and proposed future developments. Inadequacy of KVDA Act 1988 has to be resolved.

2) Need strong urban development management in KV

There is no coordination mechanism between MOFALD and MOUD although they share the same urban space. KVDA was established as an upgraded institution from TVTDC. However, there is still unclear demarcation among municipalities and VDCs.

3) Need manpower for building control

The system is not effective for private individuals' buildings.

4) Need capacity building for public officials

Lack of technical expertise and capacity is a serious problem. Continuous training of government staff is required to keep a certain level of expertise to implement projects successfully.

(3) Housing and private sector issues

1) Necessity of appropriate control of realty market

After the change of policy for housing loan, the realty market was cooled down. However, investment from the private sector is a vital engine for economic growth. Appropriate measures are necessary to guide investment in urban development.

2) Need sufficient supply of housing units and planned development

Although population in KV has been rapidly increasing, supply of housing units and planned housing land is not sufficient. Public sector (DUDBC) shall have responsibility for housing for the disadvantaged people.

CHAPTER 5 PRESENT TRAFFIC CONDITION

5.1 Transport Infrastructure Condition

5.1.1 Road and Network

(1) Road Network

The road classification, the length and the jurisdiction of each road classification are summarized in Table 5.1.1. The roads under the jurisdiction of DOR are categorized as the Strategic Road Network (SRN) and other roads are categorized as the Local Road Network (LRN) under jurisdiction of DOLIDAR including DDCs, VDCs and Municipalities.

Table 5.1.1 Road Length in Kathmandu Valley

Jurisdiction	Classification		Kathmandu District	Bhaktapur District	Lalitpur District	Total
DOR	SRN	National Highway	39.85	14.12	18.00	71.97
		Feeder Road (Major)	143.46	70.47	113.39	327.32
		Feeder Road (Minor)	46.68	27.00	0	73.68
		Sub Total	**229.99**	**111.59**	**131.39**	**472.97**
DOLIDAR	LRN	District Road Core Network	209.52	21.15	242.66	473.33
		Village Road	503.72	171.05	218.49	893.26
		Urban Road	97.26	6.10	56.61	159.97
		Sub Total	**810.50**	**198.30**	**517.76**	**1,526.56**
Total			**1,040.49**	**309.89**	**649.15**	**1,999.53**

Source: SSRN 2013/14, DOR, District Transport Master Plan (DTMP), MOFALD, 2013

National Highway (NH): National Highways are main roads which are continuous throughout the country. The roads are the major connections to the capital of Kathmandu from areas outside the valley.

The Tribhuvan Highway or National Highway No.2 (NH02) is the most important highway connecting Kathmandu and the regions in southern Nepal and India. The road is heavily crowded and congested due to the increase in traffic volume to and from Kathmandu as well as the development of new settlements along the road.

The Arniko Highway or National Highway No.3 (NH03) is the main road running east from Kathmandu to the eastern Nepal up to the Tibetan border. The road between Kathmandu and Bhaktapur and the section inside the Ring Road, which are part of the Arniko Highway, were recently widened to four lanes.

The Ring Road identified as National Highway No.16 (NH16), surrounds Kathmandu and Lalitpur cities by approximately 27 km length. It is a vital arterial road with a function of dispersing traffic into the core area of Kathmandu City. The road is currently being widened to six lanes.

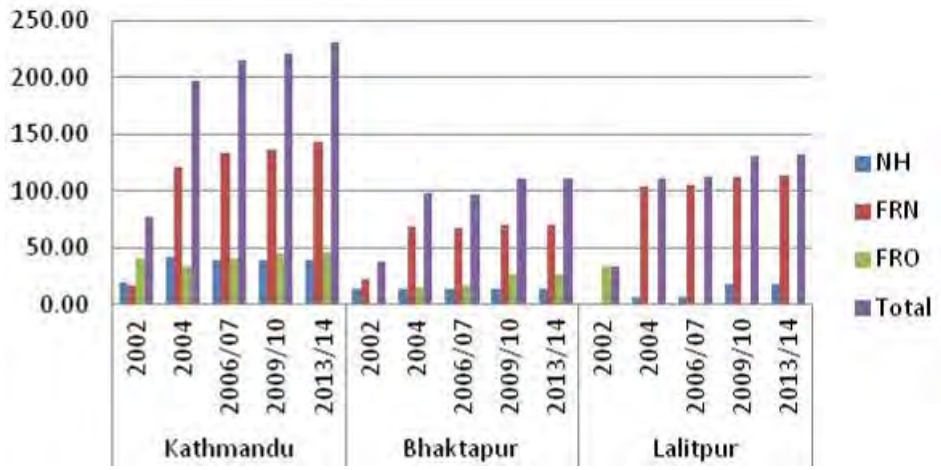
Feeder Roads: The feeder roads are classified into primary (or major) and secondary (or minor). The former generally leads from the national highway to the district headquarters and the latter connects the primary feeder road to the major towns and villages. The feeder road, radiating from the Ring Road, constitutes the vital road network of Kathmandu Valley and plays an important role as the arterial road linking the suburbs and the city center.

Urban Roads: The urban roads are classified into two categories depending on the administration body. Strategic Urban Road (SUR) is under the jurisdiction of DOR. The SUR is the vital city road

constituting primary road network in the city and serves a greater portion of the vehicular traffic passing through the city.

District Road/Village Road: Numerous village roads, agriculture roads and district roads have been constructed in the recent years by local bodies (DDCs, VDCs, Municipalities) under DOLIDAR.

Figure 5.1.1 shows the registered total road length of SRN for past 12 years. It is noted that the registered length was increased much in 2004 and this substantial increment is not found after 2004. The rapid urbanization was started after the political change in 2001. At the same instance, the budget allocation of DOR was increased to construct the road network to back up the urbanization.



Source: JICA Study Team based on SRN and SSRN, DOR (2002-2014)

Figure 5.1.1 Registered Road Length of Strategic Road Network

SOURCE: SSRN, DOR

Figure 5.1.2 SRN Network in Kathmandu Valley

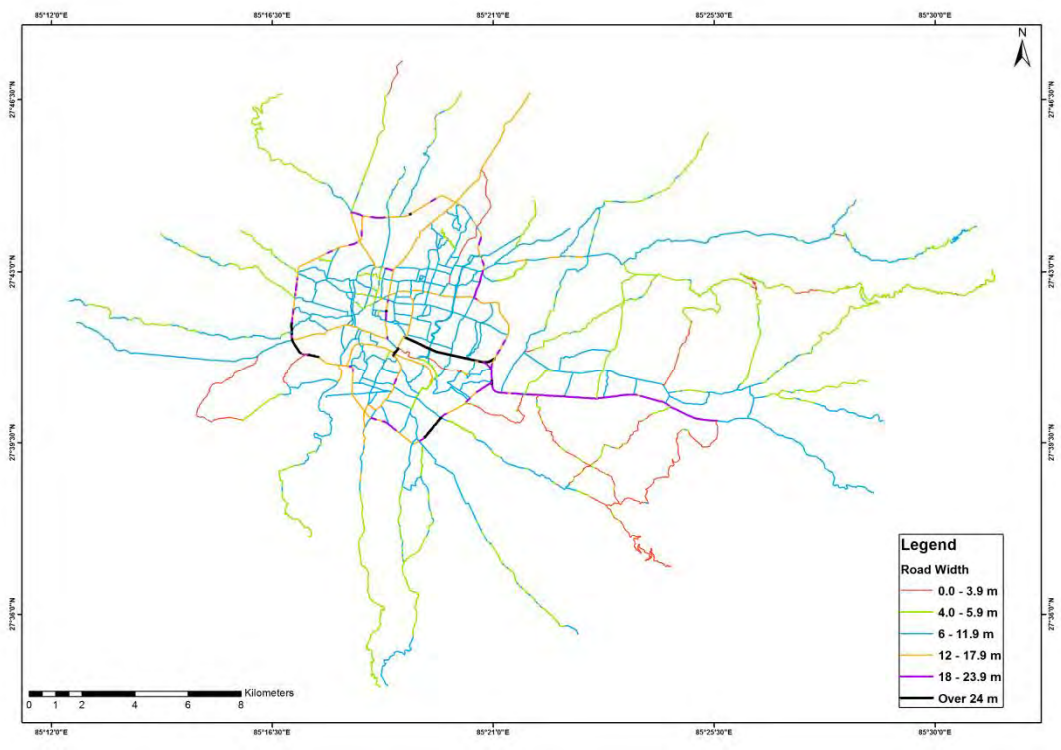
The existing road network and road width are presented in the below figure based on the road inventory survey in 2014 by JST.

The general feature of the existing road network is shown in Table 5.1.2.

Table 5.1.2 General Feature of Road Network in Kathmandu Valley

Road Network	Description
Urban Road Network inside Ring Road	**[National Highways as an East-West Axis]** National Highway No.2 (4-lane with service roads) and No.3 (narrow 4-lane) cross the City as "East-West Axis" of the road network. National Highway No.2 is the widest road in the City which was recently widened. On the other hand, National Highway No.3 is always congested and the improvement work to widen it into 4-lane is on-going by DOR. Further widening to more than 4-lane of these highways will be quite difficult due to built-up premises along the roads. **[Arterial Roads]** Serious traffic jam is observed on the arterial roads in the city due to the inadequate capacity of the road network (number of lanes, road side friction, etc.). Some of the roads were widened recently by DOR and KVDA but further road widening will need massive land acquisition and resettlement budget. Figure 5.1.1 shows the slow-down of the road development representing difficulties in further road widening as mentioned above. The East-West Axis is supported by 2 National Highways which are relatively wider than arterial roads. On the other hand, the North-South Axis of the City consists of 2-lane or narrow 4-lane arterial roads and serious traffic congestion is found on some of the roads along the axis (See LHS of Figure 5.1.4.). **[River Crossings]** The area inside the Ring Road (Kathmandu and Lalitpur) are divided by Bagmati River. Due to lack of the river crossing facility, serious traffic jam is observed on the bridges. (Refer to Figure 5.1.5.)
Ring Roads	**[Ring Road]** Ring Road was constructed in 1970s as an urban boundary but the recent urbanization was already beyond the Ring Road. The Ring Road is going to be widened to 8-lane. **[Inner Ring Road]** The inner Ring Road is proposed by the master plan in 1993 but has not been realized yet. The road is expected to strengthen the road network inside the Ring Road.
Radial Roads outside Ring Road	**[National Highways as an East-West Axis]** National Highway No.2 (4-lane with service roads) and No.3 (narrow 4-lane) cross the City as "East-West Axis" of the road network. Both roads are functioning as the national logistic network connecting with India/China borders. **[Other Radial Arterial Roads]** Radial road network connects between the City center and the suburban area. Most radial roads are 2-lane or narrow 4-lane. Due to recent urbanization outside the Ring Road, traffic congestion is observed on some of the radial roads. (See Figure 5.1.4.).

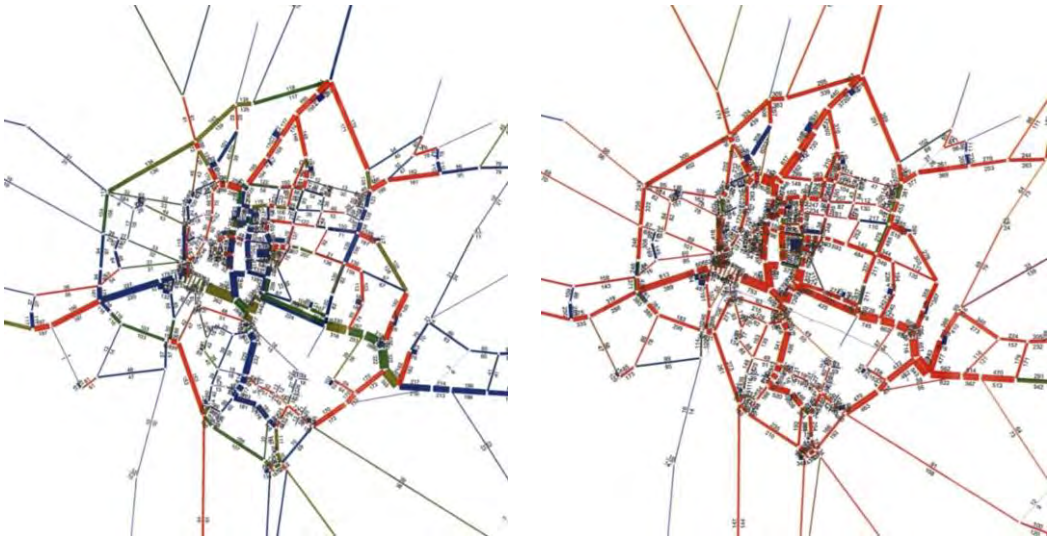
The Data Collection Survey for the MP revealed that numerous roads have been upgraded/widened after 2012.



Source: Road Inventory Survey by JICA Study Team, 2014

Figure 5.1.3 Road Network and Width

The traffic volume capacity ratio under the future traffic demand in 2030 on the existing road network has been preliminarily examined as shown Figure 5.1.4. Most of the arterial roads might be saturated (shown in red) in case of no improvement of the road network.



(V/C on Existing Road Network in 2012) (V/C on Existing Road Network in 2030)

Source: JICA Study Team based on the traffic survey and tentative analysis, 2014

Figure 5.1.4 Vehicle Capacity Ratio on Existing Road Network in 2012/2030

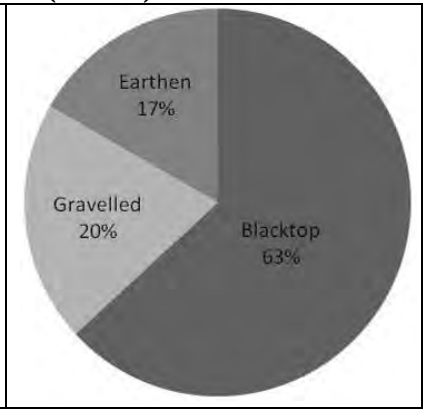
(2) Road Surface Condition

Table 5.1.3 and Table 5.1.4 show the road surface condition under DOR in Kathmandu Valley. The ratio of the blacktop surface (bituminous surface) has been increased by the road improvement works by DOR. However 21% of SRN is still unpaved and the dust and fine silt coming from the graveled and earthen roads are found on the paved roads inducing air pollution to pedestrians and residents.

Table 5.1.3 Road Surface Condition (2009/10)

(Unit: km)

		Blacktop	Gravelled	Earthen
National Highway	Kathmandu	39.85	0	0
	Bhaktapur	14.12	0	0
	Lalitpur	7	11	0
Feeder Road (Major)	Kathmandu	90.61	25.7	19.65
	Bhaktapur	57.88	12.59	0
	Lalitpur	54.37	25.04	33.2
Feeder Road (Minor)	Kathmandu	19.13	8.4	17.55
	Bhaktapur	9.5	10.5	7
	Lalitpur	0	0	0
Total		292.46	93.23	77.4
		62%	20%	16%

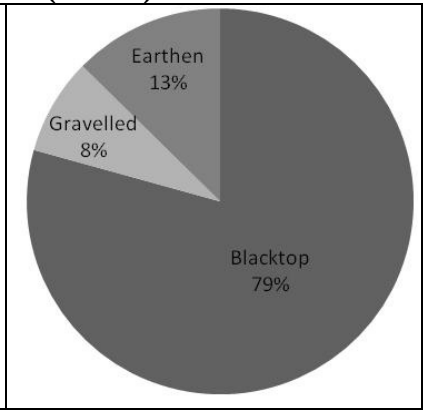


Source: JICA Study Team based on SSRN 2009/10

Table 5.1.4 Road Surface Condition (2013/14)

(Unit: km)

		Blacktop	Gravelled	Earthen
National Highway	Kathmandu	39.85	0	0
	Bhaktapur	14.12	0	0
	Lalitpur	7	11	0
Feeder Road (Major)	Kathmandu	130.51	2	10.95
	Bhaktapur	61.13	9.34	0
	Lalitpur	75.83	4.36	33.2
Feeder Road (Minor)	Kathmandu	37.13	1	8.55
	Bhaktapur	9.5	10.5	7
	Lalitpur	0	0	0
Total		375.07	38.2	59.7
		79%	8%	13%



Source: JICA Study Team based on SSRN 2013/14

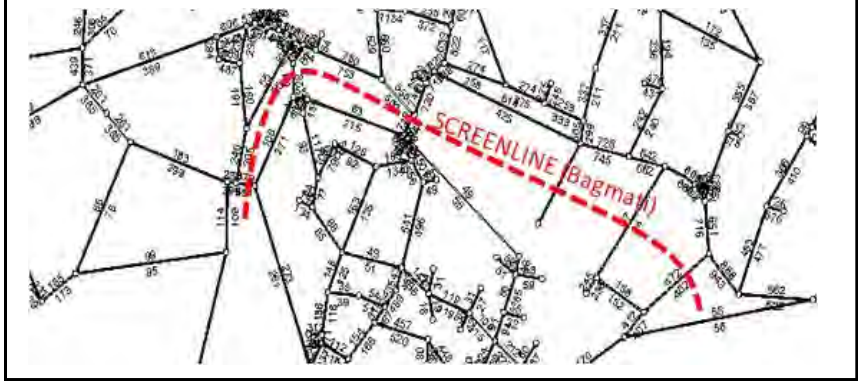
(3) River Crossings in Road Network (Bridges)

In Kathmandu Valley, the bridges are crossing across 5 rivers (Bagmati, Bishnumati, Manohara, Dhobi Khola, Tukucha) and minor water channels.

Generally, the river crossing points become bottleneck points for traffic flow and serious traffic congestion is constantly observed at the bridge sections in the valley too due to lack of the vehicle volume capacity of the bridge sections.

Figure 5.1.5 presents the preliminary analysis to estimate the required number of bridges along Bagmati River. At least 4 more bridges (each 4-lane) might be required for the future traffic demand in 2030.

Traffic Volume (pcu/day) (A)	Target Num. of Lanes (B)=(A)/11,050	Current Num. of Lanes (C)	Required Additional Num. of Lanes =(B)-(C)
356,300	32	16	16 = 4 Bridges (each 4 lanes)



Source: JICA Study Team based on the traffic survey and analysis, 2014

Figure 5.1.5 Required Number of Bridges along Bagmati River

The data on bridges under SRN has been compiled from the recently completed Bridge Management Infrastructure System (BMIS) as listed in Table 5.1.5.

Table 5.1.5 Registered Bridges of Strategic Road Network

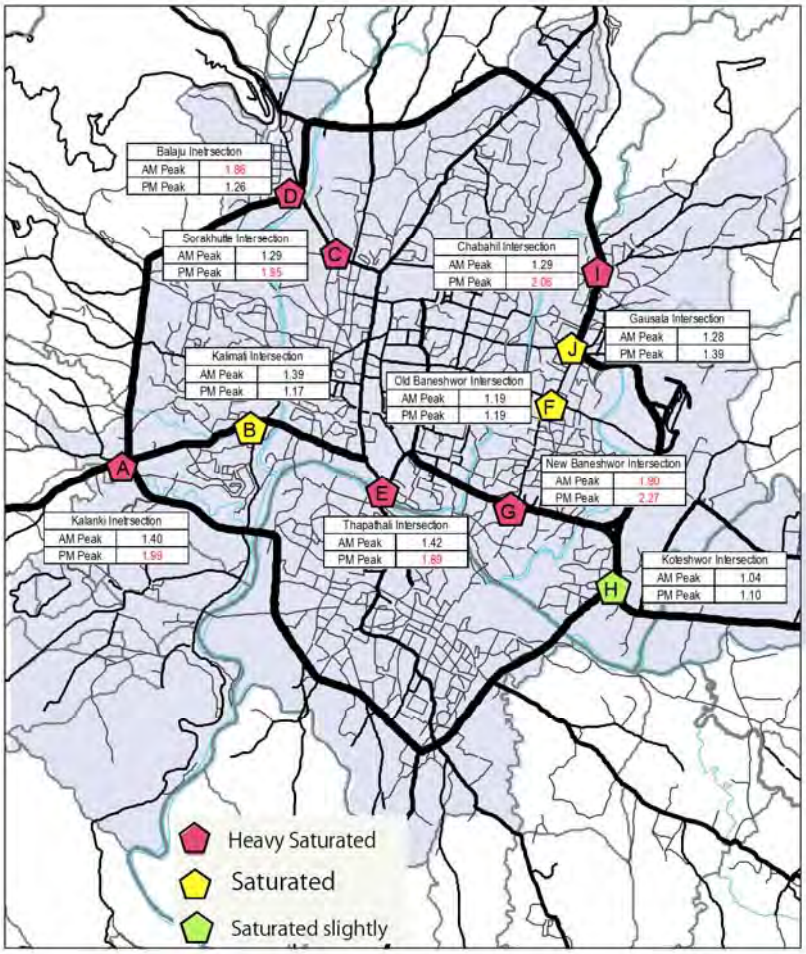
Kathmandu	Road ID	H002	H003	H016	F0211	F0225	F0226	F0227	F0276	F0278	F0280	F0281	F0282	F0283	F0286	F0288	F0289	F0295	F0296	F1003	F1004	F1005	Total
	Num. of Bridges	5	4	9	1	1	4	2	1	2	1	1	3	2	1	1	1	1	1	2	1	1	45
Bhaktapur	Road ID	F0900	F0901	F0907	F0908	F0909	F1000																
	Num. of Bridges	1	1	1	1	1	1																6
Lalitpur	Road ID	F0233	F0234	F0272	F0900	F1003																	
	Num. of Bridges	1	2	2	1	1																	7

Source: JICA Study Team based on SSRN 2013/14

(4) Nodal Points of Road Network (Intersections)

In 2012, the intersection traffic count survey was carried out to obtain traffic volume and vehicle type data of directional traffic flow at ten selected at-grade intersections.

All of the degrees of saturation were more than 0.9, which is the desirable maximum requirement factor of traffic control at intersection. Especially, the degrees of saturation at Chabahil, New Baneshwor, Thapathali, Balaju, Kalanki, and Sorakhutte intersections were more than 1.80. Most of the intersections are still manually operated by traffic police officers and the signalized system installed by JICA was non-functional.



Source: Data Collection Survey, JICA, 2012

Figure 5.1.6 Degree of Saturation at Major Intersections

(5) Non-Motorized Transport

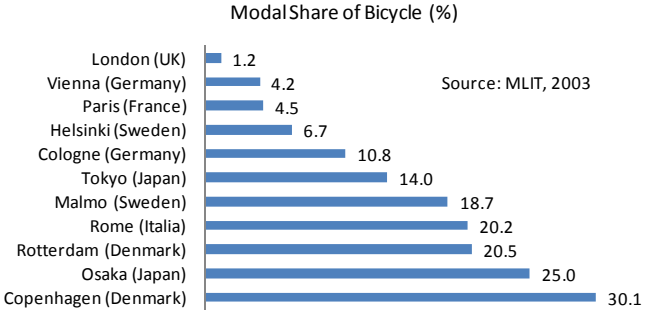
Non-motorized transport (NMT) is generally classified into 2 categories, that is, pedestrian and bicycle. The sidewalk has been built for pedestrians on most of the major arterial roads in the city but the width of the sidewalk is not adequately provided (2.5m is recommended in the geometric design standard in Nepal) due to the first priority given to vehicle lanes within the limited ROW. In addition, the required minimum width of outer shoulders is often not provided even on the major arterial roads. The designated bicycle lanes are not found in the city. These issues are inducing traffic accidents to pedestrians and cyclists. The modal ratio of bicycle in some developed countries is relatively high based on the development of public transport network and proper road facilities for bicycles.

The proposed new roads by the comprehensive master plan shall consider to provide proper width of the sidewalk and outer shoulders to accommodate the bicycle traffic in parallel with the development of public transport.

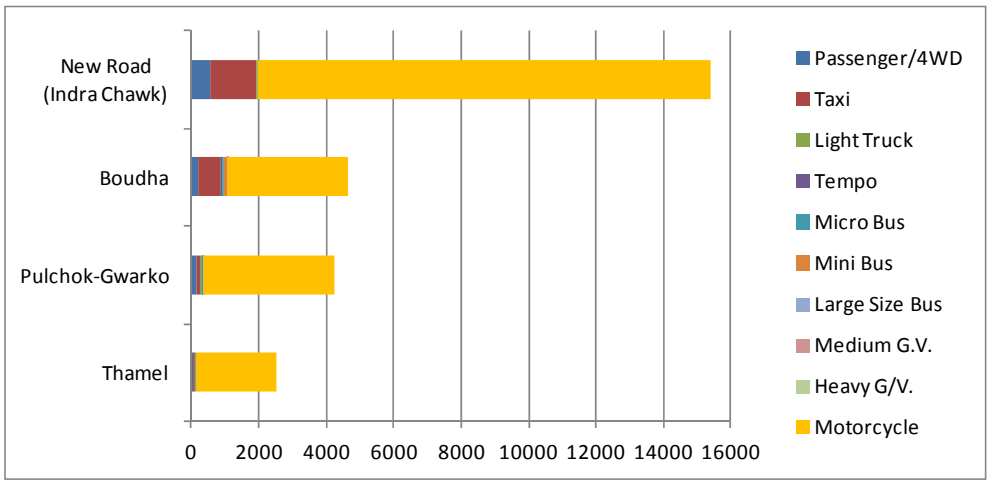
(6) Parking

The road side parking survey inside the Ring Road area was conducted in September 2014.

The majority of the parking vehicles were motorcycles at the surveyed roads inside the Ring Road. Major parking sections were near commercial areas such as banks

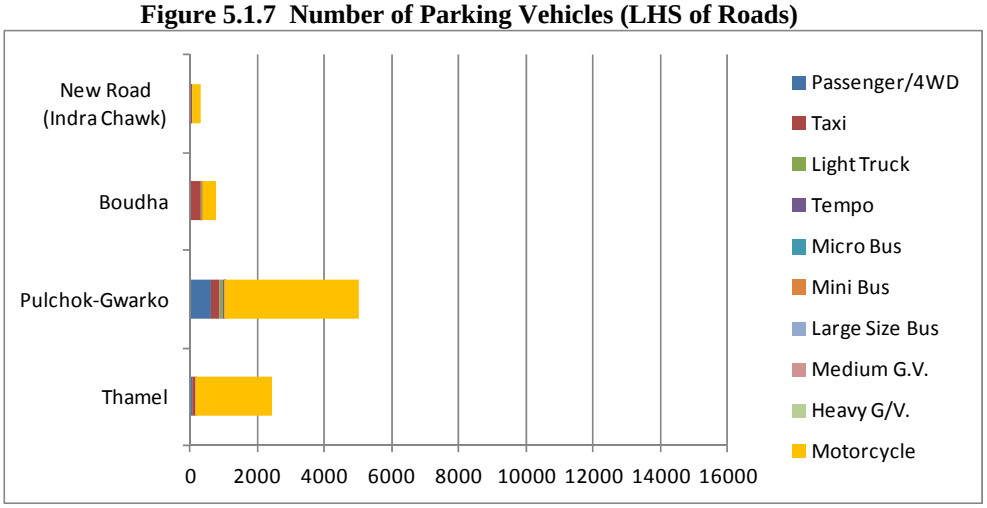


and the entrance of shopping markets (i.e. Indra Chawk, etc). In the area of the market, it is difficult to access by vehicles due to very narrow roads crowded by pedestrians.



Source: Parking Survey by JICA Study Team, 2014

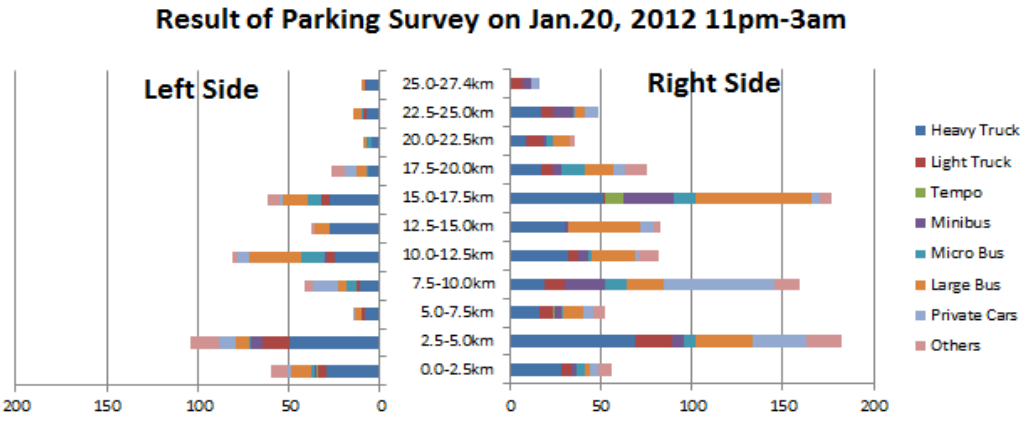
Figure 5.1.7 Number of Parking Vehicles (LHS of Roads)



Source: Parking Survey by JICA Study Team, 2014

Figure 5.1.8 Number of Parking Vehicles (RHS of Roads)

On the other hand, the survey results in 2012 indicated 35% to 40% of the parked vehicles along the Ring Road at night were heavy trucks. Major parking sections were near the major intersections connecting with the radial national highways and feeder roads such as Kalanki, Balaju and Satdobato.



Source: Data Collection Survey, JICA, 2012

Figure 5.1.9 Number of Parking Vehicles (RHS & LHS of Roads)

5.1.2 Public Transport and Network

In the Kathmandu valley, people's travel modes are walk, bicycle, motorcycle, tempo, microbus, minibus, medium bus, large bus, car, taxi, light truck and heavy truck for movement within the Valley. In addition, the Tribhuvan international airport located close to a highly populated area plays a great role in both the global access and domestic long distance mobility. Nevertheless, railways including LRT, AGT and Monorail, and BRT have not been introduced yet. Therefore, the urban transport system in the Kathmandu Valley depends greatly on road related infrastructure such as road network, car parking and bus terminal. As a mass public transport, bus transport is the only mode for short, middle and long distance movements. There are no designated lanes, exclusive lanes or priority lanes at all. Consequently, the bus transport is highly affected by the general traffic condition.

(1) Bus Network

Bus network is categorized mainly by distance into three:

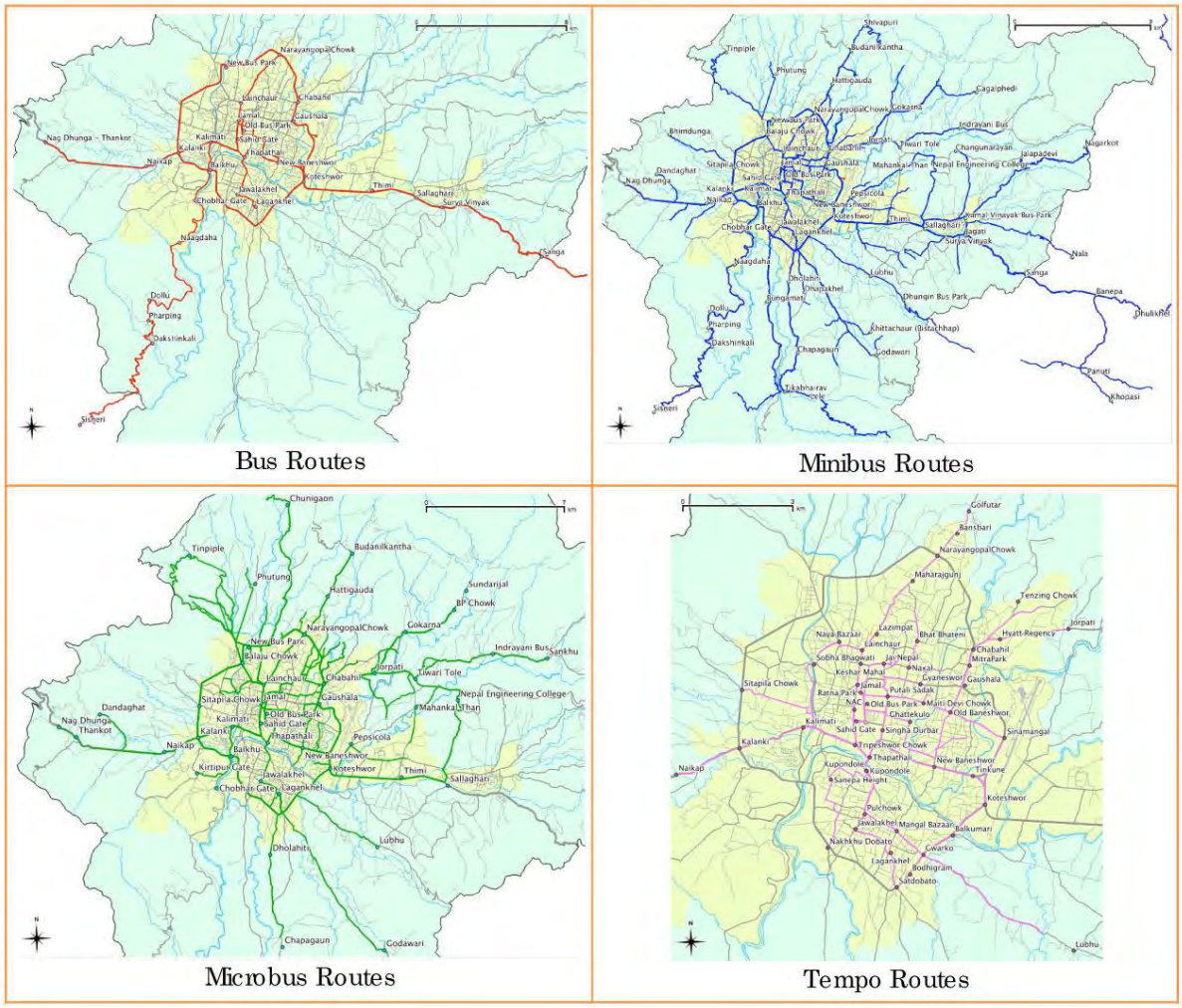
- City bus service: Operating in the area generally within the Ring Road, and providing short distance service, for the trip of 5-10km.
- Commuter bus service: Operating for commuters between the area within the Ring Road and suburbs, for the trip of 10 -30 km.
- Long distance bus service: Connecting Kathmandu Valley and other regions for inter-regional movement of residents, workers and tourists, for trips over 30km.

The above categorization is dealt with by the following four kinds of buses:

- Tempo: Tempo has about 20 routes and provides short distance services generally within the Ring Road, with a capacity of 10-15 passengers.
- Microbus: Microbus has about 70 routes and provides middle distance services, generally between the city center and outside the Ring Road, with a capacity of 15-20 passengers.
- Minibus: Minibus has about 90 routes and provides similar services as Microbus, with a capacity of 20-35
- Bus including medium and large sized bus: Bus has about 10 routes and provides middle and long distance services with a capacity of 35 more passengers

The above information is based on 'Data Collection Survey on Traffic Improvement in Kathmandu Valley, 2012, JICA' and 'Public Transport Restructuring, KSUTP, ADB, Feb, 2014'. Moreover, all the other Buses except Tempo are operated by a driver and a conductor. A conductor guides the passengers to the next bus stop and collects the bus fare. Tempo is operated by only the driver. The routes operated by each mode is shown in Figure 5.1.10.

Most of the bus transport services are provided by a great number of small private operators and small sized old buses like tempo, micro-bus and mini-bus. Large buses are being operated on limited few routes. The ratio of large buses to the number of bus routes is 1% and that of operation is 3%. Presently, the main public transport is tempo, microbus and minibus. This situation has been caused by several factors such as lack of wider roads suitable for large bus operation, lack of relatively bigger operators and easy entry of small sized companies.



Source:Public Transport Restructuring, KSUTP, ADB, Feb2014

Figure 5.1.10 The Routes operated by Bus, Minibus, Microbus and Tempo

70～80persons : Large Bus

35～50persons : Medium Bus

20～35 persons: Mini Bus

15～20persons:Micro Bus

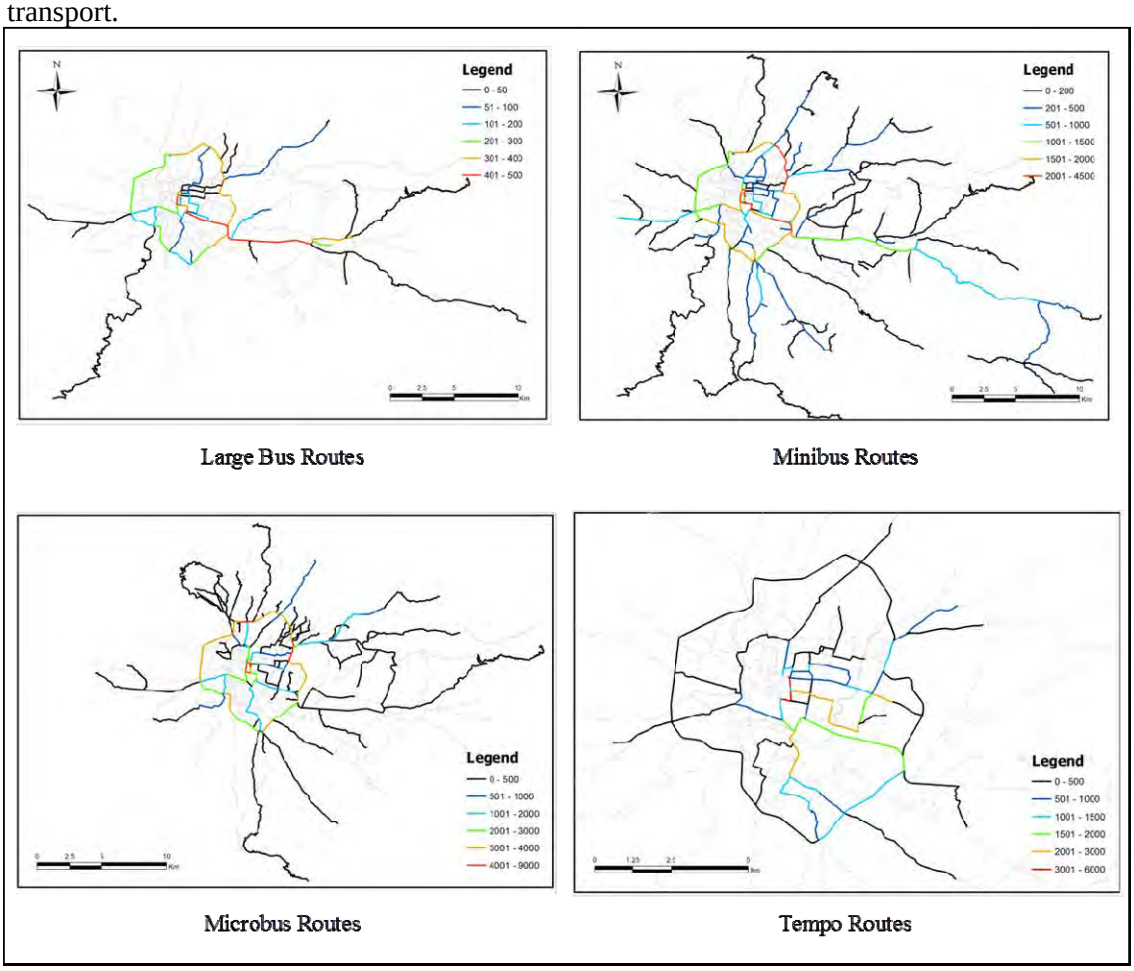
10～15persons:Tempo

Source: JICA Study Team

Figure 5.1.11 Type of Bus

(2) Bus Routes and Operation

Based on the survey conducted in 2011 by JICA Study Team, the number of bus routes was 220, the number of buses was 5,305 and the number of operations was 32,835 within the Kathmandu Valley. The location of bus routes is shown in Figure 5.1.12. Minibus and microbus are operated as the major bus transport.



Source: Data Collection Survey, JICA, 2012
Note: Here, operation means the departure frequency. If including the return of the frequency, it will be double.

Figure 5.1.12 Bus Operation by Bus Type

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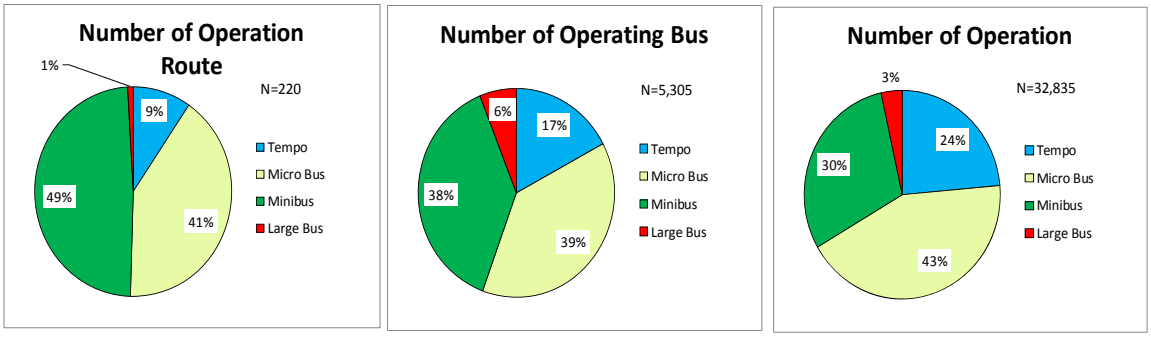


Source: Data Collection Survey, JICA, 2012

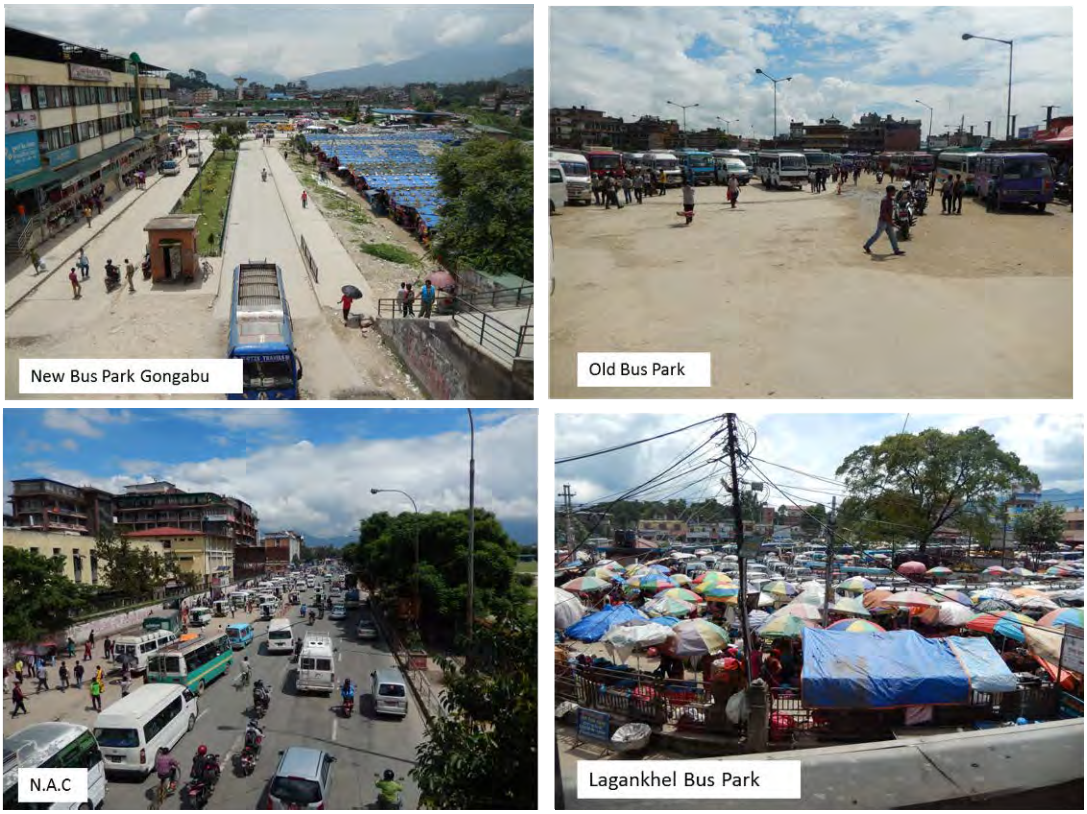
Figure 5.1.13 Number of Bus Operation Route, Operating Bus and Bus Operation

(3) Bus Terminal

Bus terminal can be divided into two types: one is `off-road-type', the other is `roadside -type'. There are 3 off-road-type bus terminals called Bus Park within the Ring Road. Roadside-type bus terminals which are relatively larger than others are N.A.C, Ratnapark, Koteswo and Kalanki. In addition to those bus terminals, there are increasingly roadside-type small bus terminals dispersed along and within the Ring Road. Most of the bus terminals are very crowded. In particular, the roadside-bus terminals and the many bus stops around intersections can be seen as one of main causes for traffic jam and accidents.

Source: JICA Study Team

Figure 5.1.14 Location of Bus Terminals



Source: JICA Study Team

Figure 5.1.15 Main Bus Terminals

Source: JICA Study Team

Figure 5.1.16 Roadside Bus Terminals on the Ring Road

The number of operations originating from bus terminals is shown in Table 5.1.6. The total number of operations starting from Kathmandu city center was 12,862. It can be estimated that approximately 300,000 passengers are getting on or off in the Kathmandu city center. Especially, Ratnapark and NAC, which are roadside-type bus terminals, play a great role in dealing with bus operation in the urban area.

Table 5.1.6 Bus Operations from Main Bus Terminals

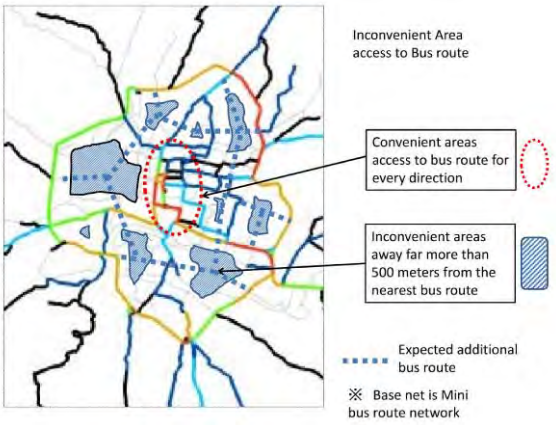
	Large Bus	Minibus	Micro Bus	Tempo	Total
Old Bus Park	110	1,115	1,086	0	2,311
Ratnapark	45	288	3,438	1,025	4,796
NAC	0	367	2,042	2,444	4,853
Sahidget	0	69	833	0	902
Kathmandu City Center (above total)	155	1,839	7,399	3,469	12,862
Lagankhel	80	1,324	2,584	1,200	5,144
Gongabun Bus Park	169	605	230	0	1,004

Source: Data Collection Survey, JICA, 2012

(4) Bus Route Accessibility and Bus Stop

The density of bus network in the urban area is low due to the insufficient road network. As shown in Figure 5.1.17, more than 15% of the area within the Ring Road is not covered by bus service. The distance to the nearest bus and minibus route is far more than 500 meters in the area although microbus and tempo services are available in some part of western area.

Bus stops are placed at intervals of approximately less than 500m. There are many bus stops on the trunk roads with a roof and a bar that people can sit on. The typical bus stops are shown in Figure 5.1.18.



Source: JICA Study Team

Figure 5.1.17 Inconvenient Area Access to Bus

Source: JICA Study Team

Figure 5.1.18 Typical Bus Stop

(5) Bus fare

Bus fare on the fixed route is regulated by DOTM. The fare is same for all types of bus, tempo, microbus, minibus and large bus. Taxi fare is approximately ten times the bus fare.

Table 5.1.7 Bus Fare, Taxi Fare and Petrol Cost and Motorcycle / Car Price

Bus fares	1. The present fare was set up by area and distance. For example: NPR 16 for 5 km within the Ring Road 2. This price regulation is well operated in practice.	3. The fare table has been applied since May 06, 2014 by the Government of Nepal. New fare was decreased by 1.0% from the old fare.
Taxi fares	4. The minimum fare is NPR 51 within a distance of 1 km and an additional fare for distance beyond 1km is added at NPR 7.40 per 200 m. For example: NPR 199 for 5 km 5. This price regulation is not operated in practice. Actually, taxi price is decided by the negotiation between customer and driver	
Petrol cost	Petrol: NPR 111.5/L	6. Petrol price was set at the price in Kathmandu City in February 2015
Motorcycle Price	-Price: 170,000 NPR for a widespread type of new vehicle e.g. Honda -Price includes custom duty of 85%, registration and so on of 15%	
Car Price	-Price: 2,450,000 NPR for a widespread type of new vehicle e.g. Honda -Price includes custom duty of 230%, registration and so on of 15%	

Source: JICA Study Team based on the information from several Car Dealers, and Website of DOTM, Nepal, Dec 24, 2014

(6) Bus Operators

There are a great number of bus operators, most of which are single bus operators. The number of bus operators is said to be more than 2,000. Most bus operators belong to the Federation of Nepal National Transport Entrepreneurs (FNNTE).

Almost all operators are private companies except Sajha Yatayat. Sajha Yatayat is the semi-governmental organization for which Nepal government owns a 70% share. Sajha Yatayat is now operating two routes, North-South and East-West as shown in Table 5.1.8 16 large buses depart from 6:30am to 9:00pm every day.

Table 5.1.8 General Information about Sajha Yatayat

Established	In 1961
Capital	20 million NPR
	Nepal Gov. has 70% equity
Bus	16 Large Buses
	-51-54 seats -capacity 70-80 with standing
Drivers	30 (Conductors 30)
workers	85
Two routes Began since April 2014	North-South: 13km
	East-West :10km
	Expected speed: 15km/hour
	Operating every 15-20minites
	Operating hours : 6:30 – 21:00
	-Fare 15- 20 NPR per trip -Discount 45% for students and over 60-year old -Free for children
	Roughly, 10,000 passengers per day

Bus Route

Source: the result of interview to Sajah Yatayat by JICA Study Team, Jan 2015.

5.2 Traffic Movement

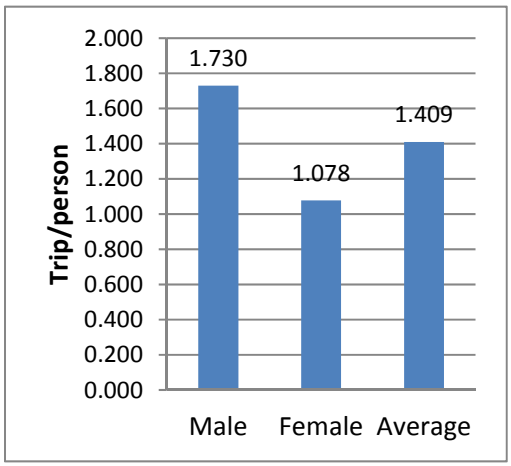
5.2.1 Person's Movement

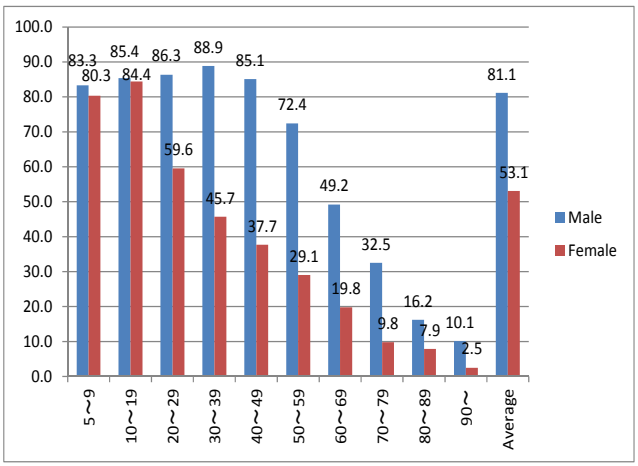
As far as data on a person's movement in the Kathmandu Valley is concerned, the result of the home interview survey conducted in "Data Collection Survey on Traffic Improvement in Kathmandu Valley, 2012, JICA" is referred to in this chapter as a valuable and overall information source. In addition, past similar data is referred to from "The Study on Kathmandu Valley Urban Road Development, 1993, JICA".

5.2.1.1 Trip Generation

(1) Trip Production Rate

The total number of trips made by residents in the study area was counted to be 3,483,393 trips. Trip production rate is the average number of trips made by one person in one day. The average trip production rate in the study area was 1.409. The trip production rate of males was higher than females because the female's ratio of going out was much lower than the male's ratio, especially the generation over 20 years old.





Source: Data Collection Survey, JICA, 2012

Figure 5.2.1 Trip Production Rate by Sex

Figure 5.2.2 Ratio of Going Out by Age and Sex

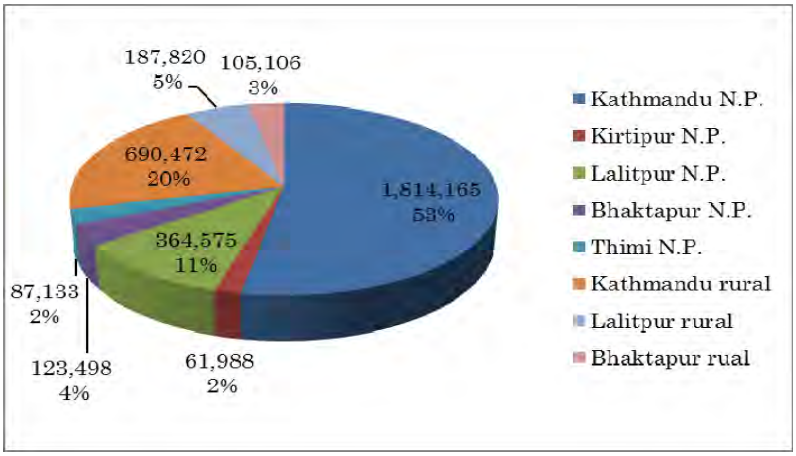
Table 5.2.1 shows the population composition by occupation obtained from the interview of household members and corresponding to trip production rates. Workers including employers and employees occupied only 33% of the total population. On the other hand, hhousekeepers and uunemployed, who have a tendency of lower trip production rate, occupied 35.7%. As a result, the average trip production rate was in the relatively lower level.

Table 5.2.1 Composition of Population by Occupation and Trip Production Rate

	Employer	Employee	Student	Housekeeper	Unemployed	Total
Population by Occupation	275,540	532,670	763,390	376,670	495,880	2,444,150
Percentage (%)	11.3	21.8	31.2	15.4	20.3	100.0
Trip Production Rate	1.788	1.812	1.736	0.475	0.935	1.409

Source: Data Collection Survey, JICA, 2012

Figure 5.2.3 shows the composition of trip generation by zone. Kathmandu N.P. occupied 53% of trip generation.

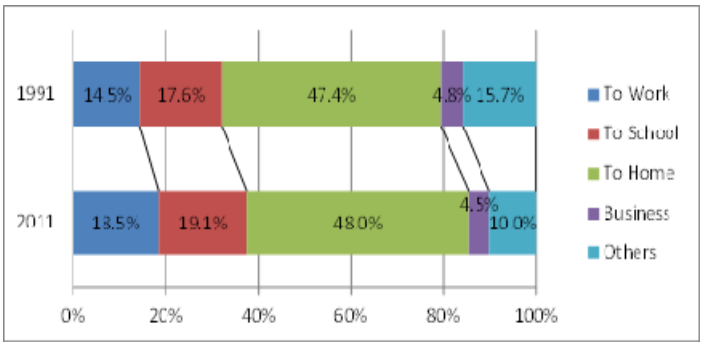


Source: Data Collection Survey ,JICA, 2012

Figure 5.2.3 Composition of Trip Generation by Large Zone

(2) Trip Purpose

Comparison in the composition of trip purpose between 1991 and 2011 showed that the proportion of “Others” decreased while “To Work” and "To School” increased.



Source: Data Collection Survey, JICA, 2012

Figure 5.2.4 Comparison of Trip Purposes between 1991 and 2011

Table 5.2.2 Trip Composition by Purpose

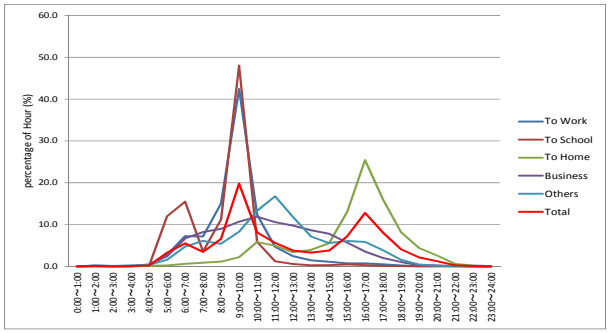
Trip Purpose	Number of Trips	Percentage (%)	Small Purpose Category	Number of Trips	Percentage (%)
To Work	634,461	18.5			
To School	657,030	19.1			
To Home	1,649,236	48.0			
Business	153,469	4.5			
Others	344,197	10.0	Shopping	136,533	4.0
			Dining	14,068	0.4
			Leisure/Recreation	62,419	1.8
			Medical, Treatment	30,606	0.9
			Others	100,761	2.0
Total	3,438,393	100.0	Others Total	344,197	10.0

Source: Data Collection Survey, JICA, 2012

(3) Hourly Trip Generation

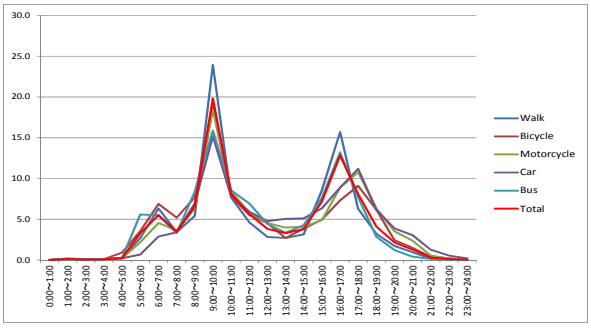
Figure 5.2.5 shows the hourly variation of trip generation by purpose. The peak rate of trip generation for all purposes was 20% which occurred from 9:00 to 10:00. The second highest was 13% from 16:00 to17:00. The major trip purposes in peak hour were going to work and to school at peak rates of 42% and 48%, respectively.

Figure 5.2.6 shows the hourly variation of trip generation by mode. The peak rate of Bus trip was 15% from 9:00 to 10:00 same as Car.



Source: Data Collection Survey, JICA, 2012

Figure 5.2.5 Hourly Trip Generation by Purpose

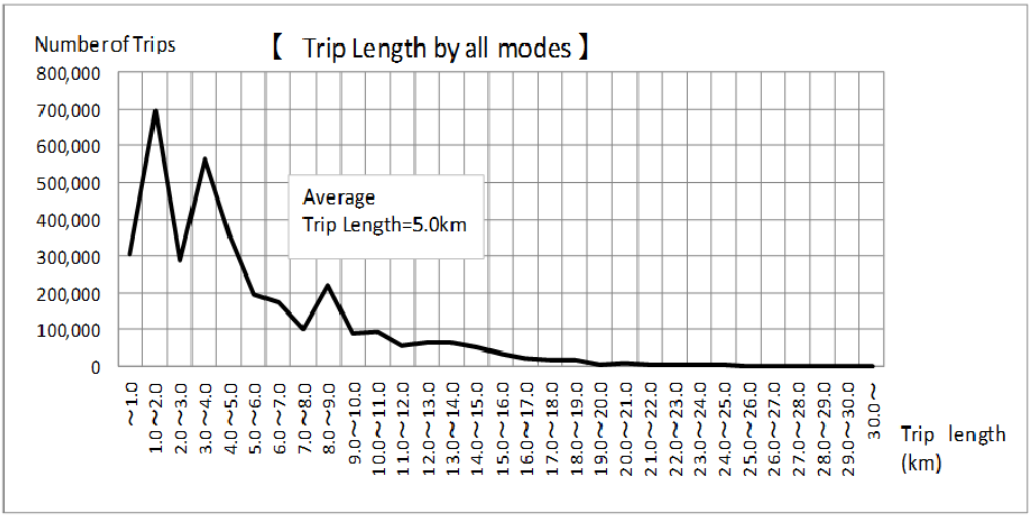


Source: Data Collection Survey, JICA, 2012

Figure 5.2.6 Hourly Trip Variation by Mode

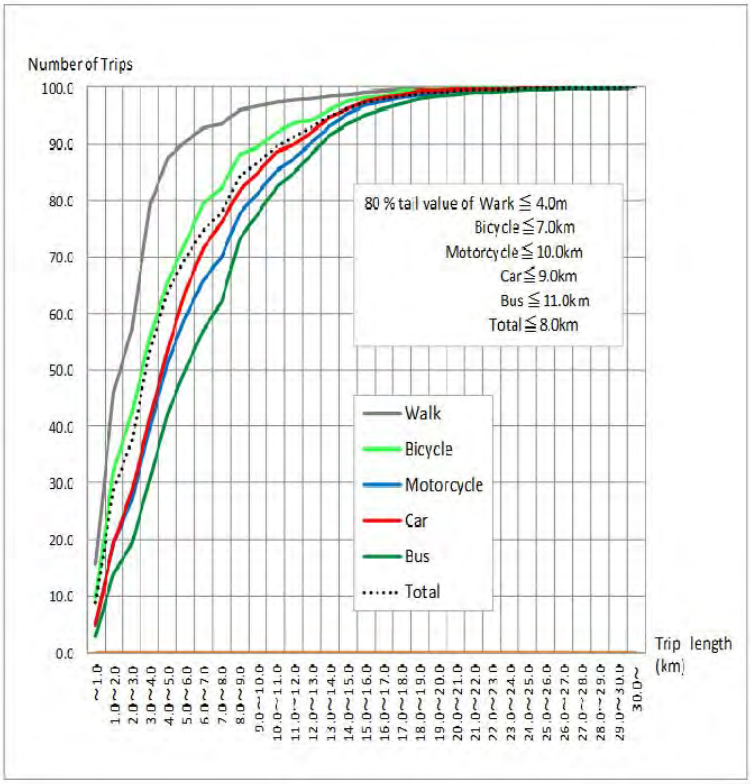
(4) Trip Length

Trip length of all modes is distributed with three peaks such as 1.0-2.0km, 3.0-4.0km and 8.0-9.0km as shown in Figure 5.2.7. Bus trip is longer than other modes in that the average length of bus trips is 6.9km whereas the average length of all modes is 5.0km.



Source: Data Collection Survey, JICA, 2012

Figure 5.2.7 Distribution of Trip Length (All Modes)



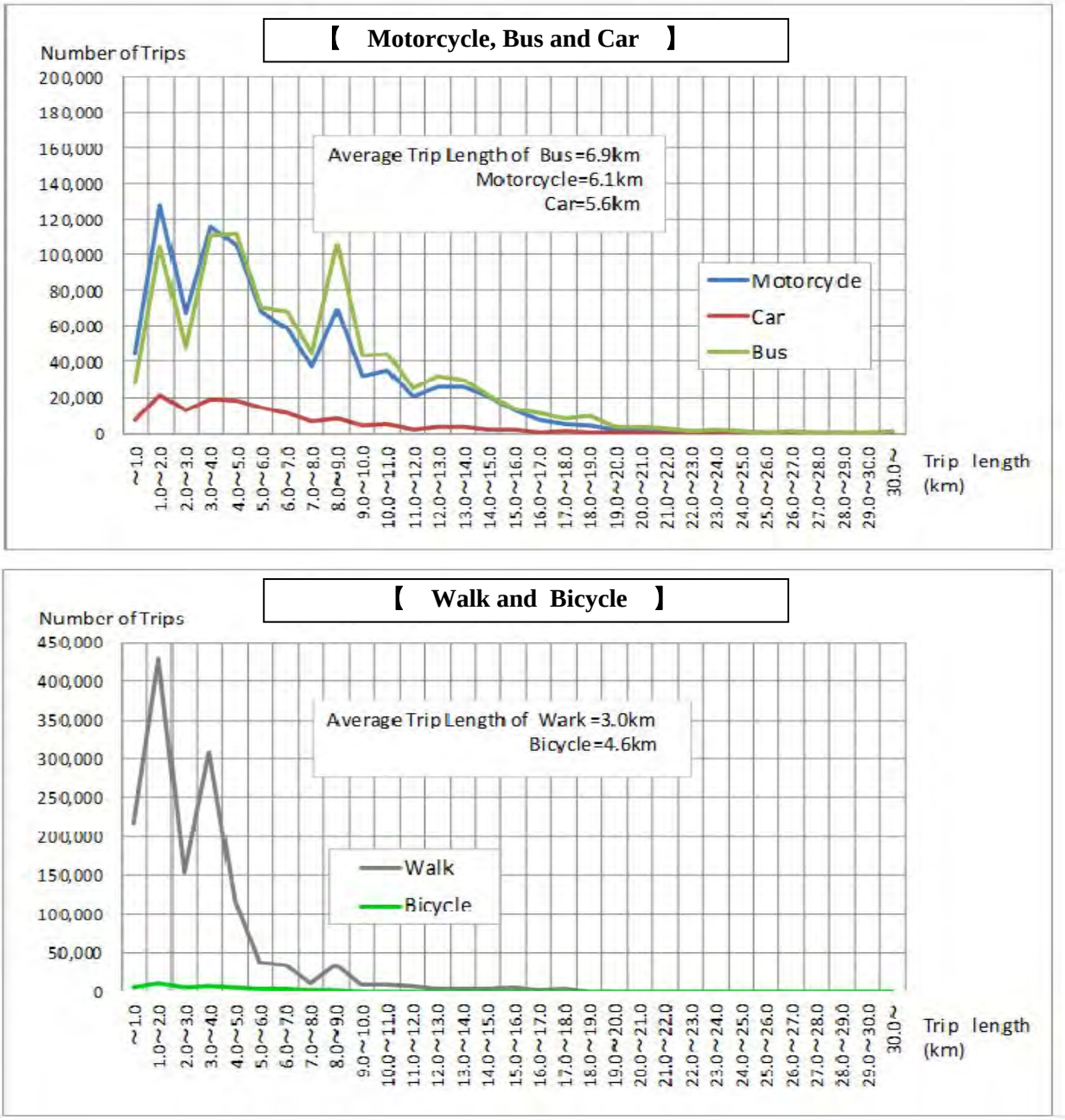
Average Trip length
- Walk =3.0km
- Bicycle =4.6km
- Motorcycle =6.1km
- Car =5.6km
- Bus =6.9km
- Total =5.0km

Source: Data Collection Survey, JICA, 2012

Figure 5.2.8 Accumulated Distribution of Trip Length by Mode

Figure 5.2.9 shows the distribution of trip length by each mode. Several characteristics are as follows:

- Distribution pattern of bus trip length is quite similar to motorcycle in that there are three peaks i.e. 1.0-2.0km, 3.0-5.0km and 8.0-9.0km.
- Car trip has two peaks i.e. 1.0-2.0km and 3.0-5.0km.
- Bicycle trip does not have a particular peak and range from short trip to long trip.
- Walk trip has two peaks i.e. 1.0-2.0km and 3.0-4.0km.



Source: Data Collection Survey, JICA, 2012

Figure 5.2.9 Distribution of Trip Length by Mode

(5) Average of number of Passengers

Average number of passengers by type of vehicle is estimated based on the data obtained from several kinds of traffic survey as shown in the following table. The average number of passengers for each type of bus can be seen to be nearly as same as 60% -70% of capacity.

Table 5.2.3 Average of number of Passengers by type of vehicle

Average Number of Passengers for Motorcycle, Car, Taxi and Truck — unit: person/vehicle

Motorcycle	Car	Taxi	Light Truck	Heavy Truck
1.1	1.9	2.0	1.8	1.9

Source: Results of Roadside Interview Survey by JICA Study Team in 2011

Average Number of Passengers for Bus — unit: person/vehicle

Tempo *1	Microbus *2	Minibus *2	Large Bus *2	Total *3
7.8	13.5	18.5	33.5	14.4

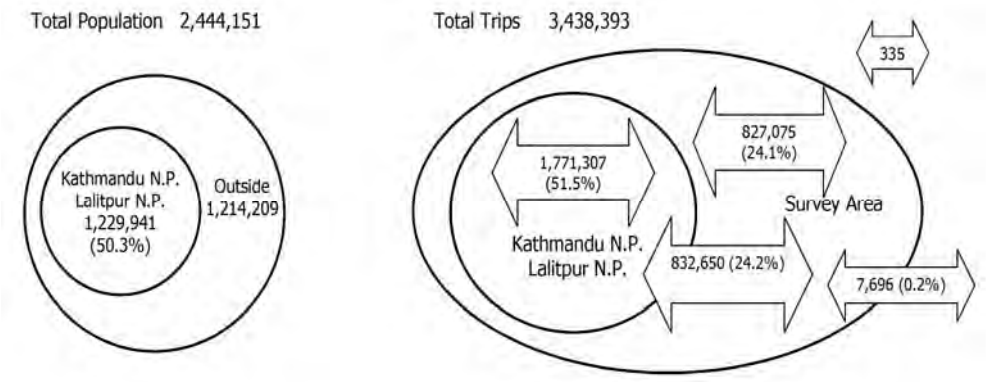
Source: Results of Roadside Interview Survey and Home Interviw Survey by JICA Study Team in 2011

*1: Based on the Result of Roadside Interview Survey
*2: Eatimated by JICA Study Team based on the results of related survey and capacity of each bus type
*3: Calculated by total bus trips(948,464)/total bus operation number(32,835×2)

5.2.1.2 Trip Distribution

(1) Trip Distribution in Kathmandu Valley

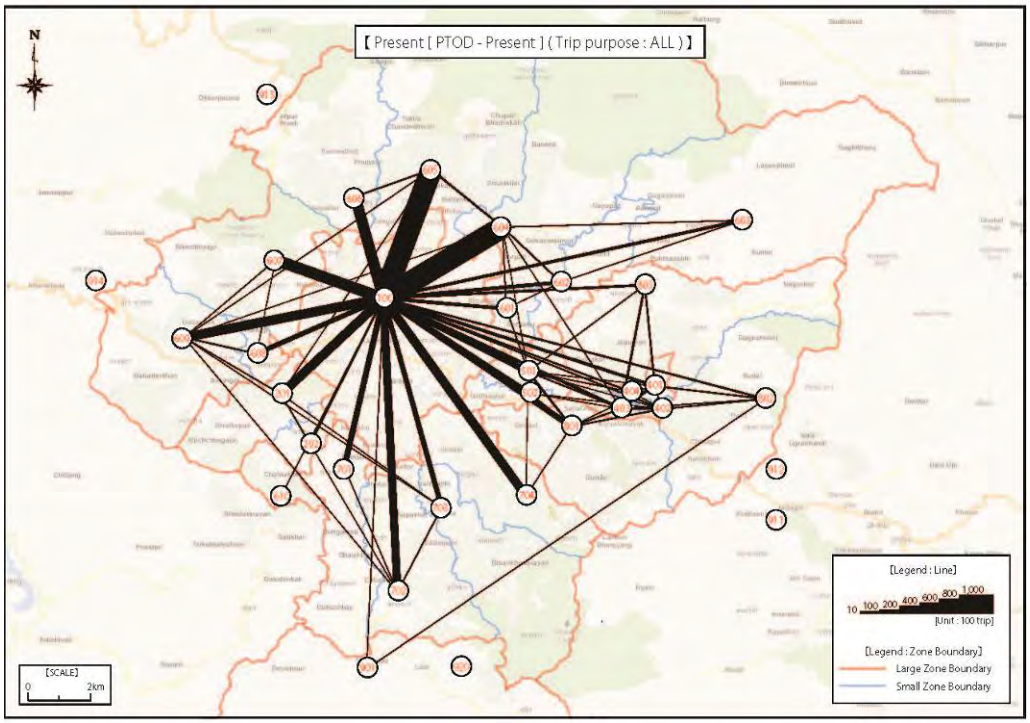
Figure 5.2.10 shows the trip distribution for all purposes. Concentration of trips to Kathmandu N.P. and Lalitpur N.P. is evident and movement within both municipalities was the largest.



Source: Data Collection Survey, JICA, 2012

Figure 5.2.10 General Person Trip Movement in the Study Area

Figure 5.2.11 shows the desire line of all purposes which illustrates persons' movement between zones by the width of lines. The trip concentration from suburbs into the central area consisting of Kathmandu N.P. and Lalitpur N.P. was remarkable. This is caused by the urban functional concentration within the Ring Road.

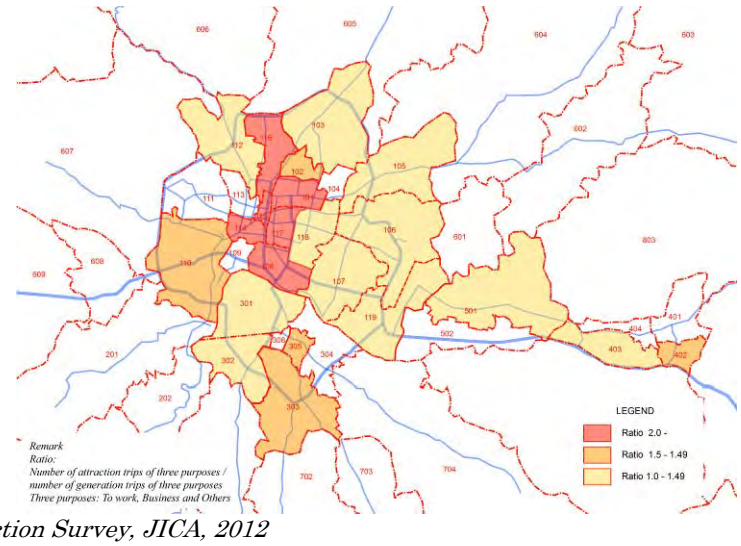


* In the figure of trip distribution, traffic zones were collected to express the movement more clearly.
Source: Data Collection Survey, JICA, 2012

Figure 5.2.11 Person Trip Desire Line Map (All Purposes)

(2) Trip Concentration in CBD

The CBD in Kathmandu Valley is located in the center of Kathmandu city. Traffic zone No.101, 108, 114, 115, 116 and 117 correspond to the CBD. The CBD attracts a great number of trips relating to 'Going to work', 'Business' and 'Other purpose trips including Shopping'. In the zones of CBD indicated in red in Figure 5.2.12, the attraction trip is more than twice as much as the generation trip. 885 thousand person trips per day are generated and attracted in the zones. While the population in the zones occupies 6% of that in Kathmandu Valley, the trips with purpose of "Going to work", "Business", and "Other purpose trips including shopping" occupy 23%, 25%, and 22% respectively as shown in Table 5.2.4 and Figure 5.2.13.



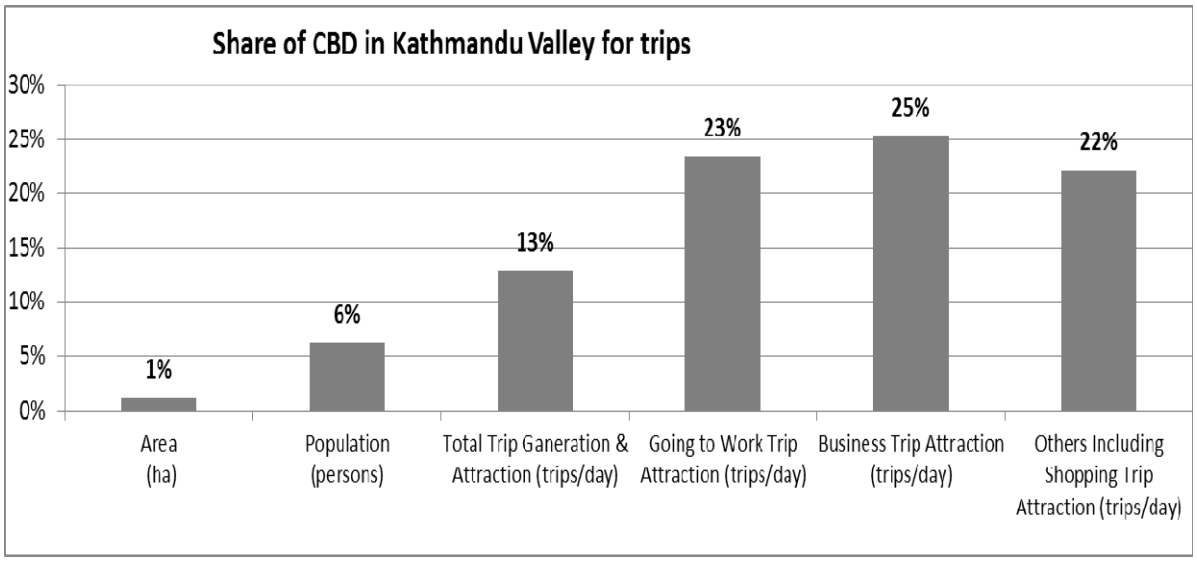
Source: Data Collection Survey, JICA, 2012

Figure 5.2.12 Ratio of Trip Attraction/Generation for the trips of 'Going to work', 'Business' and 'Other purpose trips including Shopping'

Table 5.2.4 Share Occupied by CBD Zones in KV

Zone No.	Area (ha)	Population (persons)	Total Trip Ganeration & Attraction (trips/day)	Going to Work Trip Attraction (trips/day)	Business Trip Attraction (trips/day)	Others Including Shopping Trip Attraction (trips/day)
101	138	13,728	114,131	23,280	3,669	7,123
108	184	17,726	108,763	22,615	3,461	5,398
114	79	44,209	252,769	39,699	13,167	33,116
115	33	16,322	95,648	11,373	5,880	13,803
116	219	44,648	183,910	27,079	6,567	9,044
117	104	16,603	129,938	24,399	5,895	7,730
CBDTotal	757	153,236	885,159	148,445	38,639	76,214
Share of CBD in Kathmandu Valley	1%	6%	13%	23%	25%	22%
Total in KV	61,947.7	2,444,151	6,876,786	632,965	153,052	343,044

Source: Data Collection Survey, JICA, 2012



Source: Data Collection Survey, JICA, 2012

Figure 5.2.13 Share Occupied by CBD Zones in KV

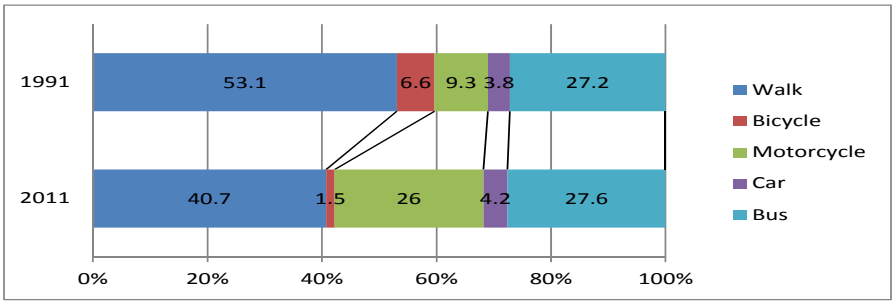
5.2.1.3 Modal Split

The total number of trips by travel mode is shown in Table 5.2.5 and Figure 5.2.14. Walking has the largest share among travel modes. Comparing the results between 1991 and 2011, the percentage of travel mode by walking decreased whereas the motorcycle increased greatly. In Table 5.2.5 Bus includes Tempo, Microbus, Minibus, Medium-bus and Large-bus. Car includes passenger car, Taxi and Truck.

Table 5.2.5 Trip Composition by Mode

Travel Mode	Number of Trips	Percentage
Walk	1,398,378	40.7
Bicycle	52,445	1.5
Motorcycle	893,126	26.0
Car	145,980	4.2
Bus	948,464	27.6
Total	3,438,393	100.0

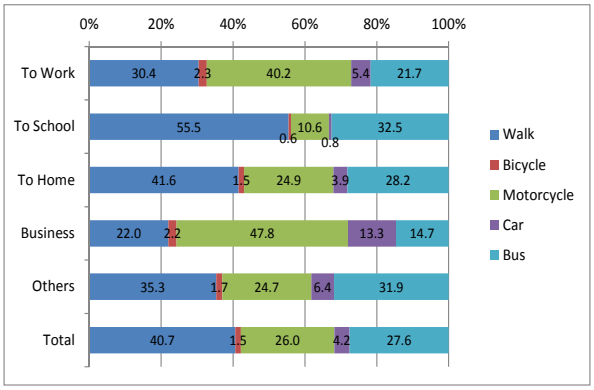
Source: Data Collection Survey on Traffic Improvement in Kathmandu Valley, 2012, JICA



Source: Data Collection Survey JICA, 2012

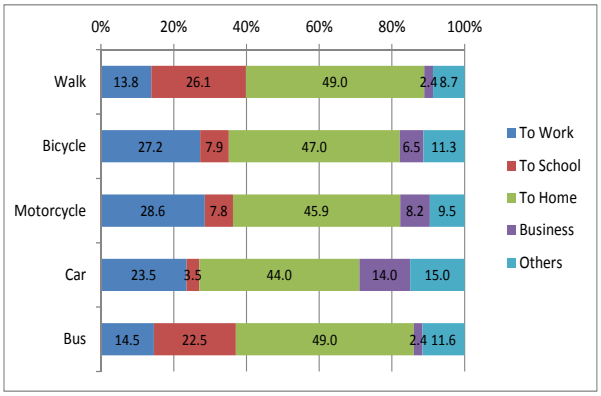
Figure 5.2.14 Comparison of Travel Modes between 1991 and 2011

Regarding the mode for the purposes of "Going to work" and "Business", Motorcycle has the largest share. As for Going to School, Walk and Bus have the larger share than other modes. With regards to composition of purpose of Bus trips, share of "Going to work" is lower than that of Bicycle, Motorcycle and Car.



Source: Data Collection Survey, JICA, 2012

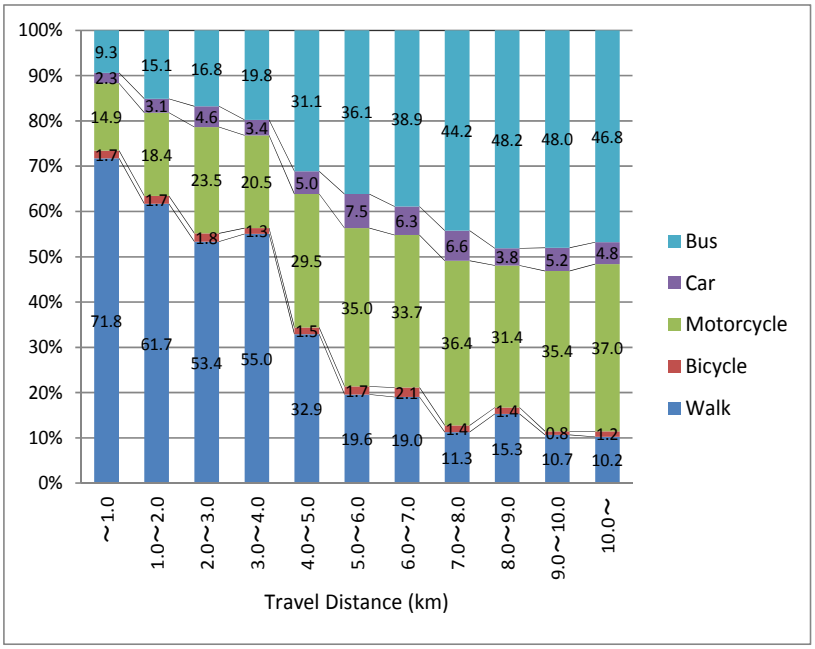
Figure 5.2.15 Travel Mode by Trip Purpose



Source: Data Collection Survey, JICA, 2012

Figure 5.2.16 Trip Purpose by Travel Mode

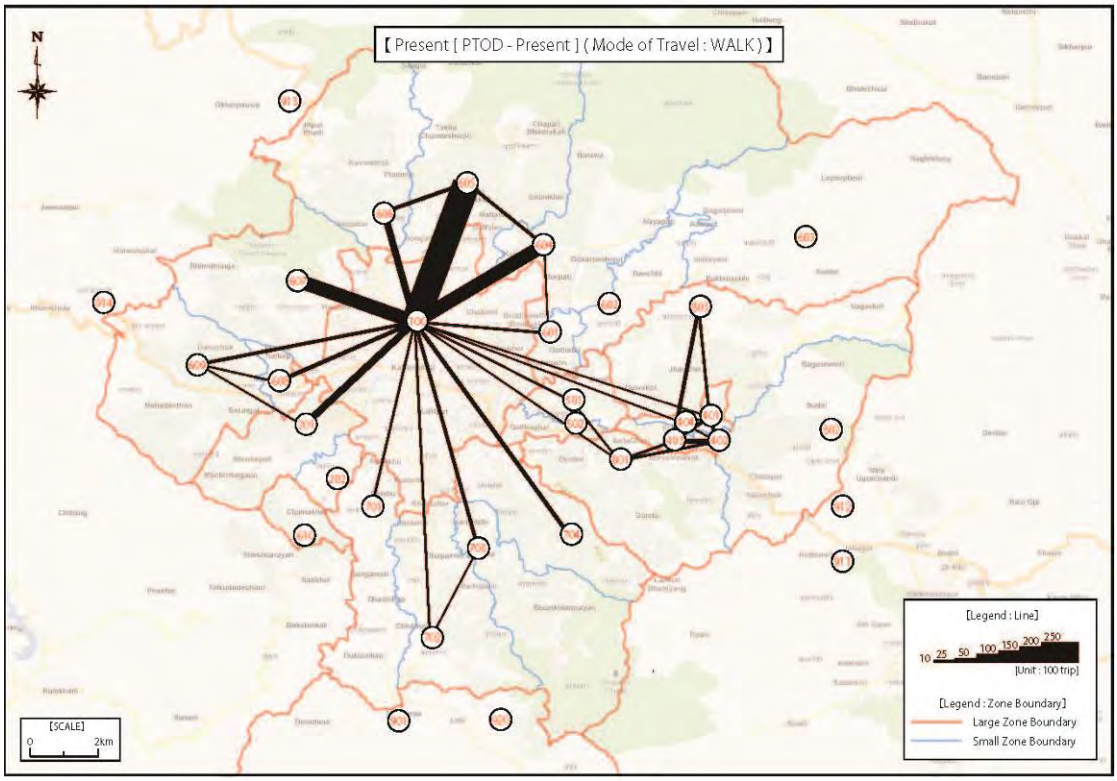
Share by distance shows that bus share is highest among all modes for the trips with longer distance which is more than 5km.



Source: Data Collection Survey, JICA, 2012

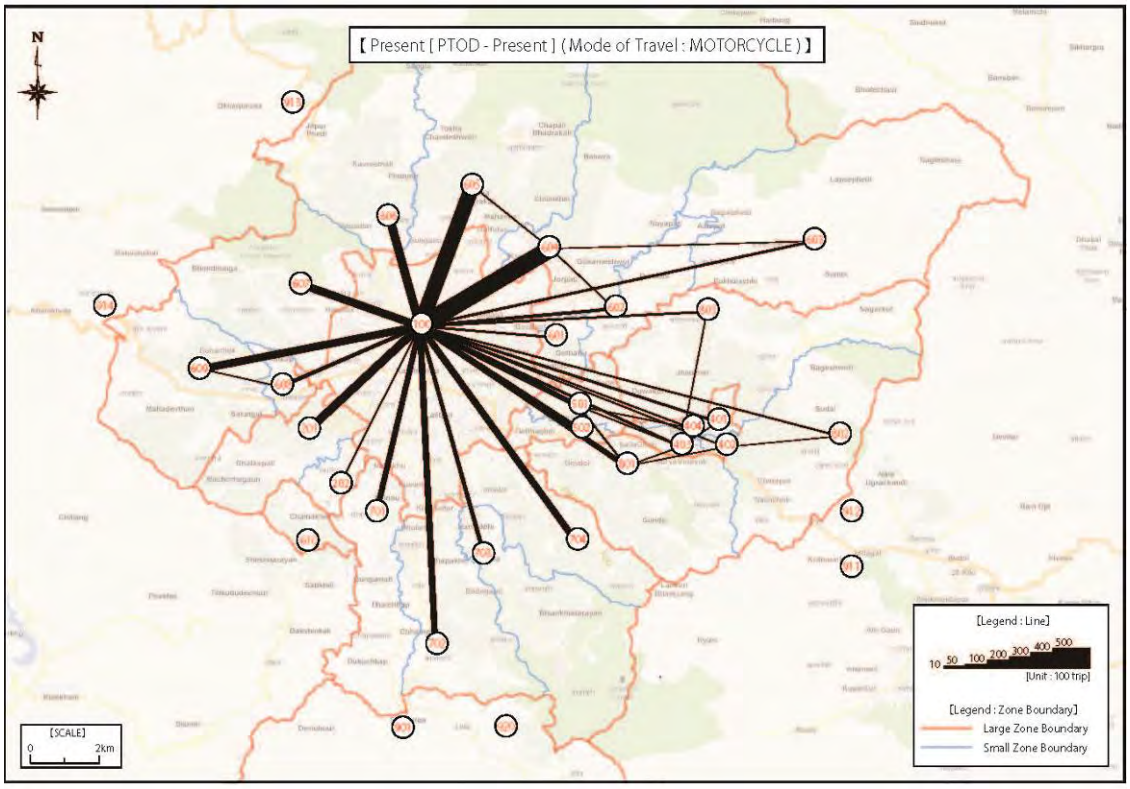
Figure 5.2.17 Modal Split by Trip Length

From Figure 5.2.18 to Figure 5.2.21 show desire line by travel mode. Concentration into Kathmandu and Lalitpur is observed for all travel modes.



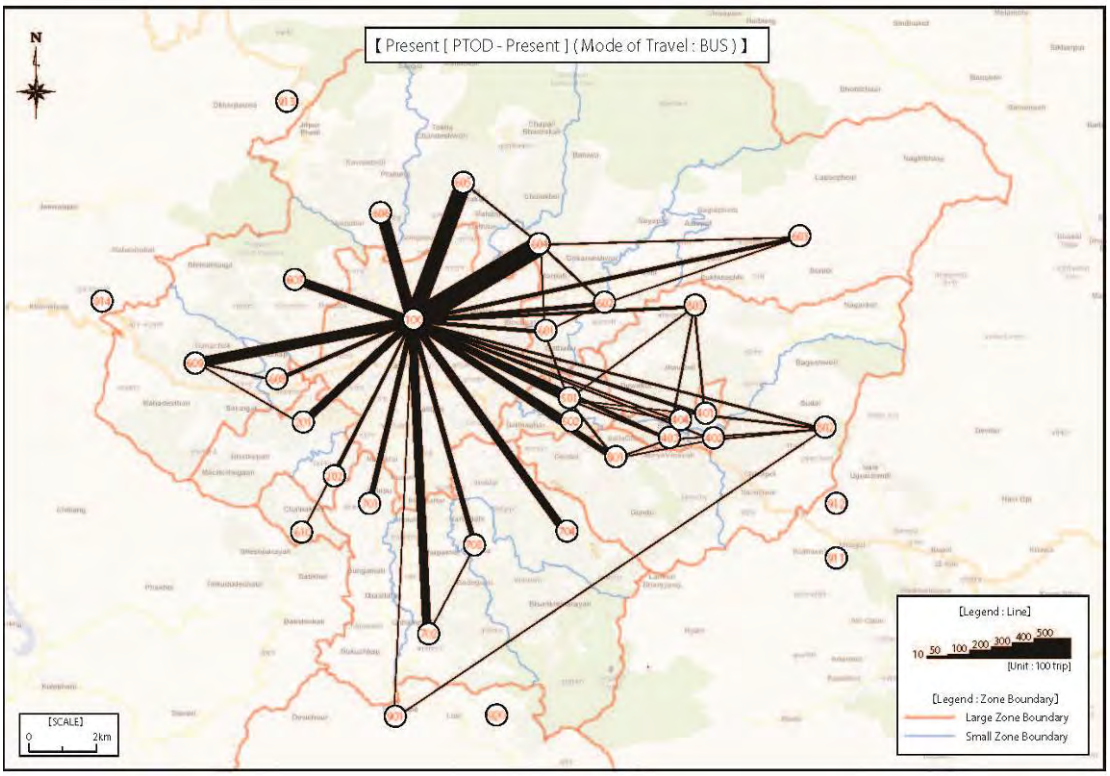
Source: Data Collection Survey, JICA, 2012

Figure 5.2.18 Person Trip Desire Line Map by Mode (Walk)



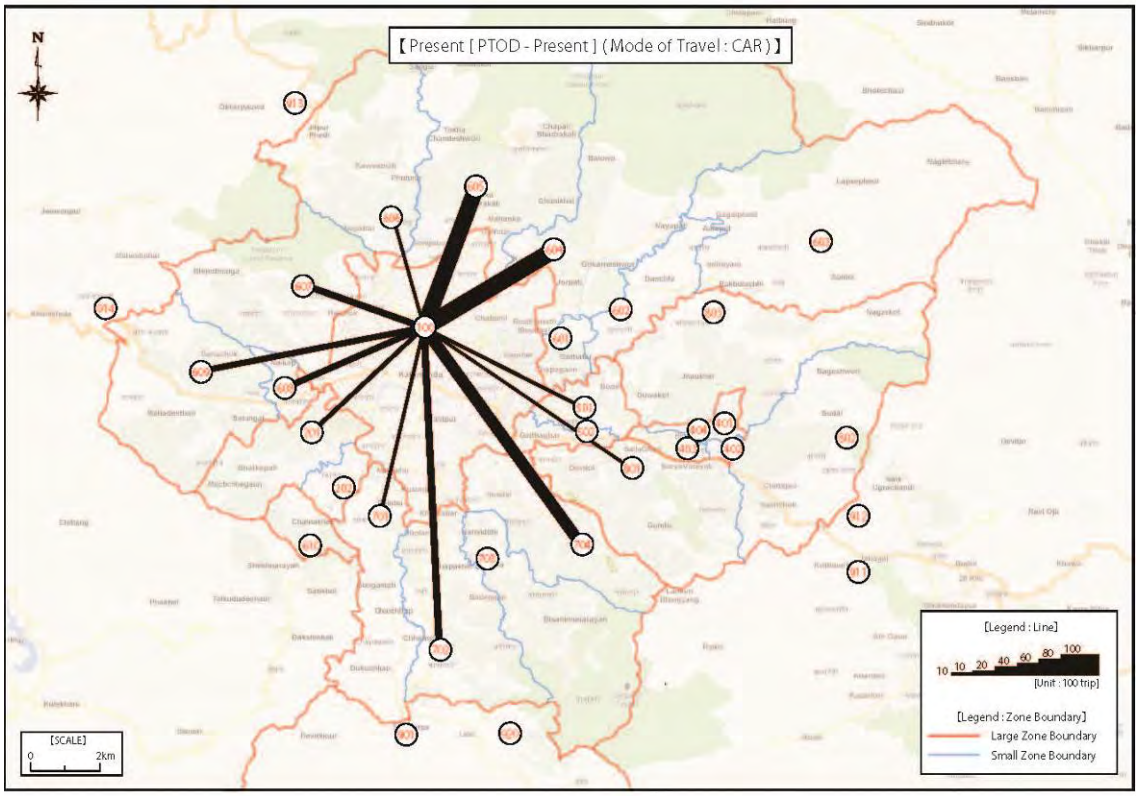
Source: Data Collection Survey, JICA, 2012

Figure 5.2.19 Person Trip Desire Line Map by Mode (Motorcycle)



Source: Data Collection Survey, JICA, 2012

Figure 5.2.20 Person Trip Desire Line Map by Mode (Bus)



Source: Data Collection Survey, JICA, 2012

Figure 5.2.21 Person Trip Desire Line Map by Mode (Car)

5.2.2 Vehicle Movement

The current vehicle movement in the valley is generally presented below based on the actual site survey results in 2012 and 2014.

(1) Traffic Volume

The comparison of the traffic volume between the 2014 survey and the 1993 survey is shown in Table 5.2.6 and Figure 5.2.22. Due to rapid urbanization of the valley, the traffic volume has been increasing threefold in the last 20 years. Increase rate on Cordon Line is 6.58 times while inside Cordon Line increase rate is 2.25. Population expansion outside the Ring Road caused large increase of traffic volume on Cordon Line. On the other hand, roads inside the Ring Road are almost saturated, thus a difference in increase rate was observed.

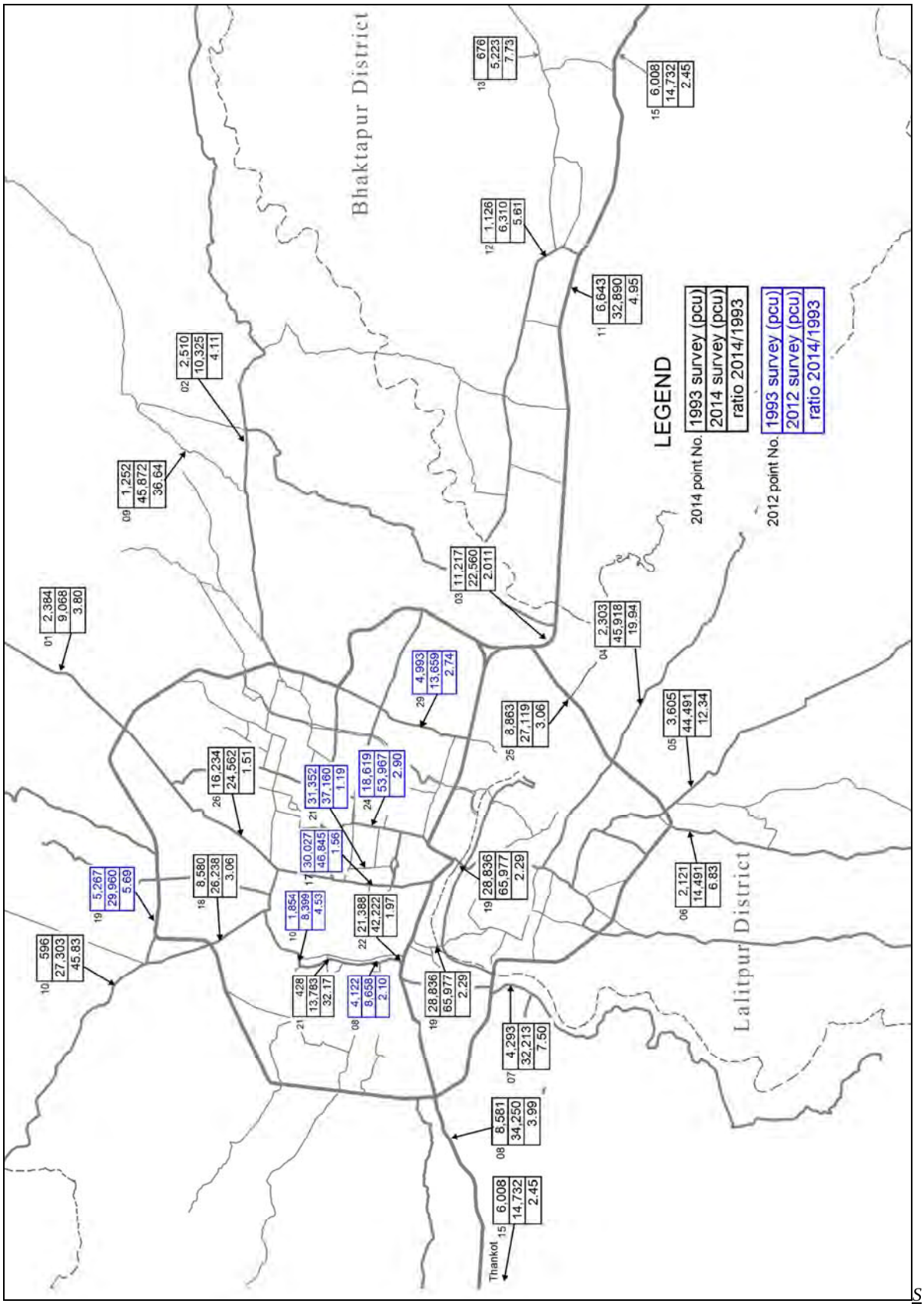
Table 5.2.6 Comparison of Total Traffic Volume Surveyed in 1993 and 2014

Unit: pcu

	Passenger Car	Taxi	Light Truck	Tempo	Microbus, Mini-Bus	Large Bus	Heavy Truck	Bicycle	Motor-cycle	Total
Cordon Line										
Survey in 1993MP	4,131	2,694	5,597	3,436	7,418	8,860	17,708	3,073	2,712	55,629
Survey in 2014	56,034	41,398	20,517	6,900	67,798	18,632	56,716	3,671	94,189	365,855
Increase (2014)/(1993)	13.56	15.37	3.67	2.01	9.14	2.10	3.20	1.19	34.73	6.58
Inside Cordon Line										
Survey in 1993MP	38,696	24,005	10,085	43,033	13,700	11,604	9,132	14,564	16,199	181,018
Survey in 2014	86,398	48,146	24,326	9,607	81,696	10,872	18,168	6,384	122,199	407,795
Increase (2014)/(1993)	2.23	2.01	2.41	0.22	5.96	0.94	1.99	0.44	7.54	2.25
Total										
Survey in 1993MP	42,827	26,699	15,681	46,469	21,118	20,464	26,840	17,637	18,911	236,646
Survey 2011/12&14	142,432	89,544	44,843	16,507	149,494	29,504	74,884	10,055	216,388	773,651
Increase (2014)/(1993)	3.33	3.35	2.86	0.36	7.08	1.44	2.79	0.57	11.44	3.27

Source: JICA Study Team

Regarding the vehicle type, increase in the number of motorcycles was the largest both on Cordon Line and inside Cordon Line. On the Cordon Line, increase in the number of taxis and passenger cars is also very large. Inside the Cordon Line, increase in the number of micro bus and minibus is large.



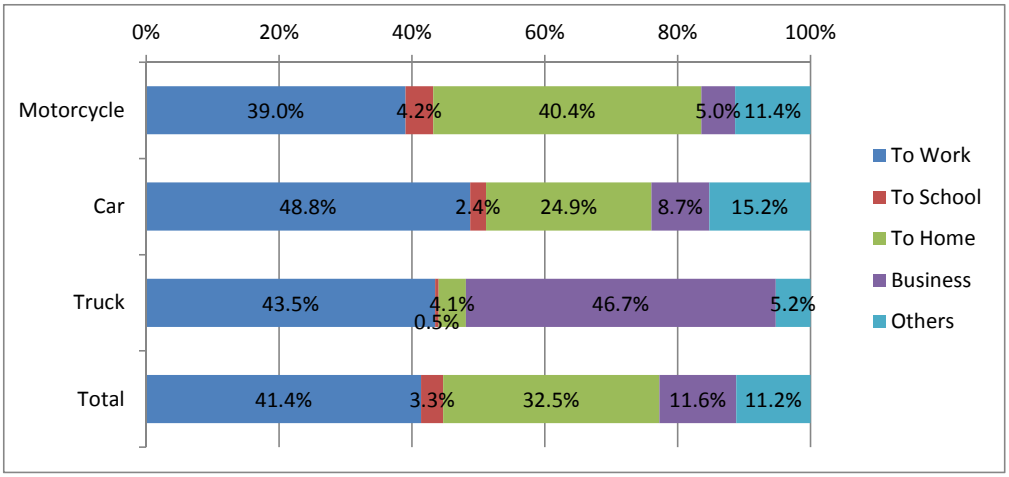
Source: Traffic Survey Results in 1993 and JICA Study Team

Figure 5.2.22 Comparison of Vehicle Volume between 1993 and 2014

Note: Vehicle number is shown by pcu

(2) Trip Purpose

The composition of trip purposes of drivers by vehicle type is shown in Figure 5.2.23. The trip purpose composition of motorcycles and cars were similar. However the percentages for the trip purposes "Business" and "Others" were larger in travel mode by car. Compared with those two vehicle types, the trip purpose composition of truck was different, as it had a larger percentage for "Business".

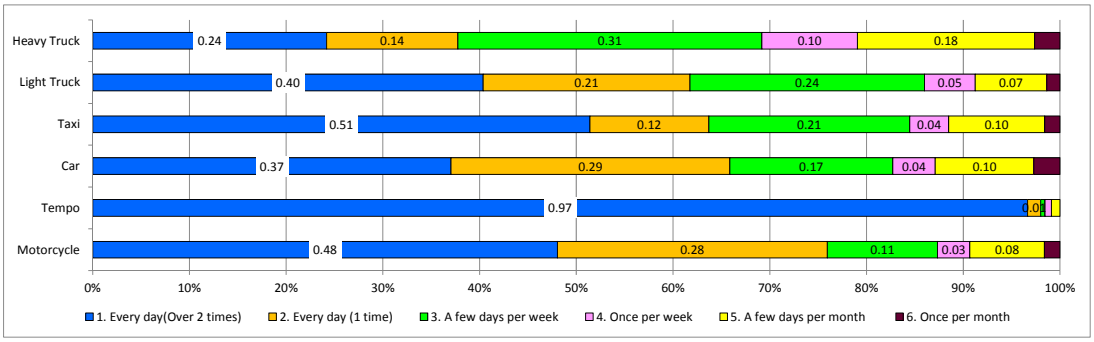


Source: Data Collection Survey, JICA, 2012

Figure 5.2.23 Trip Purpose by Vehicle Type

(3) Trip Frequency

Figure 5.2.24 shows that more than 60% of car, taxi, and light truck drivers used their vehicles more than once a day. Approximately 40% of heavy truck drivers had a trip frequency of more than once a day.



Source: Data Collection Survey, JICA, 2012

Figure 5.2.24 Trip Frequency of Each Vehicle Type

(4) Trip Length

The average trip length shown in Table 5.2.7 indicates that the trip lengths of motorcycles and cars were around 5 km, and the average trip length of trucks was a little longer at 6.8 km. Since the survey was conducted mainly at the boundary of the Ring Road, which has a radius of 3.0 km to 5.0 km, the average trip length was considered appropriate.

Table 5.2.7 Average Trip Length by Vehicle Type

	Motorcycle	Car	Truck	Average
Average Trip Length (km)	5.0	5.4	6.8	5.2

Source: Data Collection Survey, JICA, 2012

(5) Vehicle Characteristics

The average number of passengers per vehicle type was surveyed in the roadside OD survey. The results of which are shown in Table 5.2.8. The average number of passengers of passenger cars, light trucks, heavy trucks, and taxis were about two passengers.

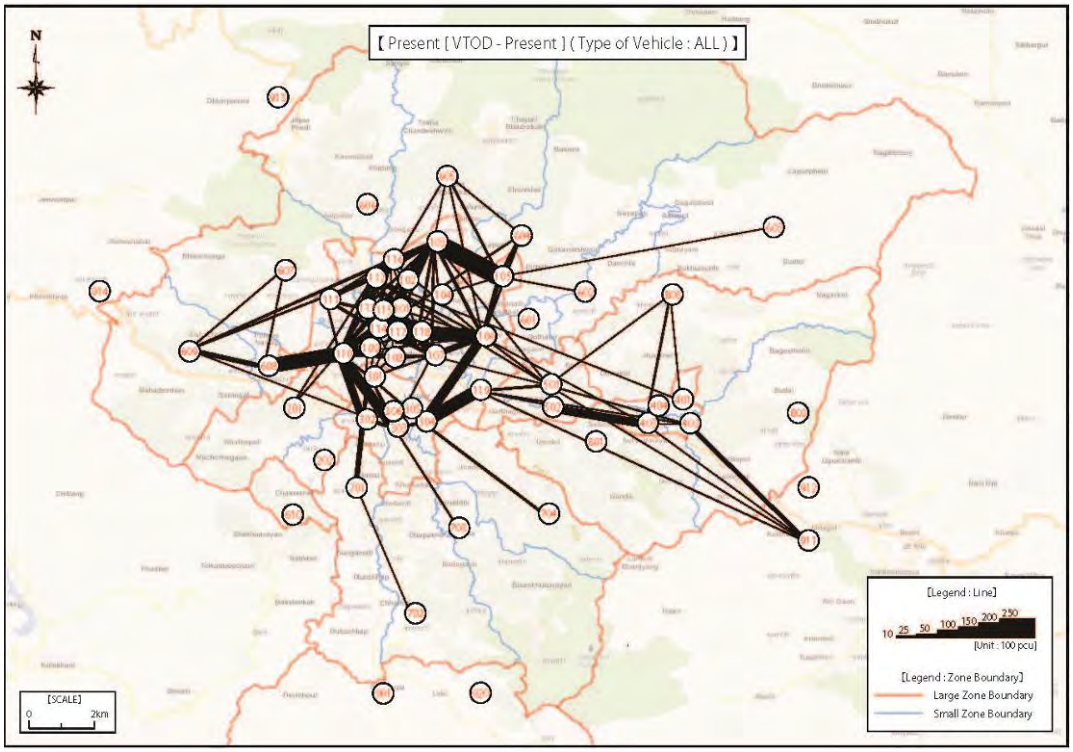
Table 5.2.8 Average Number of Passenger

	Motorcycle	Tempo	Car	Taxi	Light Truck	Heavy Truck	Average of Total
Average Passenger (person/vehicle)	1.1	7.8	1.9	2.0	1.8	1.9	1.4

Source: Data Collection Survey, JICA, 2012

(6) Traffic Movement within Study area

The desire lines of all vehicle types are shown in Figure 5.2.25. In general, almost all the desire lines of car trips are concentrated toward City Center area inside the Ring Road. In addition, Bhaktapur area is functioning as the center of the eastern rural area.

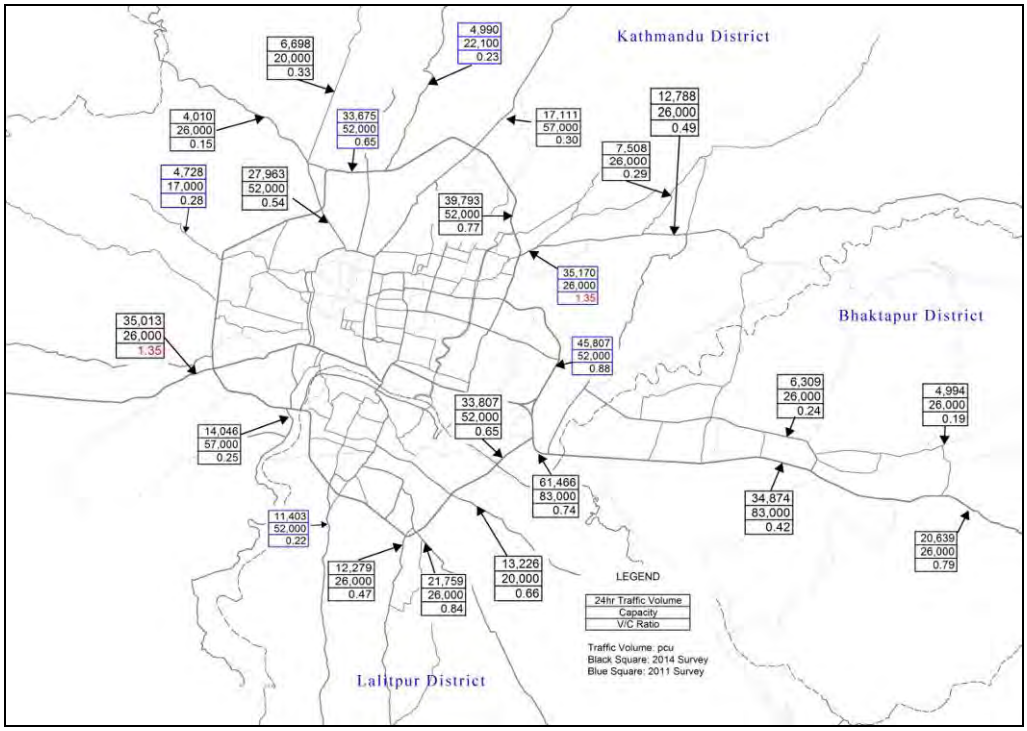


Source: Data Collection Survey, JICA, 2012

Figure 5.2.25 Vehicle Trip Desire Line Map (All Vehicle Type)

(7) Current Traffic Condition on Roads

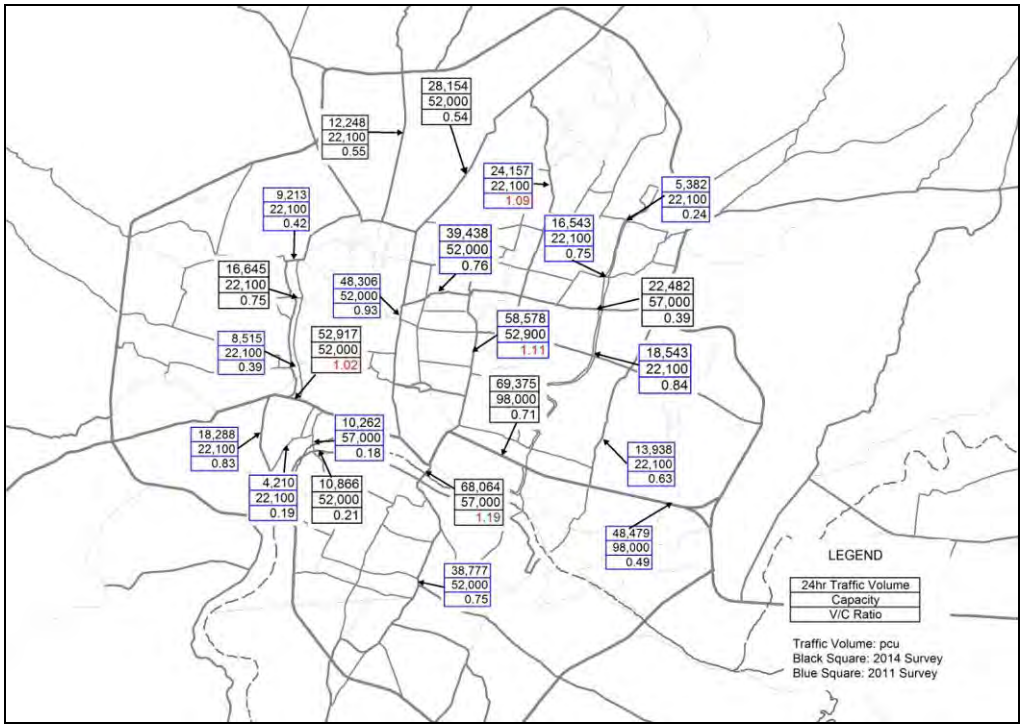
The vehicle volume on most of the major radial arterial roads in the valley is still within its capacity as shown in Figure 5.2.26. However it is noted that some of roads are going to be saturated (V/C more than 0.80) even under the current traffic demand.



Source: JICA STUDY TEAM based on the traffic survey and analysis, 2014
Note: Above figures are based on PCU (Passenger Car Equivalent Unit).

Figure 5.2.26 Estimated Vehicle Capacity Ratio outside Ring Road

On the other hand, the vehicle volume on some of the major arterial roads inside Ring Road is already beyond its capacity as shown in Figure 5.2.27. Other roads are also going to be saturated even under the current traffic demand. However the capacity upgrading (i.e. road widening or new construction) of the road network inside the Ring Road will be quite difficult due to land constraint and therefore a modal shift to public transport will be requisite.



Source: JICA STUDY TEAM based on the traffic survey and analysis, 2014
Note: Above figures are based on PCU (Passenger Car Equivalent Unit).

Figure 5.2.27 Estimated Vehicle Capacity Ratio inside Ring Road

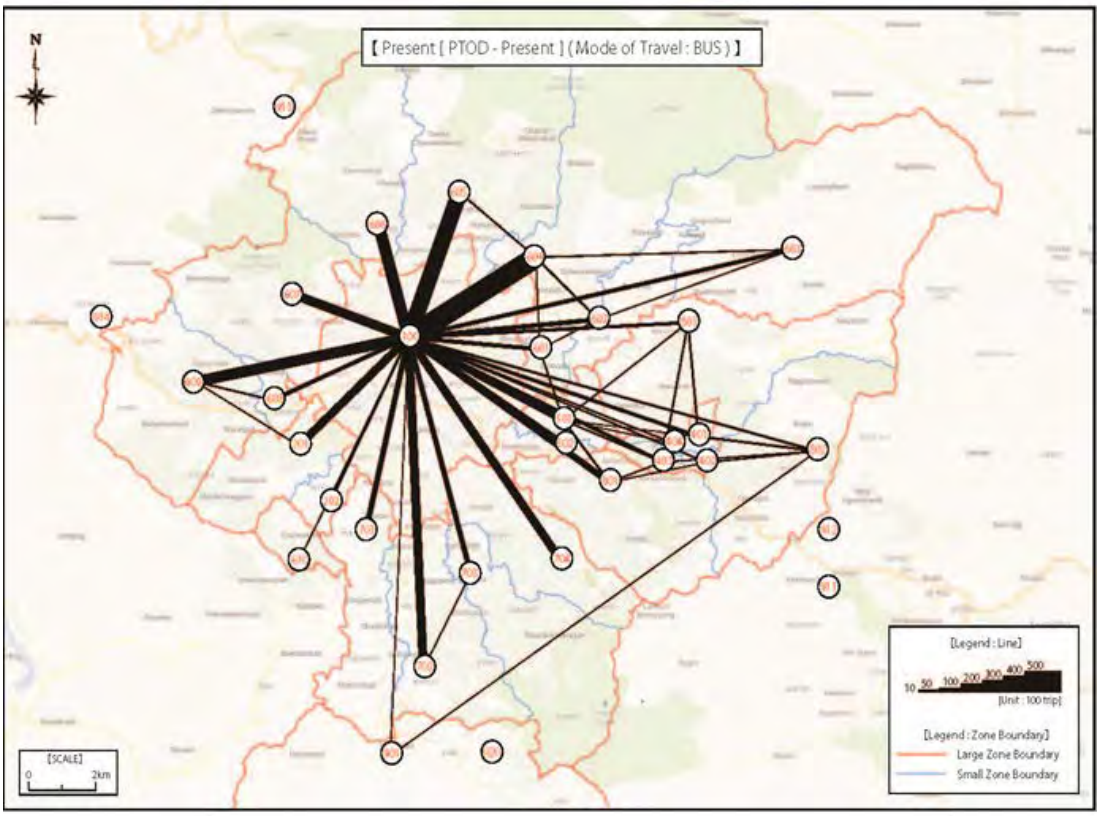
As indicated in the previous section, (5) Traffic Movement within Study area, the current trend of the traffic flow is "mono-centric" flowing toward City Center area which does not have much more space to enhance the road capacity (i.e. road widening, new construction). The current "mono-centric" traffic flow shall be dynamically changed by the strategic urban development planning and the modal shifting toward public transport system will be requisite for the future traffic demand.

5.2.3 Public Transport Movement

In the Kathmandu Valley railway transport has not yet been introduced. Bus and taxi are operated as a public transport mode. Here, bus transport is described as the major public transport because the share of taxi among all travel modes was 0.9%, whereas bus share was 27.6% in 2011.

(1) Bus OD

Bus traffic demand as well as all traffic demand in KV is concentrated in the city center. This is because many functions such as government offices, business offices, schools, hospitals, shops, restaurants, hotels, and so on have all been located intensively in the city center. This monocentric and over-concentrated urban structure should be improved in order to accommodate the increase of future population and traffic.



Source: Data Collection Survey, JICA, 2012

Figure 5.2.28 Bus OD Pattern in 2011

(2) Modal Share of Bus

As mentioned in 5.2.1, bus and motorcycle are the major transport modes in KV. The share of bus trips is 27.6% in person trip almost same as motorcycle whereas the share of car is 4.2%. The share of NMT is 42.2% in which Walk is 40.7% and bicycle is 1.5%. Except NMT, the bus share of person trips among motorized transport modes is nearly half. Furthermore based on the increasing trend in car ownership, the share of car would become higher year by year. Main trip purposes of Bus trip is 'Going to work' and 'Going to school'. 'Business' purpose is very few.

Bus occupancy rate on the arterial roads within the Ring Road can be seen ranging from 20% to 40% nearly same as motorcycle and car. This figure was calculated by using traffic volumes observed and passenger car unit. It implies that if a road with 3 lanes is constructed, assigning a lane separately to motorcycle, bus and car is an efficient way.

Table 5.2.9 Bus Occupancy Rate Calculated on the Major Road within the Ring Road

unit:pcu/16hours

Survey point	Motorcycle	Bus	Car,Taxi	Truck	Total
Bagmati River Bridge(New Baneshwer) No.28	11,170	17,131	11,578	4,708	44,587
	25.1%	38.4%	26.0%	10.6%	100.0%
Bagmati River Bridge (Kupundole) No.16	16,750	9,751	20,423	4,019	50,942
	32.9%	19.1%	40.1%	7.9%	100.0%
Bisunumati River Bridge (Teku-Kalimati Road) No.7	12,488	15,460	11,988	5,681	45,617
	27.4%	33.9%	26.3%	12.5%	100.0%
Lazimpat No.22	8,810	8,227	11,988	5,681	34,706
	25.4%	23.7%	34.5%	16.4%	100.0%

Note: survey in 2011/2012

Source: Data Collection Survey, JICA, 2012

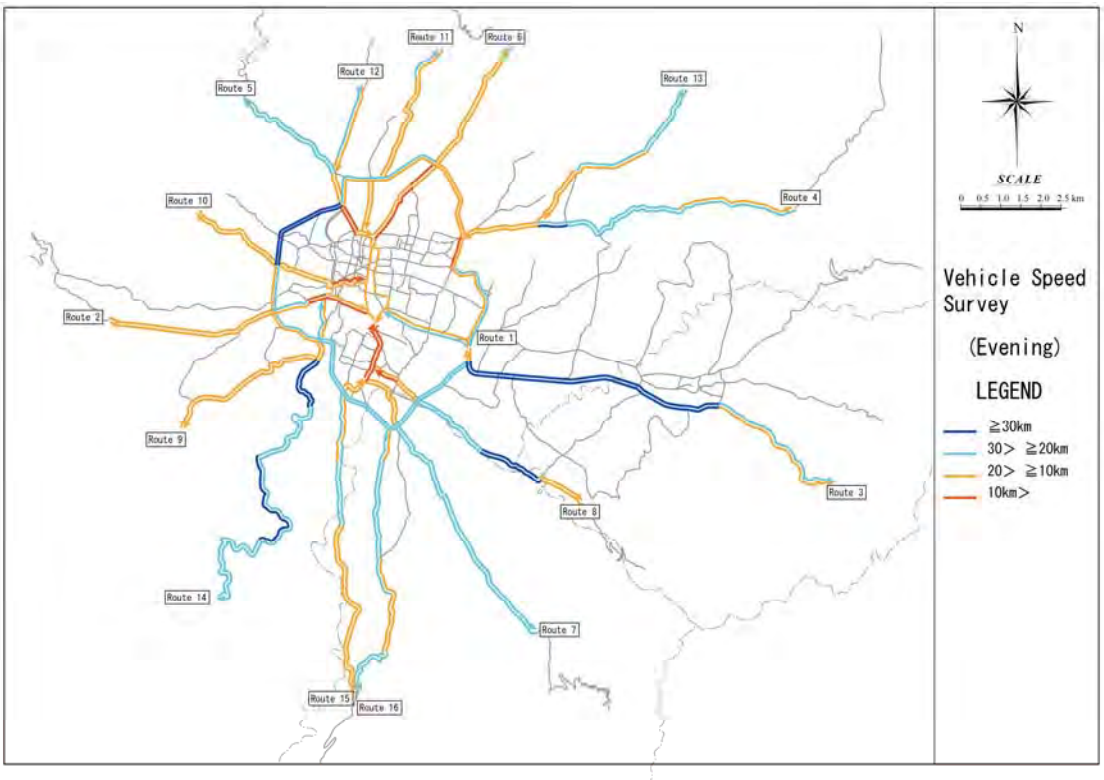
Table 5.2.10 Passenger Car Unit (PCU)

Vehicle Type	Bicycle	Motor cycle	Car	Taxi	Light Truck	Tempo	Microbus	Minibus	Large Bus	Heavy Truck
PCU	0.2	0.3	1.0	1.0	1.5	1.0	1.5	3.0	4.0	4.0

Source: Data Collection Survey on Traffic Improvement in Kathmandu Valley, 2012, JICA

(3) Bus Speed

Bus operation is greatly affected by road traffic congestion. In the Kathmandu Valley road infrastructure is so poor that most of the roads and intersections are being heavily congested especially in high-density urban areas within the Ring Road. Based on the vehicle speed survey in 2011, the speed of car within the Ring Road is less than 10km/h or 20km/h in peak hours as shown in Figure 5.2.29.

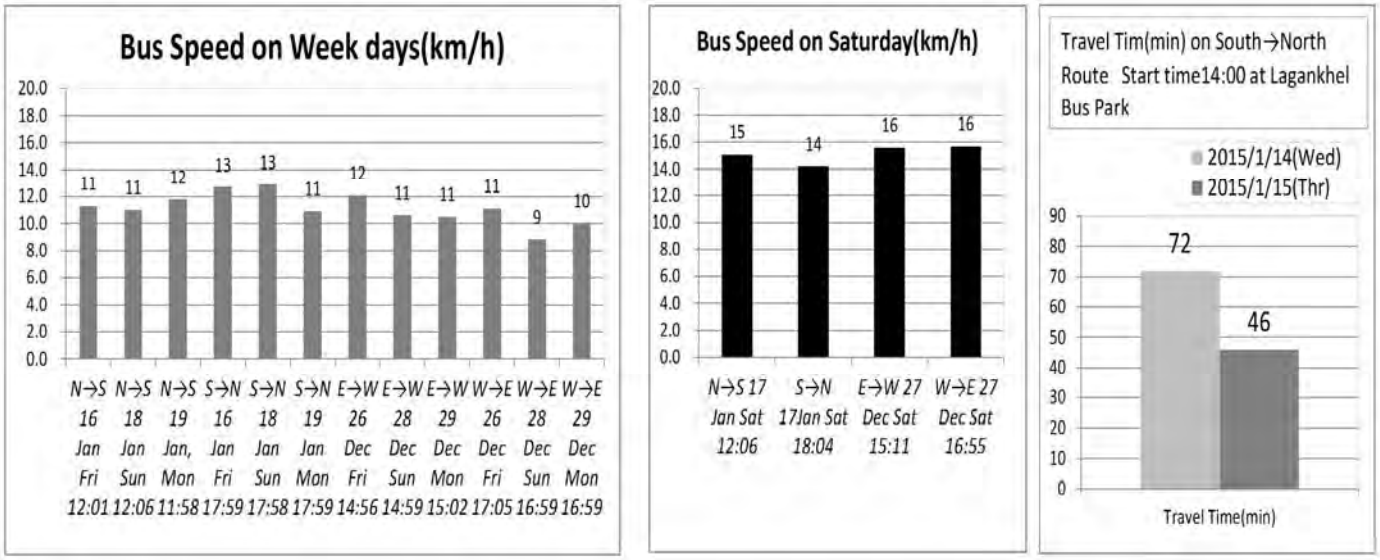


Source: Data Collection Survey, JICA, 2012

Figure 5.2.29 The Result of Speed Survey in 2011

Nepal government has expanded the road width in the urban areas of Kathmandu Valley for three years since the previous vehicle speed survey was carried out. Severe road congestion has been a little alleviated on the several roads. The result of bus travel time survey on the North-South and East-West routes operated by Sajha Yatayat Bus conducted by JICA Study Team confirmed several facts:

- Bus travel speed at peak hours of week days was still slow at around 9-13km/h.
- Bus travel speed on Saturday was stable at around 15km/h same as expected speed
- Bus travel time varied greatly by time or by day and can be said to be unstable and uncertain.
  For example, arrival time on the North-South route differed by around 26 minutes even on the same route at the same departing time. It is said that the arrival time sometimes delayed by 30 minutes due to traffic congestion according to Sajha Yatayat.



Source: JICA Study Team

Figure 5.2.30 The Result of Bus Speed Survey in 2014/2015

Table 5.2.11 The Result of Bus Speed Survey

1. North→ South Route L= 13.5 km

Date / BusStop	16 Jan, Fri	17 Jan, Sat	18 Jan, Sun	19 Jan, Mon	Average
	Time	Time	Time	Time	
Gongabun Bus park	12:01:45	12:05:45	12:05:45	11:57:45	
Maharajgunj	12:27:00	12:28:45	12:25:45	12:21:30	
Lainchaur	12:40:15	12:36:30	12:35:45	12:28:00	
Jamal	12:45:45	12:39:30	12:42:15	12:34:45	
Tripureshwor	12:56:15	12:47:15	12:55:30	12:44:15	
Thapathali	13:00:15	12:49:00	13:02:15	12:51:45	
Jawalakhel	13:08:00	12:54:15	13:11:45	13:00:15	Excluding
Lagankhel Bus Park	13:13:30	12:59:30	13:19:15	13:06:15	Saturday
Travel Time	1:11:45	0:53:45	1:13:30	1:08:30	1:11:15
Bus Speed	11.3	15.1	11.0	11.8	11.4

Survey Date 16-19, Jan 2015

2. South → North Route L= 13.0 km

Date / BusStop	16 Jan, Fri	17 Jan, Sat	18 Jan, Sun	19 Jan, Mon	Average
	Time	Time	Time	Time	
Lagankhel Bus Park	17:58:45	18:04:30	17:58:15	17:59:30	
Jawalakhel	18:03:15	18:08:45	18:04:15	18:04:00	
Kupandole(near to Thapathali)	18:12:15	18:16:00	18:12:45	18:14:00	
Tripureshwor	18:22:00	18:20:15	18:16:45	18:23:00	
NAC	18:25:45	18:22:45	18:19:30	18:26:30	
Lainchaur	18:35:15	18:34:15	18:31:15	18:41:30	
Maharajgunj	18:45:30	18:43:45	18:42:00	18:54:00	Excluding
Gongabun Bus park	19:00:00	18:59:30	18:58:45	19:10:45	Saturday
Travel Time	1:01:15	0:55:00	1:00:30	1:11:15	1:04:20
Bus Speed	12.7	14.2	12.9	10.9	12.1

Survey Date 16-19, Jan 2015

3. East → West Route L= 9.6 km

Date / BusStop	26 Dec, Fri	27 Dec, Sat	28 Dec, Sun	29 Dec, Mon	Average
	Time	Time	Time	Time	
Airport	14:56:00	15:11:15	14:59:30	15:01:45	
Tinkune	15:03:00	15:18:00	15:05:45	15:08:00	
Baneshwor	15:07:30	15:23:45	15:11:15	15:24:00	
Maitighar(Thapathali)	15:14:45	15:30:45	15:24:45	15:22:00	
Tripureshwor	15:26:45	15:32:30	15:34:00	15:31:45	
Kalimati	15:37:30	15:39:45	15:45:30	15:45:45	Excluding
Kalanki	15:43:45	15:48:15	15:53:45	15:56:30	Saturday
Travel Time	0:47:45	0:37:00	0:54:15	0:54:45	0:52:15
Bus Speed	12.1	15.6	10.6	10.5	11.0

Survey Date 26-29, Dec 2014

4. West → East Route L= 9.6 km

Date / BusStop	26 Dec, Fri	27 Dec, Sat	28 Dec, Sun	29 Dec, Mon	Average
	Time	Time	Time	Time	
Kalanki	17:05:00	16:55:00	16:59:00	16:59:30	
Kalimati	17:12:45	17:03:30	17:10:15	17:10:30	
Tripureshwor	17:21:45	17:11:00	17:29:00	17:24:00	
Maitighar(Thapathali)	17:30:00	17:13:00	17:33:30	17:27:45	
Baneshwor	17:38:30	17:19:15	17:41:15	17:36:30	
Tinkune	17:47:45	17:26:15	17:55:45	17:49:00	Excluding
Airport	17:57:00	17:31:45	18:04:45	17:57:15	Saturday
Travel Time	0:52:00	0:36:45	1:05:45	0:57:45	0:58:30
Bus Speed	11.1	15.7	8.8	10.0	9.8

Survey Date 26-29, Dec 2014

1. North→ South Route

Date / BusStop	15 Jan, Thr	19 Jan, Mon	
	Time	Time	
Gongabun Bus park	8:08:30	8:13:45	
Maharajgunj	8:24:00	8:34:15	
Lainchaur	8:32:00	8:45:15	
Jamal	8:35:15	8:51:15	
Tripureshwor	8:40:00	8:58:45	
Thapathali	8:41:45	9:05:30	
Jawalakhel	8:48:15	9:15:45	
Lagankhel Bus Park	8:52:00	9:21:15	difference:
Travel Time	0:43:30	1:07:30	24minutes
Bus Speed	18.6	12.0	

Survey Date 14-19, Jan 2015

2. South - North Route

Date / BusStop	14 Jan, Wed	15 Jan, Thr	
	Time	Time	
Lagankhel Bus Park	14:05:45	14:04:45	
Jawalakhel	14:10:30	14:09:30	
Kupandole(near to Th	14:22:15	14:15:15	
Tripureshwor	14:30:15	14:19:00	
NAC	14:35:45	14:22:15	
Lainchaur	14:49:30	14:32:00	
Maharajgunj	14:59:15	14:39:45	
Gongabun Bus park	15:17:30	14:50:30	difference:
Travel Time	1:11:45	0:45:45	26minutes
Bus Speed	10.9	17.0	

Survey Date 14-19, Jan 2015

Note: Bus speed=km/hour
Source: JICA Study Team

(4) Characteristics of Bus Users' Movement

Bus users' movement in the Kathmandu Valley has several characteristics as follows:

- People use bus as the only mass transit for short, middle and long distance trip. In particular bus is the most used mode for trips of more than 5 km.
- Bus trips are combined with Walk as an access to or an egress from bus terminal and bus stop. Walk & Bus is the most common mode combination pattern. Based on 'the Data Collection Survey', 99.4% of bus trips are of this combination. The other mode combinations were very few, less than 0.4%.

- Furthermore, regarding the number of transfer from bus to bus, bus trips with no transfer, that single bus trip, have the share of 90.5%. Once Transfer has the share of 8.8%, twice and third time transfers are very few with the share of less than 1%.
- Approximately 300,000 passengers get on and off at the bus terminals located in the city center. Many passengers change from one bus to another.
- Bus trips are combined with walk as an access to or an egress from bus terminal and bus stop. Bus & Walk is the most common trip chain pattern.
- Bus is used mainly for Going to school and Going to work, on the other hand bus trips for Business are few.
- A great number of small-sized buses are operated within the Ring Road and provide frequent bus operations. Therefore, bus users can catch bus easily without waiting for long.
- Bus network density is low because there is lack of a wide road network. Especially large bus operation is difficult in many parts of high-density urban areas. More than 15% of the areas within the Ring Road is not covered by bus service, far more than 500 meters from the nearest bus route.
- Bus and motorcycle are under a competitive situation in that the share of modal split is almost same and the distribution of trip length is also similar.

Table 5.2.12 Classification of mode Combination by Bus

Mode Combination	Number	Share
Walk & Bus	942,634	99.4%
Bicycle & Bus	504	0.1%
Motorcycle & Bus	3,914	0.4%
Car & Bus	1,412	0.1%
Total	948,464	100.0%

Source: Data Collection Survey on Traffic Improvement in Kathmandu Valley, 2012, JICA

Table 5.2.13 Number of Transfer from Bus to Bus

Categories	Person Trips/day	Share
No Transfer	858,081	90.5%
Once	83,267	8.8%
Twice	6,497	0.7%
Three Times	619	0.1%
Total	948,464	100.0%

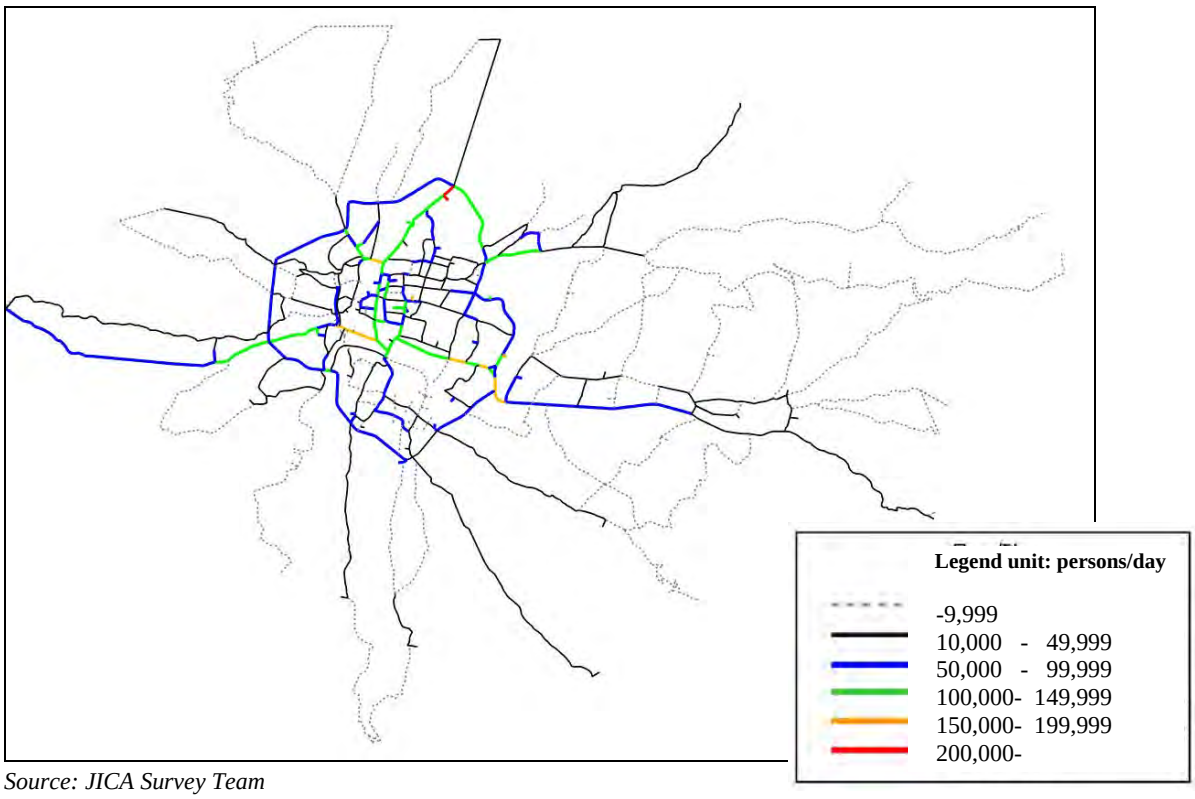
Source: Data Collection Survey on Traffic Improvement in Kathmandu Valley, 2012, JICA

(5) Estimated Existing Bus Transport Demand on Routes

JICA Study Team estimated the existing bus and all vehicles' demand per person on each link by using present vehicle trip OD table in 2011, existing road network in 2011 and average number of passengers by type of vehicle. Furthermore, a user equilibrium assignment was applied as the method of traffic assignment. The results are shown in Figure 5.2.31 and Figure 5.2.32. All the results exclude NMT, such as walk and bicycle trips.

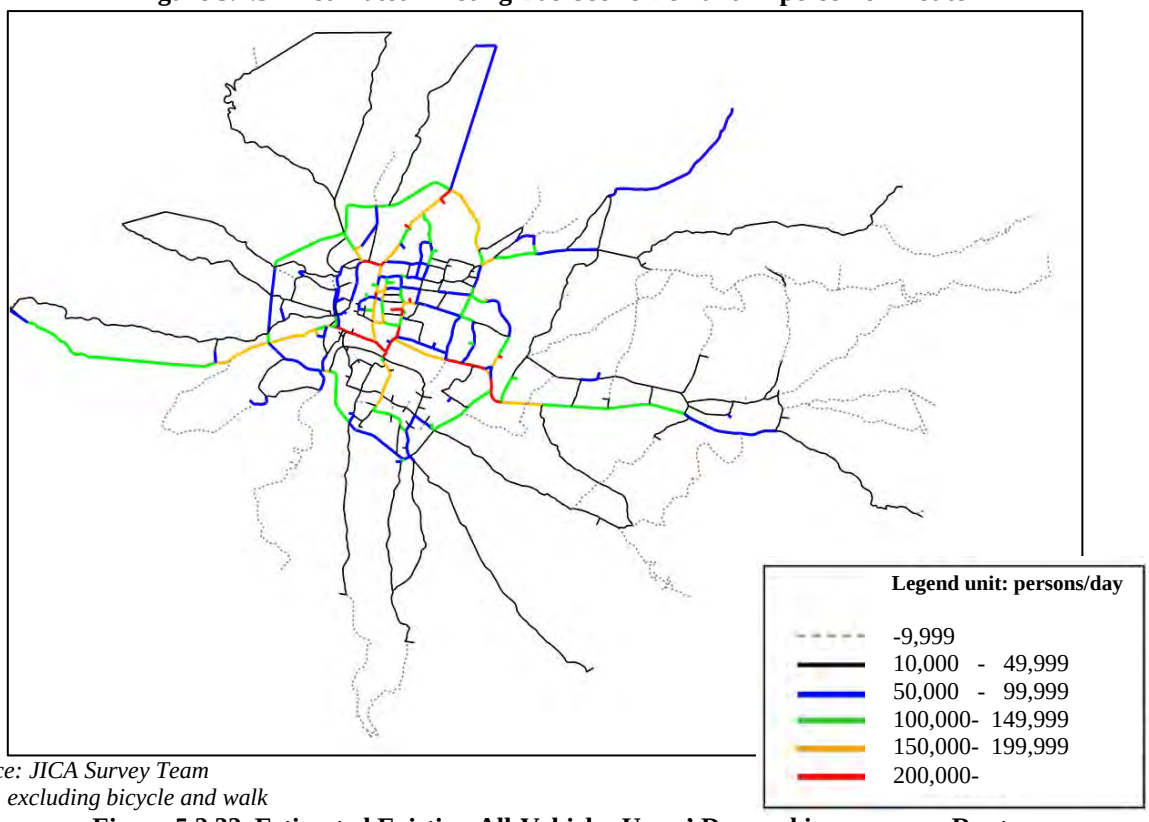
According to the result of bus demand on routes, the existing large demand can be seen as the volume between 100,000 and 150,000 persons per day on the routes of North-South axis, East-West axis and the Ring Road. On the other hand, in the case of all vehicles' demand on a route, large demand is between 150,000 and 200,000 persons per day on the same routes as bus.

If bus peak-hour- ratio of demand is 15%, peak hour passenger per direction would range between 7,500 and 11,250 Peak Hour Peak Direction Traffic (PHPDT). The high demand has already reached a level that exceeds the ordinary bus transportation capacity. Even for the current demand, introduction of BRT, AGT or Monorail is expected on the North-South and East-West routes.



Source: JICA Survey Team
Note: including tempo

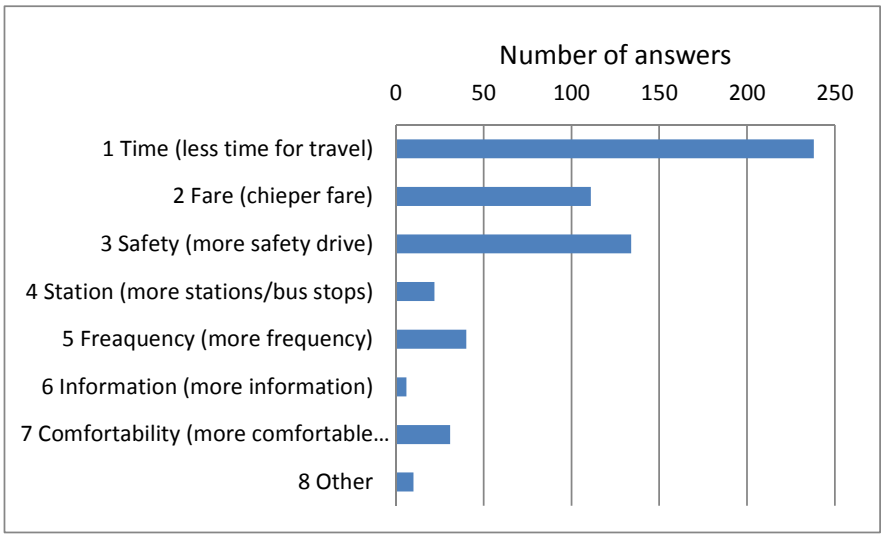
Figure 5.2.31 Estimated Existing Bus User's Demand in person on Route



Source: JICA Survey Team
Note: excluding bicycle and walk

Figure 5.2.32 Estimated Existing All-Vehicles Users' Demand in person on Rout

Bus users' demand captured by bus passenger interview survey at Ratnapark, N. A. C. and Lagankhel Bus Park is shown in Figure 5.2.33. The biggest requirement for bus operation is "Time (less time for travel)" and the second biggest requirement is "Safety (more safety driving)". Decreasing travel time is the most effective way to enhance use of public transport.



Source: JICA Study Team

Figure 5.2.33 Bus Passengers' Demand for Bus Operation

(6) The Trend of Bus Demand

Based on the several traffic demand related statistics in the past 10 years between 2001 and 2011, motorcycle had the highest growth at the annual growth rate of 15.8%. Bus and car had relatively lower growth rates than motorcycle at 6.9% and 9.6% respectively. Nevertheless all those figures in the growth rate of registered vehicles are larger than the population growth rate in the same period. Moreover the car ownership ratio in the Kathmandu Valley is still low at the level of 25 vehicles per 1,000 people according to the Data Collection Survey. Therefore, motorization has rapidly and steadily progressed in recent years and would continue with national economic growth for several decades.

As far as traffic demand of bus is concerned, it could be said that the demand would continue to increase for the next decade because several socio-economic trends will continue almost at the same rates as in the recent years. On the other hand, it is uncertain in the long term whether the demand would increase or decrease. It depends on how the urban transportation system in the future will be built and managed, under the pressure of rapid population growth, urban area expansion and motorization.

Table 5.2.14 Population and Vehicle Registered Number in the past 10 years

year	2001	2011	Growth 2011/2001	Annual Growth Rate 2001-2011
Population in KV	1.56 million	2.44 million	1.56	4.6%
Total Vehicle Registered in KV	179 thousand	570 thousand (2010)	3.18	13.7%
Motorcycle Registered in KV	113 thousand	424 thousand (2010)	3.75	15.8%
Bus Registered in KV	11 thousand	20 thousand (2010)	1.82	6.9%
Car Registered in KV	47 thousand	107 thousand (2010)	2.28	9.6%
Truck/others Registered in KV	8 thousand	18 thousand (2010)	2.25	9.4%

Notes : The number of registered vehicles is for Bagmati Zone and is a cumulative number.
Bus Includes tempo, microbus, minibus, medium-bus and large-bus.
Source: Department of Transport Management, Nepal
Source: Source: Data Collection Survey, JICA, 2012

Based on the results of traffic count survey on the roads in the Kathmandu Valley both in 1991 and 2011, Motorcycle, Microbus, Minibus, Passenger Car and Light Truck have increased whereas Bicycle and Tempo have decreased. The annual growth rate by type of vehicle is shown in Table 5.2.15. It can be said that these rates are of similar values as the annual growth rates of registered vehicles. Roughly speaking, it is assumed that the annual growth rate of motorcycle is 16%, Bus is 7%, Car is 9% and Truck is 9% as the trend value.

Table 5.2.15 Average Growth Rate of Traffic Volume by Type of Vehicle (2011/1991)

	Bicycle	Motorcycle	Tempo	Taxi	Microbus, Minibus	Large Bus	Passenger Car	Light Truck	Heavy Truck
Total increase (survey in 2011/survey in 1991)	0.97	19.80	0.72	3.36	10.64	1.38	5.58	7.33	2.42
Annual growth rate (1991-2011, %)	-0.15	16.10	-1.63-	6.3	12.55	1.62	8.98	10.47	4.52

Source: Data Collection Survey, JICA, 2012

5.3 Traffic Safety

5.3.1 Objective

Road Traffic Safety is a great concern in Kathmandu Valley and therefore a road traffic safety study was conducted to improve the safety situation.

In recent years, the concentration of economic activities in the Kathmandu Valley has contributed to the rapid increase in both the population and the number of motorized vehicles. As traffic volume expanded, traffic–related problems such as bottlenecks, congestion and traffic safety matters also increased. On the other hand, the level of understanding and compliance to traffic rules is very low among the drivers and this can been seen in the reckless manner in which the vehicles are driven in a bid to try and reach to their destination earlier or to make more trips in the case of public transporters.

From the situation mentioned above, traffic safety has become a major social problem, in fact it is now as one of the most urgent issues affecting Kathmandu Valley.

The objectives of the road traffic safety are as follows:

- To develop a road traffic safety study plan up to 2030, and
- To formulate an action plan for road traffic safety in the Kathmandu Valley

The road traffic safety strategic plan aims to provide various comprehensive strategies and develop sustainable fundamentals for the road traffic safety in the Valley. The Plan is based on the existing conditions of the Valley.

In the following paragraph, the current circumstances are explained.

5.3.2 Study Area and Coverage

The study area of the road traffic safety study is described as follows:

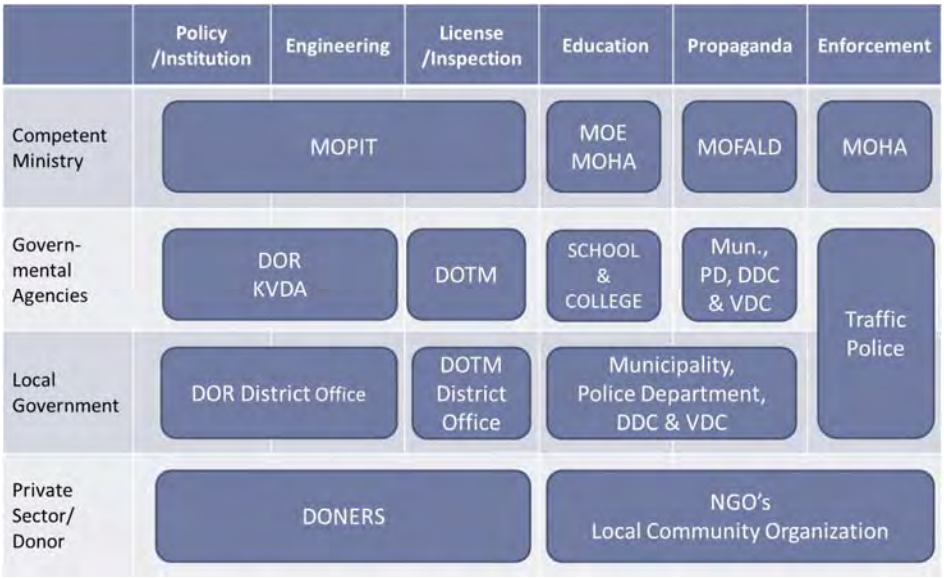
The related central and local government authorities as stakeholders of the Road Traffic Safety Study are as follows.

- Ministry of Physical Infrastructure and Transport (MOPIT) (incl. DOR, DOTM)
- Ministry of Federal Affairs and Local Development (MOFALD)
- Ministry of Education (MOE)
- Ministry of Home Affairs (MOHA) (incl. Traffic Police)
- Kathmandu Metropolitan City (incl. Police department)
- Lalitpur City Council (incl. Police department)
- Bhaktapur Municipality (incl. Police department)
- Village Development Committee (VDC)
- Village Coordination Committee (VCC)
- Donors and NGO's

Figure 5.3.1 gives the composition of the above stakeholders and their roles in traffic safety.

MOPIT is an organization responsible for Policy/Institution, Engineering and License/Inspection. The major function of MPOIT is to set strategies and policy directions, and supervise its statutory agencies, to ensure the operations and the regulatory functions and duties are being carried out properly.

DOR and DOTM are constituted under MOPIT and are charged with actual activities such as road maintenance, issuing vehicle licenses, vehicle registration and ownership transfer. Management of public transport is also under DOT's jurisdiction.



Source: JST

Figure 5.3.1 Composition of Stakeholders and their Role on Traffic Safety

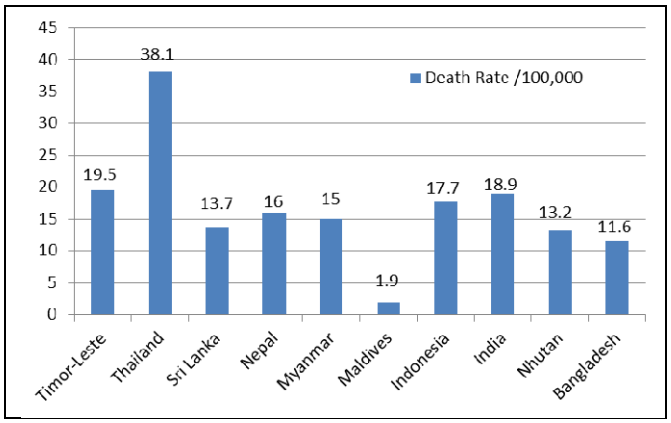
MOE & MOHA is responsible for education on traffic safety. Municipal & City police is an organization under MOHA and is charged with educating and disseminating traffic rules and regulations as well as MOE in the schools & colleges. VDC & VCC are also key players on education and propaganda at the local government level.

MOHA is also responsible for enforcement. The traffic police under MOHA is in charge of this activity. The traffic police has the right to control the traffic, cordon the streets, inspect vehicles and the drivers as well. The driver who violates the regulation has to pay penalty according to the level of violation as prescribed.

Donors and NGOs are also expected to be among the main players to support efforts geared at improving traffic safety, for instance conducting traffic safety campaigns, seminars and competitions. These activities are aimed at increasing the social awareness concerning traffic safety.

5.3.3 Comparison with ESCAP Neighboring Countries

Figure 5.3.2 gives the death rate per 100,000 population between neighboring UNESCAP member countries. From this figure, it can be seen that Nepal's situation is similar to the other countries except Thailand and Maldives.

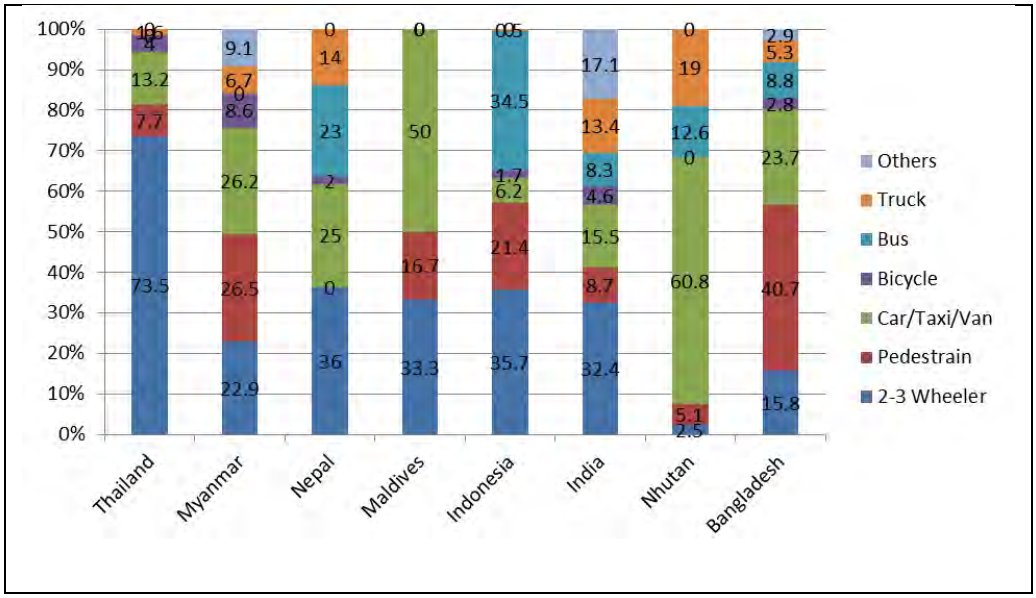


Source: Global Status Report on Road Safety 2013, WHO, 2013

Figure 5.3.2 Estimated Death Rate from Road Accidents

The following Figure 5.3.3 gives the comparison of composition of victims from road accidents by user type. Here, since the data for Nepal was not available in the source report[1], the figure was made by incorporating the data provided by the traffic police in Kathmandu. From this figure, it is found that accidents involving 2-3 wheelers including motorcycles and private car/taxi/van are the most dominant going by user type. This trend is similar in the other countries except Thailand and Bangladesh. In Thailand the number of accidents involving 2-3 wheelers is the highest while the number of accidents involving pedestrians is remarkable in Bangladesh.

[1] Global status report on road safety 2013



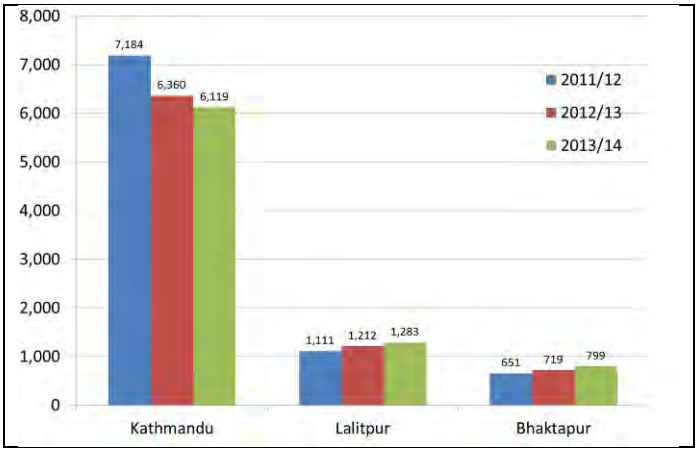
Source: Global status report on road safety 2013, WHO, 2013 (except Nepal), Data from Traffic Police Kathmandu

Figure 5.3.3 Composition of Victims by User Types

5.3.4 Current situation of traffic accidents in Kathmandu Valley

(1) Number of vehicles involved in accidents by cities

Figure 5.3.4 gives the number of traffic accidents in last three years from 2011/12 to 2013/14. Although the total number of the accidents in Kathmandu Municipal City was found to be decreasing, the other surrounding cities witnessed increasing number of accidents. This can be as a result of economic activities and settlements expanding to the outer side of the Valley.

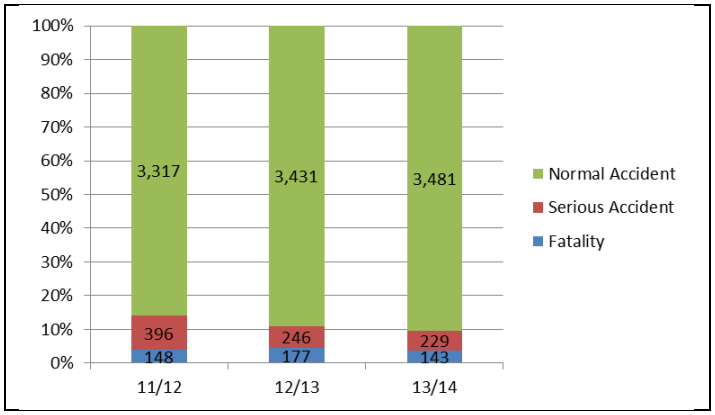


Source: Traffic Police

Figure 5.3.4 Traffic Accidents by Cities

(2) Type of Injuries

Figure 5.3.5 gives the composition of traffic accident victims. From this figure, it can be seen that the number of the serious accidents and fatality rate is decreasing as well as the total number of victims as shown in Table 5.3.1. This fact that the number of the victims and the accidents are decreasing can be considered to be the result of the traffic police cordon in the center barrier of the major sections so that the vehicles will not cross the road at their convenience.



Source: Traffic Police

Figure 5.3.5 Composition of Traffic Accident Victims

Table 5.3.1 Composition and Percentage of Serious/Fatal Injured Victims

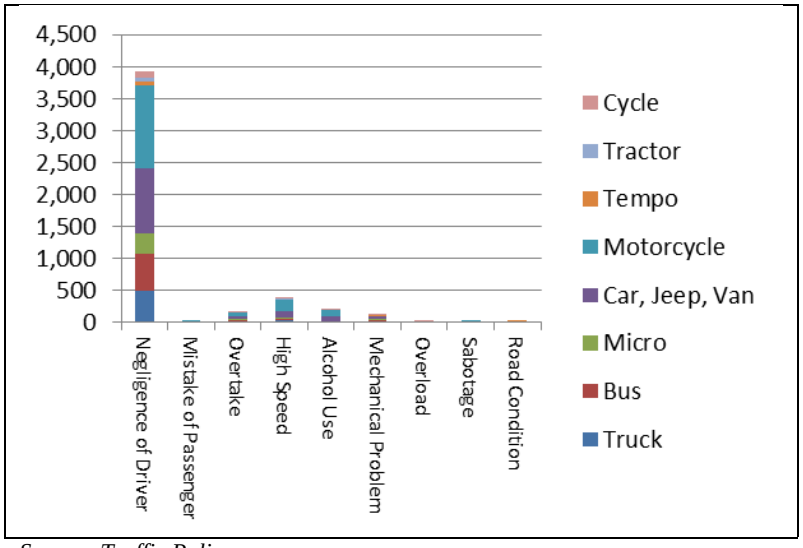
FY	Number of Victims in Serious and Fatal Injury (A)	Number of Victims in Normal Injury (B)	Total Number of Victims (C=A+B)	Percentage of serious and fatal injured victims (A/C x100)
2011/12	544	3,317	3,861	14.1%
2012/13	423	3,431	3,854	12.3%
2013/14	372	3,481	3,853	9.6%

Source: Traffic Police

(3) Cause of the Accident

Figure 5.3.6 shows the composition of type of vehicle and number of accidents by cause. From this figure, it can be said that most of the accidents are caused by driver behavior which is represented by "Negligence of the Driver" in particular. Some other reasons such as mechanical problems, overloading and road condition are also seen, however, negligence of the driver is the dominant factor.

On the other hand, there is another characteristic regarding the composition of the type of vehicle which indicates that most of the vehicles involved in accidents are private cars. Commercial vehicles including public transport vehicles are involved in fewer accidents.

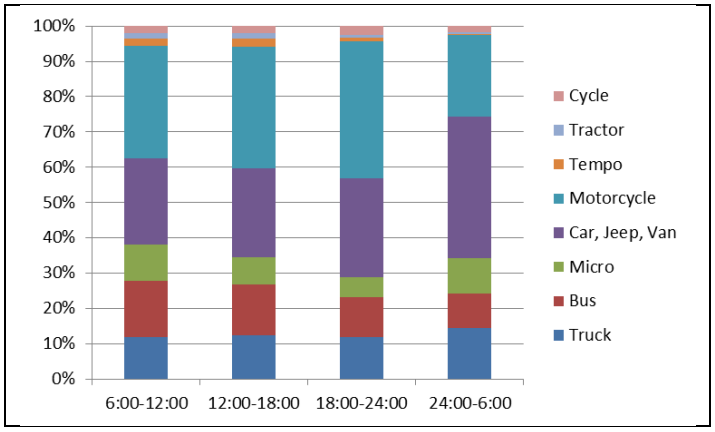


Source: Traffic Police

Figure 5.3.6 Number and Composition of Accidents by Causes

(4) Number of Accidents by Time Zone

Figure 5.3.7 and Figure 5.3.8 give the number of accidents and the composition of each type of vehicle by time zone. From Figure 5.3.7, again it can be seen that most of the vehicles involved in accidents are private vehicles in the categories of "motorcycle" and "Car, Jeep, Van". Therefore, there is no difference by time zone on the type of vehicle causing the most accidents.



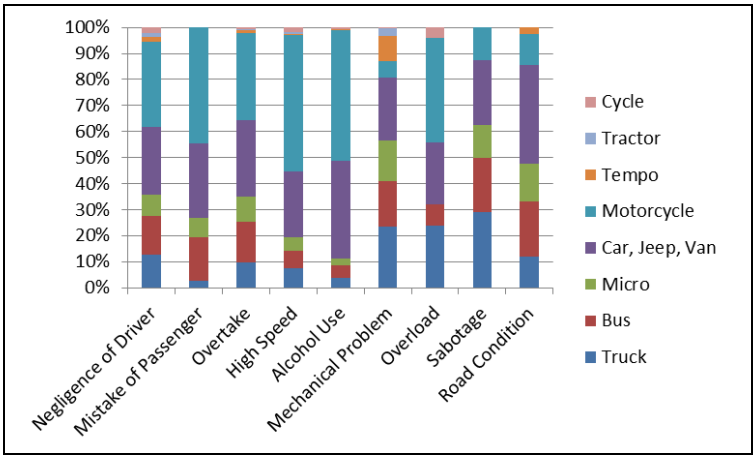
Source: Traffic Police

Figure 5.3.7 Composition of Type of Vehicle by Time Zone

Figure 5.3.8 below also shows that most of the accidents occur during the day time and that private vehicles take the biggest share in terms of the composition of accident cars by vehicle type.

(5) Causes of Accidents by Type of Vehicle

Figure 5.3.8 gives the composition of type of vehicle by cause of accidents. From this figure, it can be said that private cars such as "motorcycle" and "car, jeep, van" cause the most accidents. However, on the other hand public service vehicles, e.g. "Micro" and "Bus" are dominant for "Mechanical Problem", and this should be focused on since the characteristic of this cause is different from the others.



Source: Traffic Police

Figure 5.3.8 Composition of Type of Vehicle by Cause of Accidents

(6) Number of Accidents by Location

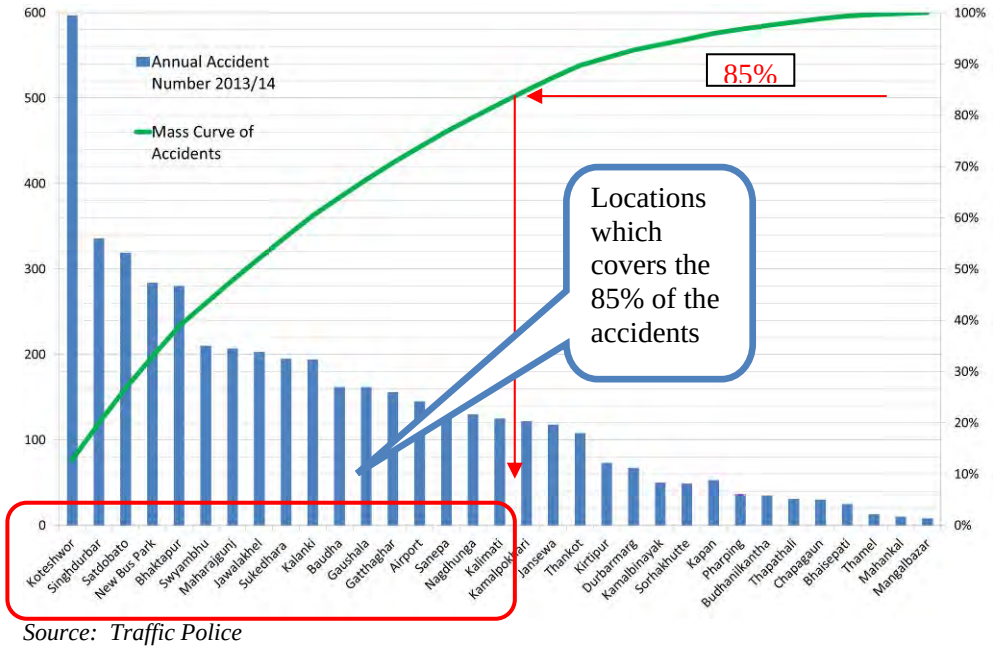
The accident black spots are shown in Table 5.3.2.

Table 5.3.2 Black Spot Locations of Traffic Accidents (2013/14)

Worst Ranking	Location	Number of accidents	Ratio	Cumulative	Ratio
1	Koteshwor	597	12.8%	597	12.78%
2	Singhdurbar	336	7.2%	933	19.97%
3	Satdobato	319	6.8%	1,252	26.80%
4	New Bus Park	284	6.1%	1,536	32.88%
5	Bhaktapur	280	6.0%	1,816	38.87%
6	Swyambhu	210	4.5%	2,026	43.36%
7	Maharajgunj	207	4.4%	2,233	47.80%
8	Jawalakhel	203	4.3%	2,436	52.14%
9	Sukedhara	195	4.2%	2,631	56.31%
10	Kalanki	194	4.2%	2,825	60.47%
11	Baudha	162	3.5%	2,987	63.93%
12	Gaushala	162	3.5%	3,149	67.40%
13	Gatthaghar	156	3.3%	3,305	70.74%
14	Airport	145	3.1%	3,450	73.84%
15	Sanepa	138	3.0%	3,588	76.80%
16	Nagdhunga	130	2.8%	3,718	79.58%
17	Kalimati	125	2.7%	3,843	82.26%
18	Kamalpokhari	122	2.6%	3,965	84.87%
19	Jansewa	118	2.5%	4,083	87.39%
20	Thankot	108	2.3%	4,191	89.70%
21	Kirtipur	73	1.6%	4,264	91.27%
22	Durbarmarg	67	1.4%	4,331	92.70%
23	Kamalbinayak	50	1.1%	4,381	93.77%
24	Sorhakhutte	49	1.0%	4,430	94.82%
25	Kapan	53	1.1%	4,483	95.95%
26	Pharping	37	0.8%	4,520	96.75%
27	Budhanilkantha	35	0.7%	4,555	97.50%
28	Thapathali	31	0.7%	4,586	98.16%
29	Chapagaun	30	0.6%	4,616	98.80%
30	Bhaisepati	25	0.5%	4,641	99.34%
31	Thamel	13	0.3%	4,654	99.61%
32	Mahankal	10	0.2%	4,664	99.83%
33	Mangalbazar	8	0.2%	4,672	100.00%

Source: Traffic Police

Figure 5.3.9 below describes the above table using a graph. This graph also gives the information on locations/Sections target to improve. It can be found that 18 of the worst locations/sections will cover 85% of the accidents, and giving priority budget allocation to these locations/sections will be an effective way to use the limited resources.



Source: Traffic Police

Figure 5.3.9 Location /Section where covers the 85% of the Accident

Following Table 5.3.3 shows the locations/sections of traffic black spots under interview by the traffic police. Some locations/sections duplicate with the data shown in Table 5.3.2 above.

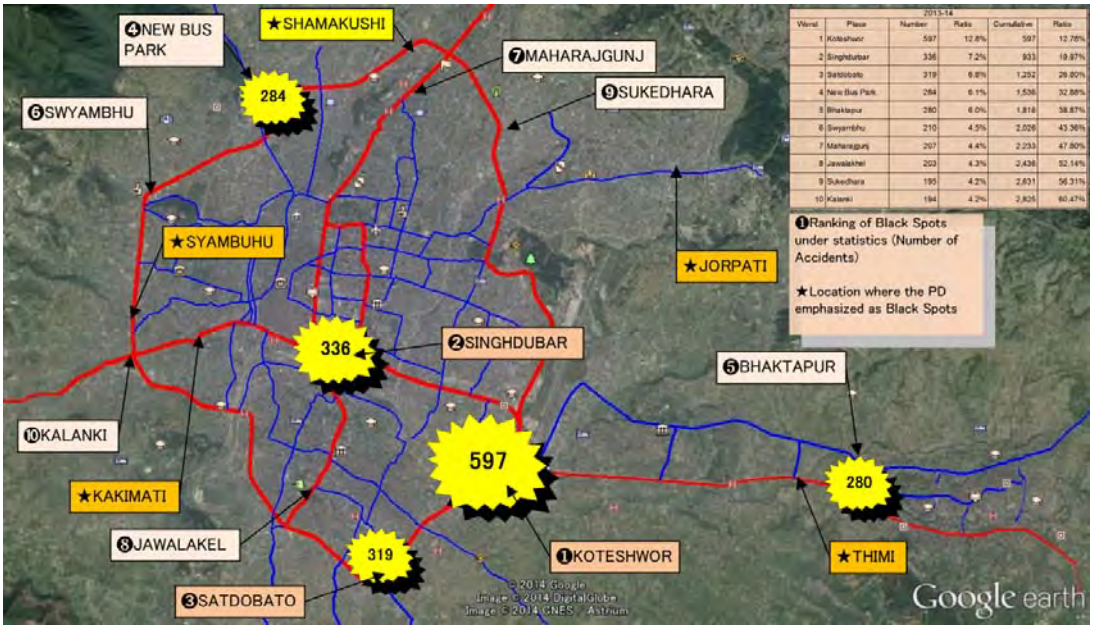
Table 5.3.3 Location/Section of Black Spots from Interview

S/N	Name of Black Spot	Vehicle Description at Black spot Accident				Vehicle categories at Accident					Cause of Accident
		Total Accident	Fatality	Serious Accident	Normal Accident	Bus	Truck	Car, Jeep, Van	Motorcycle, Scooter	Other	
1	Kalimati, Ravi Bhawan	15	1	5	7	6	3	9	12	4	- Negligence of Driver - Not use of Zebra cross - Decline & Curve Road
2	Kalimati, Soaltee Mod	25	1	7	13	8	4	12	14	3	- Decline & Curve Road - Zebra Crossing near to Y Junction
3	Basundhara Chowk -Tilingetar Chowk	27	3	3	10	6	16	11	17	0	- High speed, Lack of Awareness, Bad condition of Road, Unsafe Lane change, Careless use of Vehicle, Bad condition of Vehicle
4	Sukedhara, Prakash Marg Road	37	1	2	7	11	7	14	8	0	- High Speed, Careless of driver, decline & Curve Way, Alcohol Use etc.
5	Syambhu, Bafal	55	2	9	50	15	18	10	12	0	- Open wide road, Uncomfortable to cross the road for Pedestrian
6	Syambhu, Sano Bharyang	38	2	6	35	10	7	8	10		- Slope & Winding Road
7	S. S. Chowk, Thimi	34	2	3	47	12	3	13	29		- Negligence of driver - High Speed - Unsafe lane change - Wrong overtake - Negligence of Pedestrians - Animals, Alcohol use, Mechanical error, over load
8	Salla Ghari, Srijana nagar	22	2	2	27	9	3	5	17		
9	Jorpati Inclination to Narayantar	55	2	0	40	18	4	20	40	0	- Decline way - High Speed - Wrong Overtake - Negligence of Driver
10	Bauddha, Shankhu Nanglebhar to Lassi Fedi	15	4	0	52	13	2	2	4	0	- No any indication board regarding traffic rule & bad condition of Road

11	Nag Dhunga, Banbhanjyang, Piplamod	45	2	8	31	16	26	21	12	0	- Uphill, downhill , winding Road Overtake, Negligence of Driver
12	Kamalbinayak, Kharipati	75	2	3	74	9	16	11	57	0	- Driving after alcohol use - Careless driving, without getting driving license
13	Shamakhushi, In front of Karyadal	96	2	0	31	9	16	56	61	2	- High speed - Overtake
14	Balaju	21	3	3	27	13	7	7	9	5	- Negligence of Driver - High speed - Alcohol use - Overtake
15	Bhaisepati Aawas	9	2	0	4	0	0	12	3	0	- Uphill, downhill Road - Undergoing road maintenance - No Traffic Sign - High Speed
16	Gatthaghar, Chardobato Chowk	15	3	1	10	12	1	12	15	0	- High speed - Absence of Pedestrian Bridge
17	Thapathali, Rotary Club & near to Telecom	52	1	7	0	0	0	0	0	0	- Narrow road and closer to bus park
18	Dhapakhel Mod & Dholahiti Inclination	30	6	7	28	20	12	18	16	1	- Narrow road - Dirt Road
19	Jansewa, Nagsthan	15	1	0	10	4	0	8	4	4	- Because of Intersection
20	Babarmahal	21	1	7	14	11	2	25	15	7	- High speed, - Negligence of Driver

Source: Traffic Police
Note) Highlighted indicates the location inside the Ring Road

The following Figure 5.3.10 shows the location/section of black spots plotted on the map. Number of accidents at Koteshwor, where roads are intersecting in irregular angle and parking buses at roadside are hampering smooth traffic flow, is highest.



Source: Traffic Police

Figure 5.3.10 Ranking and Location/Section of traffic black spots

(7) Findings from the Data

The below are the findings based on the data indicated in the previous pages.

- Total number of accidents is decreasing in the Valley while increasing in the surrounded cities.
- Number of accidents with fatal and serious injury is decreasing.
- Most of the accident is caused by the drives behavior such violent against the traffic rule, and cause by other reasons such as road condition is very few.

- Most of the accident is occurred by private vehicles. Accident by public transport such as mini & large bus caused by mechanical problem.
- Most of the accident occurs at or out of the Ring Road, and focusing inside the Ring Road, around Singhdurbar will be the most severe section.

5.3.5 Road Traffic Laws and Regulations

Table 5.3.4 gives the laws related to traffic safety as well as their outline.

Table 5.3.4 Outline of the Act Relate to Traffic Safety

Name of the Act	Outline
Public Road Act, 1975 (PRA)	This Act authorizes the DOR to keep the road free from any obstacle that may hamper safe vehicle movement. DOR is also responsible to the management and control of encroachment within the Right of Way. Any works within the difined right of way such as installation of service lines or opening of access roads need prior approval from the DOR. The DOR is also empowered to fix the limitaion of vehicle weight and control the movement of overloaded vehicles on the roads considering the increasing problem of overloaded vehicles on the roads.
Vehicle and Transportation Management Act, 1993 (VTMA)	The main objectives of VTMA are to prevent vehicle accidents, ensure compensation to people affected by accidents, manage insurance and ensure easy and cost effective transportation service. To fulfill this objective, it basically incorporates management of transport, vehicle, drivers, traffic, insurance, education and certification.
Vehicle and Transportation Management Regulations, 1999 (VTMR)	This Act states the vehicle standard, safety requirements and standard dimensions for public service vehicles, number of seats/height/width and folding provisions, fire extinguisher and emergency doors in public vehicles, insurance provisions and first aid kits, lock in good condition on doors and windows, shock absorbers in good condition, speed limits, axle load limits and driver change and refreshment provisions in long route driving.
Local Self Governance Act, 1999 (LSGA)	District Development Committees (DDC) and the Municipalities are empowered to manage district and urban roads. In considerations of road safety, they plan and implement clearing of the road from obstacles, confiscation of stray animals, fixing of streetlights, provision of parking facilities, and control of the registration of non-motorized vehicles. To manage the construction and maintenance of district and urban roads, the DDCs and Municipalities are supported by the Department of Local Infrastructure and Agricultural Roads (DOLIDAR).
Roads Board Act, 2002 (RBA)	Through this Act, a separate Roads Board Nepal (RBN) was established to manage road fund for planned maintenance of roads. According to this act, the RBN needs to evaluate the performance of roads through customer's satisfaction survey. Customer satisfaction survey is basically focused on getting feed back from all road users including pedestrians, public tranport operators, drivers of motorized and non motorized vehicles, road neighbors, traders, insurerers, vehicle manufacturers and repair centers, vulnerable groups (disabled persons), academia, and representatives from the media. Road safety features shall be important indicators for evaluating performance and the outcome of such survey will help in developing the future strategy for funding road safety programs.

Source: http://nepalroadsector.cartierconsult.com/legislation-and-policies

Table 5.3.5 Manuals Relate to Traffic Safety

Name of the Manual	Outline/Purpose
Traffic Signs Manual Volume 1 & 2	A "Traffic Sign" in this Manual covers any object, device, line or mark on the road whose object is to convey to road users or any specified class of road users, restrictions, prohibitions, warnings or information, of any description. The terms Traffic Sign therefore include not only signs on posts but also road markings, delineators, road studs, traffic lights, signals, and all traffic control devices. This Manual defines the shape, design, place to locate and size of the "Traffic Signs".
Road Safety Audit Manual, 1997	The term "Safety Audit" in this Manual means "a systematic method of checking the safety aspects of road schemes in order to detect potential safety hazards before the road is open to traffic". Road safety audits assess how the road will work once it is open to traffic focusing on the safety of users –including pedestrians, cyclists, motorcyclists, truck and bus drives, car drivers, and others. A road safety audit report is produced which identifies any road safety deficiencies and recommends ways in which they can be overcome.

Source: Traffic Signs Manual Volume 1 & 2, Road Safety Audit Manual 1997

5.3.6 Nepal Road Safety Action Plan 2013-2020

The UN Road Safety Collaboration (UNRSC) was established in April 2004, to better address road-safety issues globally and subsequently the UN commission of Global Road Safety issued a call for a decade of action to be dedicated to road safety in its 2009 report. The UNRSC released a Global Plan for the Decade of Action for road safety 2011 to 2020 in May, 2011 as a response to the adoption by the United Nations General Assembly which proclaimed a Decade of Action for Road Safety in 2010.

The UN Global Action mandates member countries to develop their individual national plans for the decade (2011 to 2020) incorporating interventions under the following five pillars to road safety.

Pillar 1: Road Safety Management
Pillar 2: Safer Roads and Mobility
Pillar 3: Safer Vehicles
Pillar 4: Safer Road Users
Pillar 5: Post-Crash Response

The Global Action Plan recommends that countries develop their national action plans for the decade in a manner that is consistent with or can be carried forward to the regional plans. Nepal is one of the active members of the UN and also a signatory to the UN-ESCAP Meeting in Busan, 2010, Republic of Korea which required all the signatories to pledge a 35% reduction in both the number and casualties of Road Traffic Accidents (RTA) within their respective countries. Nepal has prepared its own Road Safety Action Plan 2013-2020 in recognition of this fact, and this action plan is in line to the Global Action Plan. All stakeholders are obliged to follow the Action Plan to improve and manage road safety in an integrated manner.

On the other hand, since the National Road Safety Council which had been set up in Nepal in the nineties is now defunct, there has been calls for the Council to be revived and given expanded jurisdiction and resources. Recently lawmakers, senior bureaucrats and traffic police have mooted plans for the establishment of a high-level road management board to improve traffic management in the Kathmandu Valley. While the first emphasis of such a body is traffic management, such measures do enhance road-safety as well and encourage horizontal coordination.

"Nepal Road Safety Action Plan 2013-2020" was proposed with a detailed formulation of the road safety strategy as one of the activities of this action plan. It also sets out the activities that concerned agencies need to implement in order to achieve the desired goal of reduction in road traffic injuries and associated economic losses to Nepal.

The outline of the Action Plan is given in Table 5.3.6.

Table 5.3.6 Outline of Nepal Road Safety Action Plan 2013-2020

Activity	Objective	Major Activates
Pillar 1: Road Safety Management	To set up a mechanism to improve capacity to manage road safety through, adoption UN legal instruments, creation of regional road safety instruments, improve horizontal coordination amongst stakeholders, develop sustainable road-safety strategies and accident reduction targets, and improve accident data collection and research	• Establish the National Road Safety Council with sweeping authority. • Train stakeholders • Amend the VTMA1993, LSGA1999 and develop various guidelines. • Develop national road safety strategy and its implementation modality. • Reliably and scientifically compile and analyze the RTA statistics and research on countermeasures.
Pillar 2: Safer Roads and Mobility	To improve the inherent safety bottlenecks of the road network for all road users, especially the most vulnerable groups (e.g. pedestrians, bicyclists, and motor-cyclists). This will be achieved through: • Adoption of UN and international standards for the design of safe roads • Road safety audits and assessments • Incorporating safe design practices during design, construction and operation of roads	• Develop a safety audit manual for non-strategic roads and gradually enforce safety audits on all roads, strategic and non-strategic. • Introduce compliance policy for safety audit recommendations, strategic and non-strategic. • Develop design guidelines for safer roads and construct required infrastructure. • Investigate accident black spots for all road types and construct appropriate countermeasures. • Enforce work-zone safety from construction to defect liability period in all road project contracts. • Establish road-safety units in DOLIDAR and Valley municipalities. • Train stakeholders
Pillar 3: Safer Vehicles	To Promote the universal adoption of both the active and passive technologies that are available for safe vehicles through harmonization with global standards, publicity and incentives to the consumers for their adoption.	• Develop and implement a safe-vehicle guideline through a task-force • Develop and introduce standards for safe vehicles, spares. • Amend VTMA1993 and VTMR1994 and develop national transport policy to reinforce safer vehicles. • Review route permit procedure. • DOTM institutional development • Financial incentives to promote in-vehicle safety devices. • Improve vehicle inspection procedure • Research major public vehicle accidents, school bus safety and initiate mitigation measures. • Basic repair and maintenance training for public vehicle drivers.
Pillar 4: Safer Road Users	To develop comprehensive programmes to improve road-user behavior through, • Sustained, stronger enforcement of traffic rules • Sustained road-safety awareness campaigns • Increased effort to improve the use of seat belts and helmets • Introduce better speed control • Heavy penalty to undisciplined road users including pedestrians	• Amend VTMR1993, VTMA1997 to invigorate safe road users • Strictly enforce the rules on use of seat-belts, helmets, and public transport safety and develop comprehensive code-of–conduct for all road users. • Public awareness campaign and research for all road users • Introduce road safety education in the school curriculum with regular revisions. • Train drivers and other road-users. • Improve driving license procedure. • Establish road-safety units in the DOTM and institutional development of the traffic police. • Construct modern ddriver training centers and capacity enhancement.
Pillar 5: Post-Crash Response	To improve the post-crashe response, improve capacity of the health-care system to provide emergency treatments and long-term rehabilitation for crash victims.	• Introduce a toll-free telephone number for medical emergencies • Develop ambulance policy for post-accident treatment and emergency treatment training • Develop strategy and introduce revolving fund for RTA victims and the disabled. • Open trauma care center and training for RTAs. • Develop & introduce comprehensive injury surveillance system in hospitals, health centers. • Develop ambulance network along the major highways, urban and rural roads.

Source: Status Paper on Road Safety in Nepal

5.3.7 Activity of Donors

(1) World Bank

World Bank (WB) is now conducting a project named "Consulting Services for Road Transport Safety and Axle Control Study in Nepal". The outline is shown in Table 5.3.7.

Table 5.3.7 Outline of World Bank Project

Items		Description
Project Title		➢ Consulting Services for Road Transport Safety and Axle Control Study in Nepal
Objective		➢ To assess and improve the road transport safety and axle load control mechanism form the transport management perspective.
Components		➢ (PART-A) Implement the actions identified in the road safety action plans to minimize road accidents through strengthening the road safety components related to road safety management including legal provisions; safer vehicles, safer roads, and safer road users. ➢ (PART-B) Access and analyze the axle load control issues and recommend the appropriate provisions in the law and enforcement for overloading control in Nepal. The recommendations of the overloading control measures should be compatible with legal provisions or it may be in the form of provisions for the amendment of legal clauses in the existing Acts and Regulations.
Major Tasks	PART-A	➢ Identify and prepare amendments required in MVTMA-1993 & MVTMR-1994 and other documents ➢ Develop safe vehicle guidelines ➢ Review the existing and develop adequate insurance policy ➢ Review of existing route selection and permit procedure ➢ Review and prepare guideline for the establishment and operation of driving schools, driving licenses, etc. ➢ Assess the existing accident data ➢ Review and update the existing standard road traffic signs ➢ Review and prepare the comprehensive code of conduct for all road users. ➢ Review and develop standard manuals for designing, implementing and evaluating road safety awareness campaigns.
	PART-B	➢ Review and recommend on the of institutional, regulatory and entrepreneurial aspects for the effective axle load control ➢ Assess the freight flow pattern in the strategic road network with due consideration to cross border freight, industrial corridor, mega projects, and identify the important locations for the axle load control stations. ➢ Review the existing load and gross vehicle weight limits for various wheel combinations and recommend the permissible axle loads or gross vehicle weights based on the international and regional practices ➢ Review, assess and recommend the charges/fees/fines with suitable payment modalities for vehicle overloading including a standard process through which such charges/fees /fines could be updated on the regular basis. ➢ Prepare vehicle overload control guidelines for DOTM officials ➢ Assess economic impact of axle load and or vehicle overloading on road pavement, road life cycle cost, traffic accidents, and vehicle operation cost and vehicle life and prepare a report. ➢ Assess the requirements of a standard Axle Load Control Management Information System (ALC-MIS) to be used in the axle load control stations and with automatic transmission of data to the central database. Developing draft TOR for procuring services for the development and implementation of such a service. ➢ Conduct workshops/meetings/interactions/with the concerned stakeholders.

Source: Draft Terms of Reference for Consulting Services for Road Transport Safety and Axle Control Study in Nepal

5.4 Freight Traffic

(1) Freight Traffic Survey

In this study, freight traffic survey was conducted at the cordon line survey points which were the same locations for the survey points of Data Collection Survey. Objective of the survey is to capture the freight movement inside Kathmandu Valley, and to analyze measures for streamlining the freight movement. Location of survey points are shown in the Appendix.

The method of survey was interview of the truck drivers at survey points by sampling the vehicles. Vehicles were categorized into Light Truck, Medium Goods Vehicle (MGV) and Heavy Goods Vehicle (HGV). Sample data was expanded using the freight traffic volume at each cordon line survey point. Total number of trucks crossing the cordon line and quantity of freight are shown in Table 5.4.1. Largest quantity of freight is carried by HGV, while largest number of trucks is light truck.

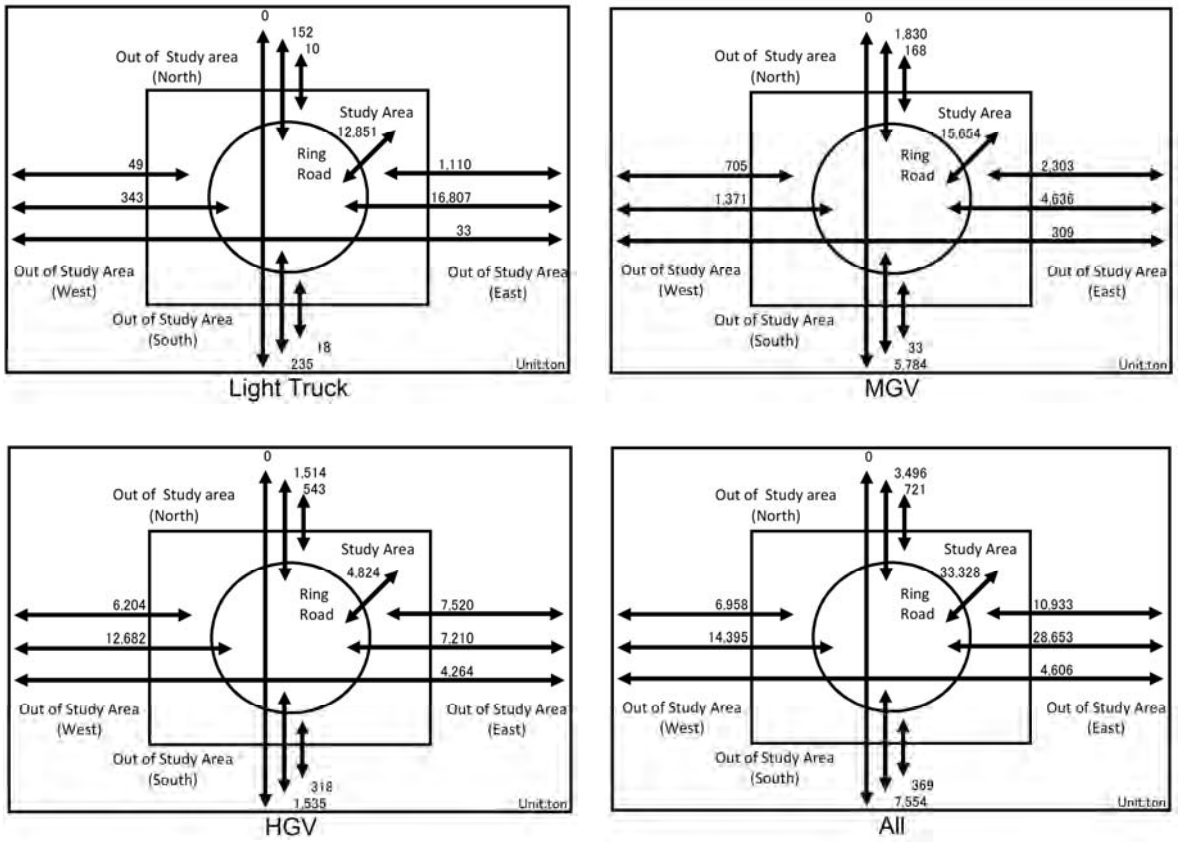
Table 5.4.1 Total Number of Freight Traffic Crossing Cordon Line

Type Of Vehicle		Light Truck	MGB (Medium Goods Vehicle)	HGV (Heavy Goods Vehicle)	Total
Number of vehicles	Number	13,633	7,488	5,552	26,673
	Percentage	51.1%	28.1%	20.8%	100.0%
Quantity of freight	Amount (t)	35,841	36,915	49,778	122,533
	Percentage	29.2%	30.1%	40.6%	100.0%
Average loading weight (t/vehicle)		2.63	4.93	8.97	4.59

Source: JICA Study Team

General movement of freight is shown in Figure 5.4.1. The following characteristics are observed.

- As a total, the largest movement to/from outside the valley is east, and next is west. North and south are rather smaller.
- Looking into vehicle type, movement of HGV to west is larger than east whilst movement of light truck and MGV to west is smaller than east. This shows that movement of smaller goods to eastern cities, Banepa and Dhulikhel, is frequent.
- Movement to inside the Ring Road is more than double the movement to outside the Ring Road in all the vehicle types.
- More than four thousand trucks are passing through Kathmandu Valley and almost all of them are HGV.



Source: JICA Study Team

Figure 5.4.1 General Freight Traffic around Kathmandu Valley

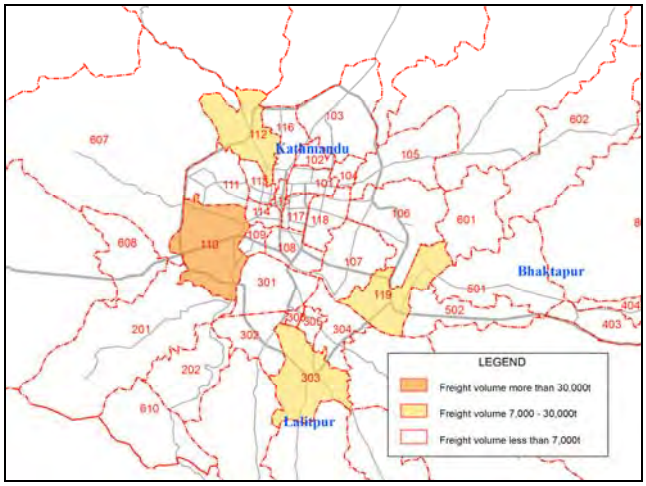
Table 5.4.2 shows the arrival and forwarding freight volume by traffic zone. Zone 110 is handling the largest volume. Most of the zones handling more than 5,000 tonnes are zones along the Ring Road. Zones outside the Ring Road, such as 702 and 703, also have large amount of cargo. These are considered to be overflow from along the Ring Road.

Table 5.4.2 Arrival and Forwarding Freight Volume by Zone

Unit: t

Zone	101	102	103	104	105	106	107	108	109	110	111	112	113
Arrival	220	33	849	0	3,381	4,509	1,210	119	483	11,810	637	4,821	85
Forwarding	191	137	184	62	1,457	876	823	216	884	25,303	586	2,898	0
Total	411	170	1,032	62	4,838	5,385	2,033	335	1,366	37,113	1,223	7,719	85
Zone	114	115	116	117	118	119	201	201	301	302	303	304	305
Arrival	533	0	950	159	145	6,654	162	3,534	947	802	3,577	4,810	927
Forwarding	93	0	827	348	16	3,138	200	2,435	595	188	4,280	1,040	648
Total	626	0	1,777	506	161	9,792	362	5,969	1,542	990	7,856	5,850	1,575
Zone	305	306	401	402	403	404	501	502	601	601	603	604	605
Arrival	0	0	642	1,060	929	13	1,634	64	164	3,828	646	2,651	2,820
Forwarding	0	0	2,236	670	203	399	611	17	131	1,651	739	2,661	2,543
Total	0	0	2,878	1,729	1,132	412	2,245	81	295	5,479	1,385	5,313	5,363
Zone	606	607	608	609	610	701	702	703	704	801	802	803	Total
Arrival	1,640	919	4,484	1,736	2,930	236	3,993	2,558	1,771	994	95	376	87,538
Forwarding	926	126	1,068	1,438	482	171	1,713	2,990	1,050	1,395	359	301	71,303
Total	2,566	1,045	5,552	3,174	3,412	407	5,706	5,548	2,821	2,388	454	677	147,606

Source: JICA Study Team



Source: JICA Study Team

Figure 5.4.2 Traffic Zones with Large Freight Volume

Number of vehicles by carrying commodity type is shown in Table 5.4.3. It is noted that 42% of trucks were carrying no commodity. Except the no commodity, construction material is the largest (15.5%), followed by miscellaneous (13.2%) and Agricultural (12.2%).

Table 5.4.3 Number of Trucks by Carrying Commodity Type

Commod-ity	No Commod -ity	Timber	Agricul -tural	Oil	Mineral or Earth and sand	Machin -ery	Chemi-cal	Construc -tion Material	Miscella -neous	Un-known	Total
No. of Trucks	11,264	848	3,247	442	1,780	679	748	4,125	3,519	21	26,673
Percentage	42.2%	3.2%	12.2%	1.7%	6.7%	2.5%	2.8%	15.5%	13.2%	0.1%	100.0%

Source: JICA Study Team

Table 5.4.4 shows the number of trucks at the east boundary of Kathmandu Valley (Jagati) and west boundary of Kathmandu Valley (Nagudhunga). At both survey points, percentage of no luggage trucks is high in the outgoing trucks. In regard to commodity type into Kathmandu Valley, agricultural products is high at the western border and construction material is high at the eastern border.

Table 5.4.4 Number of Trucks by Commodity Type at the Boundary of Kathmandu Valley

Direction		No luggage	Timber	Agricul-tural	Oil	Mineral or Earth and sand	Machin-ery	Chemi-cal	Construc-tion Material	Miscella -neous	Un-known	Total
Jagati (Bhaktapur East)												
Into KV	No. of vehicles	100	26	180	8	8	0	14	1,636	142	4	2,118
	Percentage	4.7	1.2	8.5	0.4	0.4	0.0	0.7	77.2	6.7	0.2	100.0
Out of KV	No. of vehicles	1,032	64	244	28	128	0	32	336	0	0	1,864
	Percentage	55.4	3.4	13.1	1.5	6.9	0.0	1.7	18.0	0.0	0.0	100.0
Nagdhunga												
Into KV	No. of vehicles	80	58	328	116	42	36	52	228	262	0	1,202
	Percentage	6.7	4.8	27.3	9.7	3.5	3.0	4.3	19.0	21.8	0.0	100.0
Out of KV	No. of vehicles	856	20	115	37	73	23	14	81	92	0	1,311
	Percentage	65.3	1.5	8.8	2.8	5.6	1.8	1.1	6.2	7.0	0.0	100.0

Source: JICA Study Team

(2) Carrier Interview Survey

Carrier interview survey was conducted to the companies affiliated to Truck Transport Entrepreneurs Association Nepal (ETTAN). Number of companies is 51 and total number of trucks owned by the companies is shown in Table 5.4.5.

Table 5.4.5 Number of Trucks by Type Owned by Carrier Companies

Type of truck	Number
Light truck	0
Medium goods vehicle	2
Heavy goods vehicle	154
Total	156
Average	3.1

Source: JICA Study Team

The number of vehicles obtained during the Data Collection Survey in 2012 is shown in Table 5.4.6.

Table 5.4.6 Number of Vehicles in Kathmandu Valley in 2011

	Motorcycle	Passenger Car	Truck	Car Total	Vehicle Total
Number of Vehicles	448,600	52,200	4,800	57,000	505,600
Ownership Level (vehicle/1,000 persons)	183.5	21.4	2.0	23.3	206.9

Source: Data Collection Survey, 2012

Total number of trucks in study area is 4,800 whereas number of trucks owned by carrier companies is 156. Only 3% of trucks are operated by freight carriers and most of the trucks are operated by individual companies or shops.

(3) Issues on Freight Traffic

Presently, large trucks are prohibited from entering inside the Ring Road from 5:00 to 22:00 to alleviate traffic congestion and to protect the environment. The consequence of the traffic control is that trucks arriving during the closed period are parked along the Ring Road or the peripheral area of the Ring Road. Facilities and spaces for trans-loading to smaller freight vehicles are needed for systematic freight Transport.

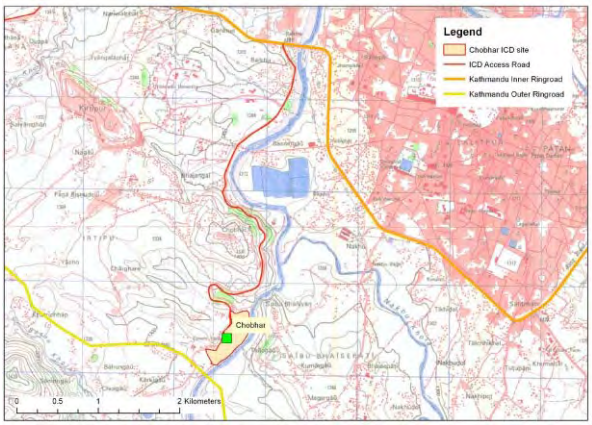
Carrier industry in Nepal is immature and commodities are carried individually. This results in high rate of vehicles carrying no commodity. Enhancement of cooperative transport is necessary for the efficient transportation.

(1) Nepal Trade Facilitation and Logistics Improvement Study

WB is now conducting the study for the improvement of logistics and issued “Nepal Trade Facilitation and Logistics Improvement Study”, January, 2014. The objective of the study is to improve trade competitiveness and facilitate trade by improving trade facilitation and logistics infrastructure frameworks, systems and processes, especially along the key Kolkata-Raxaul-Birgunj-Kathmandu corridor.

Through evaluation of the logistics systems options, the report recommends Inland Clearance Depot (ICD). An ICD within the Kathmandu Valley provides an opportunity for international trade to move under transit terms between entry gateway ports i.e. Kolkata Port, through the Indian-Nepal border posts, to clearance in Kathmandu. It is likely that this transit arrangement would fall under the current Nepal and India Trade and Transit Agreement, suitably amended to incorporate the new ICD transport corridor. This will require the ICD to be designated a Customs station/location.

Five candidate locations were selected and comparative evaluation was conducted. The recommended location was Chobar site along the Dakshinkali Road.



Source: Nepal Trade Facilitation and Logistics Improvement Study, WB, 2014

Figure 5.4.3 Location of Chobar Site

Major infrastructure of the proposed ICD are as follows:

- Overall size - 8ha;
- Tarmac areas - 4.3ha;
- Transit warehouse - 3.1ha;
- Warehouses – 4ha (2 x 2h);
- Container and open storage area – 2.5ha (indicative 100 TEU storage);
- Equipment workshop; and
- Administration (management, agents, canteen) – 8.6ha.

The envisaged layout of the logistics truck park is shown in Figure 5.4.4.

Source: Nepal Trade Facilitation and Logistics Improvement Study, WB, 2014

Figure 5.4.4 Layout of Logistics Truck Park

5.5 Issues on Traffic Condition

5.5.1 Overview of the Current Traffic Problems

As a result of reviewing policies, plans, and projects, which are relating to transport, land use, environment and institutional framework, and as a result of an analysis of data obtained from the survey conducted by the JICA Study Team and other organizations, the current issues related to traffic condition and problems can be summarized as follows.

The government of Nepal has made a great effort on road infrastructure improvement in the Kathmandu Valley with technical and financial assistance by the donors. For example, the progress of projects such as Arniko Highway, the Ring Road and On-Going Kathmandu Valley Urban Road Development Program is expected to contribute to the building of a framework of urban transport network and to alleviate traffic congestion. However, the increase in traffic demand and population was so rapid that infrastructure provision cannot catch up with the demand and a number of traffic problems remain serious.

Firstly, currently the major road traffic problems are traffic congestion and traffic accidents in the highly populated urban areas inside the Ring Road. Both problems are attributed greatly to the inadequate road infrastructure that cannot cope with the rapid increase in population and traffic demand. For example, low density of road network in the urban area, lack of bridges crossing rivers, lack of signalized intersections, lack of sidewalks with enough width, lack of bicycle lanes, lack of paved roads, lack of off-road parking and off-road bus-terminals. Such inadequacy of the road infrastructure leads to not only long and unstable travel time for all travel modes, but also environmental and socio-economic problems such as air pollution, inefficient economic activity, unemployment and difficulty in the social participation for all citizens, and high risk of fatalities in case of natural disasters such as earthquakes. Based on the growing population and economy, it is surely assumed that the current tendency of increasing traffic demand would continue for the next decade.

Secondly, from the view point of transport management, one of the crucial problems is inefficient and unreliable operation of bus transport. Too many small-sized and old buses are being operated in urban areas inside the Ring Road and concentrating into the city center. As a result, this oversupply of bus causes a number of duplication of routes, congested roads and intersections full of buses at peak hours. In this situation buses are being operated at a slow speed with unstable arrival times during peak hours. Bus passengers ride on crowded and uncomfortable small-sized buses for long hours. It seems difficult to improve the current situation in the short term because there is a great number of institutional, technical, management problems and stakeholders. Enhancement of the improvement, in particular, enforcement of DOTM is one of the important issues. Through the KSUTP, the ADB has been tackling some of these problems from comprehensive viewpoints since 2008, but it is still on its way to commence the implementation of measures.

Thirdly, NMT (Non-Motorized Transport) is important in building a sustainable transport society environmentally, socially and economically. Nevertheless, NMT's use has been decreasing as a share among all travel modes although the Kathmandu Valley is an appropriate place for NMT due to its relatively plain and compact high-density urban areas. In recent years, trip length has become longer because of urban expansion to suburban areas not only in the plain lands but also in the hilly lands. In addition, because bus transport is not an attractive mode with overcrowded and slow operation, people use motorcycles for going to work and business instead of the bus. Economic growth has promoted the increase in motorcycle and car ownership. Moreover if people own motorcycles or cars, people tend to use it for not only middle or long distance trips but also for short trips instead of cycling and walking. In terms of cycling, appropriate infrastructures such as cycling lanes and cycle parks are not provided sufficiently while the government has a plan to install cycle lanes on the Ring Road and other trunk roads.

Finally, regarding the urban structure, if the current urban structure called a typical mono-centric concentration structure with expanding urban areas to the suburbs continued, it would be extremely difficult to improve the traffic problem. Current level of motorization in the Kathmandu Valley is still low. The population growth will continue until 2030 together with vehicle ownership growth. Therefore if the urban structure is not changed, the urban area would expand more along the radial roads. As a result, using NMT would become difficult by longer trip length, and increase of traffic demand into the city center would be accelerated. Moreover, it would become more difficult for public transport to provide appropriate services efficiently to dispersed expanding urban areas and the public transport service would become fewer. Therefore, people would be more dependent on private transport. Under the constraint of road and transport investment budget the government cannot improve road infrastructure to catch up with the traffic demand continuously. Lastly, traffic problems associated with the urban structure would fall into the vicious circle of motorization. To avoid this unsustainable scenario, it is better for the increasing traffic demand in the future to reorganize and induce urban structure to maintain a compact city with multi-polar structure well organized as a whole. This scenario is a suitable urban structure for efficient public transport operation and NMT. It is necessary to demarcate the development areas and induce TOD scheme for the development of new towns and the redevelopment of existing urban areas.

5.5.2 Issues on Traffic Condition

Issues on traffic condition relating to socio-economic trends and land use trends can be summarized as shown in Figure 5.5.1. Urban transportation problems in the Kathmandu Valley are strongly related to land use problems such as urban sprawl in suburbs and overconcentration of functions in the city center. In order to improve transportation problems, it is necessary to deal with not only transportation infrastructure provision, but also traffic management measures from a wide view of urban structure rebuilding and land use planning.

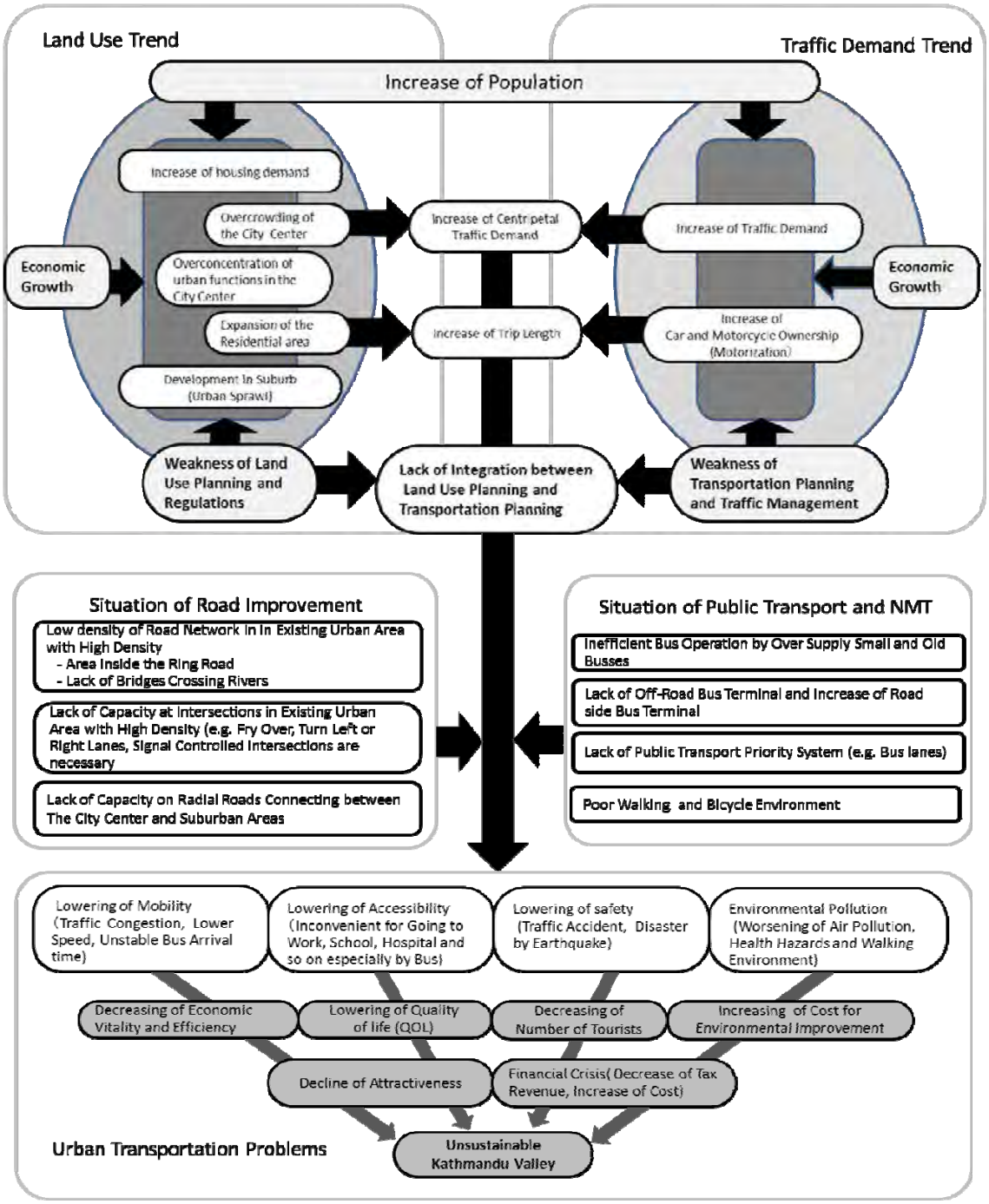


Figure 5.5.1 Urban Transportation Problems Relating to Land Use Problems

5.5.3 SWOT Analysis

In this study, a SWOT analysis on urban transport in Kathmandu Valley was applied in order to find some efective solutions for the traffic problems. Table 5.5.1 shows the result of the SWOT analysis. Based on the result of SWOT analysis, the following points are essential to attain the future sustainable transport in the Kathmandu Valley, by encouraging strengths and surmounting weaknesses.

- If the land use and transportation are effectively integrated through implementing strategic TOD

and maintaining compact urban areas, it is possible to shorten the travel distance, and to promote NMT and public transport use, as a result, and to alleviate traffic congestion and reduce travel time.

- If the reliable, rapid and comfortable public transport system which is not affected by road traffic congestion is provided, it is possible to provide the opportunities of social participation to a variety of people, especially to the people who do not use motorcycles or cars. As a result, it would enable the promotion of a wide range of social, economic and cultural activities.
- If the public transport and NMT are efficiently utilized, it is possible to:
  -reduce air pollution and secure the health of the people,
  -achieve harmony between transportation and the environment and attain an environmently friendly region,
  -reinforce the attractiveness as an international tourist site with world cultural heritages and landscape of Himalaya mountains
- If effective signal control systems, fly-over intersections and pedestrian bridges are installed to the bottlenecks such as intersections and bridges, it is possible to reduce traffic congestion and accidents.
- If the road network density within the Ring Road is improved, it is possible to secure the evacuation routes and emergency activities when a serious disaster occurs like earthquakes and shorten access distances to bus stops.
- If the above measures are combined well with activating of the tourist industry in Kathmandu Valley, the effect can be expected to greatly contribute to the regional economy. In this regard, TOD can provide the opportunity to improve the attractiveness of tourist sites particularly in Bhaktapur and Patan. Both of these areas have great potential as international tourist sites.
- In reality, it is difficult to improve transport infrastructute in the short term. Therefore, to improve traffic congestion and air pollution, comprehensive traffic management should be implemented from wide viewpoints. For example, a reorganization of bus operation towards efficient bus operation with the shift from small-sized bus to large bus, phasing out of old vehicles and introduction of proper exhaust gas regulation for vehicles should be impremented as ADB puroposed.
- Futhermore, motorcycles and buses are currently in the competitive situation as the main modes of the transport market in the Kathmandu Valley. Motorcycyle is a very flexible mode that can be used not only on narrow roads but also on steep slopes. Therefore, young men find motorcycles attractive, even for movements over short distances where there is interrupted and rough driving. From the viewpoint of traffic safety, motorcycles should be regulated in areas where there are many pedestirians like Tamel area. For example, restriction of routes or areas of operation, collection of parking fines on the trunk roads and collection of appropriate parking fees in the CBD should be introduced.

Table 5.5.1 Result of SWOT Analysis on Urban Transport in Kathmandu Valley

(Internal Factor) ■S（Strength） ■W（Weakness） (External Factor) ■O (Opportunity) ■T (Threat)		Strength S1: Metropolis (Accumulation of national function) S2: Many young generation S3: Adjacent to international airport S4: International tourist site (seven world heritages, landscape of and gate of climbing to Himalaya mountains) S5: Compact urban area within 10km and with high density	Weakness W1: Vulnerable transport infrastructure and serious traffic congestion especially at the intersection and bridges W2: Slow, unreliable and inefficient bus operation W3: Shortage of electricity W4: Weak building structure W5: Lack of development land W6: Long distance accessibility to bus stops in urban area
Oppor-tunity	O1: Population increase O2: Increase in foreign tourists O3: Continuous economic growth O4: Vehicle increase O5: Active housing development by private sector development 06:Diverse Assistance by partners	**[Strength-Opportunity Strategy]** **Maximize Opportunity by Utilizing Strength** ●Promoting TOD to integrate land use and tranport through technical and financial corporation of private sectors ●Facilitation of NMT by utilizing compact urban area. ●Attracting more foreign tourists through increasing the capacity of the international airport supported by development partners. Futhermore, increased attractiveness as an international tourist site and a gateway to Nepal should be improved through TOD.	**[Weakness-Opportunity Strategy]** **Minimize Weakness by Utilizing Opportunity** ●Promoting the shift from motorcycle to NMT and large size public transport through the introduction of a new public mass transport system with ample capacity and efficiency. Such new public transport system should be installed with TOD collaborated with public sectors. ●Obligatory road and parking lot for housing development by private sectors as part of development regulation.
Threat	T1: Risk by earthquake T2: Worsening of air pollution T3: Increase in traffic accident T4: Expanding sprawl into suburbs	**[Strength-Threat Strategy]** **Minimize threat by Utilizing Strength** ●Creating a safe and environmentally friendly region with the assistance of worldwide concerns and wisdom ●Securing international rescue base near the airport at the time of earthquake disaster (open spaces and schools in ordinary times) ●Preserving compact urban area by control and inducement of land use and enhancing NMT for young people to reduce the use of motorcycles and cars	**[Weakness-Threat Strategy]** **Minimize Weakness by Avoiding Threat** ●Reduction of disaster risk by multiple measures such as enforcement of emergency and evacuation road netowork with an appropriate density ●Reduction of air pollution by phasing out of old vehicles, introduction of exhaust gas regulation for vehicles, and promotion of NMT and public transport ●Reduction of traffic accidents by facilitation of signal intersection, fly-over intersection and pedestrian bridge