



Mainstreaming Disaster Risk Reduction in Megacities:  
A Pilot Application in Metro Manila and Kathmandu

## Sectoral Profile

Kathmandu Metropolitan City, Nepal

Activity I.1: Development of a Risk-Sensitive  
Land Use Plan for Kathmandu City

February 28, 2010



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# Contents

EXECUTIVE SUMMARY.....	1
About the Project.....	3
The KMC Risk-Sensitive Land Use Planning Project.....	4
CHAPTER 1. INTRODUCTION.....	5
1.1. Geography.....	5
1.2. History.....	5
CHAPTER 2. PHYSICAL ENVIRONMENT.....	7
2.1. Location.....	7
2.2. Land Area.....	7
2.3. Topography.....	8
2.4. Climate.....	8
2.5. Geology.....	8
2.6. Natural Hazards Identification.....	9
CHAPTER 3. POPULATION.....	15
3.1. Population Size and Annual Growth Rate.....	15
3.2. Population Distribution and Density.....	15
3.3. Household Population and Household Size.....	19
3.4. Population by Age and Sex.....	19
3.5. Population by Caste/Ethnicity.....	21
3.6. Migration.....	22
3.7. Women-headed Households.....	23
3.8. People with Disability.....	23
3.9. Situational Analysis.....	23
3.10. Challenges and Opportunities.....	24
CHAPTER 4. SOCIAL SECTOR.....	25
4.1. Education.....	25
4.1.1. Literacy Rate.....	25
4.1.2. Number and Type of Schools.....	25
4.2. Health, Nutrition and Family Planning.....	26
4.2.1. Health.....	26
4.2.2. Health Facilities.....	27
4.3. Social Welfare.....	27
4.4. Housing.....	27
4.4.1. Floor Area per Person.....	28
4.4.2. Occupancy Status.....	28
4.4.3. Informal Housing.....	29
4.5. Peace and Order.....	30



4.5.1. Police Protection.....	30
4.5.2. Crime Rate.....	30
4.5.3. Fire Protection.....	30
4.5.4. Traffic Management.....	31
4.5.5. Disaster Management.....	32
4.6. Situational Analysis.....	33
4.7. Challenges and Opportunities.....	34
<b>CHAPTER 5. ECONOMIC SECTOR.....</b>	<b>35</b>
5.1. Per Capita Income.....	35
5.2. Households below Poverty.....	35
5.3. Labor Force.....	35
5.3.1. Employment by Major Economic Activities.....	36
5.3.2. Child Labor by Major Economic Activities.....	36
5.4. Trade and Commerce.....	37
5.5. Agriculture.....	38
5.6. Tourism.....	39
5.6.1. World Heritage Sites.....	39
5.6.2. Tourist Facilities.....	41
5.7. Situational Analysis.....	42
5.8. Challenges and Opportunities.....	42
<b>CHAPTER 6. LAND USE.....</b>	<b>43</b>
6.1. Existing Land Use.....	45
6.1.1. Trends in Building Construction.....	47
6.1.2. Land Pooling.....	49
6.1.3. Urban Housing Development.....	49
6.1.4. Cultural and Heritage Sites.....	50
6.2. Land Use Trends.....	50
6.3. Situational Analysis.....	54
6.4. Challenges and Opportunities.....	57
<b>CHAPTER 7. INFRASTRUCTURE AND UTILITIES.....</b>	<b>59</b>
7.1. Transportation.....	59
7.1.1. Road Network.....	60
7.1.2. The Bishnumati Link Road.....	61
7.2. Drainage and Sewerage.....	61
7.3. Water Supply.....	62
7.4. Power.....	62
7.5. Telecommunications.....	63
7.6. Situational Analysis.....	63
7.7. Challenges and Opportunities.....	64
<b>CHAPTER 8. ENVIRONMENT.....</b>	<b>65</b>

8.1. Waste Generation Rate.....	66
8.2. Waste Collection Rate.....	67
8.3. Pollution.....	68
8.3.1. Air Pollution.....	68
8.3.2. Water Pollution.....	68
8.3.3. Industrial Pollution.....	69
8.3.4. Noise Pollution.....	69
8.4. Situational Analysis.....	69
8.5. Challenges and Opportunities.....	69
<b>CHAPTER 9. DEVELOPMENT ADMINISTRATION.....</b>	<b>71</b>
9.1. Organization and Management.....	71
9.1.1. Nepal Government Officials.....	71
9.1.2. Organizational Structure of KMC.....	72
9.2. The Political System.....	73
9.2.1. The National Government.....	74
9.2.2. The Local Government.....	74
9.2.3. Institutional Framework for Land Use Planning.....	74
9.2.4. Policy Environment for Land Use Planning.....	75
9.2.5. Planning Structures, Practices, and Types of Land Use Plans.....	76
9.3. Fiscal Management.....	76
9.4. Urban Development Projects.....	76
9.5. Situational Analysis.....	78
9.6. Challenges and Opportunities.....	78
<b>References.....</b>	<b>81</b>

## List of Tables

Table 1 KMC at a Glance.....	5		
Table 2.1 Land Area per Sector.....	8		
Table 2.2 Lives Lost Due to Different Disasters, 1983-2005.....	9		
Table 2.3 Modified Mercalli Intensity Scale.....	13		
Table 3.1 Population Projection by Ward, 2010-2020.....	16		
Table 3.2 Population Density per Ward, 1991 and 2001.....	18		
Table 3.3 Household Population and Household Size, 1991 and 2001.....	19		
Table 3.4 Population by Sex, 1991 and 2001.....	20		
Table 3.5 Population by Five-Year Age Group, 2001 and 2008.....	21		
Table 3.6 Population Age Group, 2008.....	21		
Table 3.7 Major Caste/Ethnicity, 2008.....	22		
Table 3.8 Major Languages Spoken, 2008.....	22		
Table 3.9 Major Religion, 2008.....	22		
Table 3.10 Population by Place and Birth, 2008.....	22		
Table 3.11 Percentage of Population with Disability, 2001.....	23		
Table 4.1 School-Educated Persons, 2001.....	25		
Table 4.2 Tertiary Graduates, 2001.....	25		
Table 4.3 Number of Schools, 2001.....	26		
Table 4.4 Number of Teachers, 2001.....	26		
Table 4.5 Primary and Secondary School Enrollment Rate, 2001.....	26		
Table 4.6 Higher School Enrollment Rate, 2001.....	26		
Table 4.7 Persons per Hospital Bed, 2001.....	27		
Table 4.8 Infant Mortality Rate (per '000 infants), 2001.....	27		
Table 4.9 Crude Birth Rate (per '000 population), 2001.....	27		
Table 4.10 Crude Death Rate (per '000 population), 2001.....	27		
Table 4.11 Floor Area per Person, 2001.....	28		
Table 4.12 Occupancy Status, 2001.....	28		
Table 4.13 Types of Housing Construction, 2001.....	28		
Table 4.14 Types of Housing Construction Materials, 2001.....	28		
Table 4.15 Crime Rate (per '000 population), 2001.....	30		
Table 4.16 Inventory of Personnel and Firefighting Facilities, 2009.....	31		
Table 5.1 Annual Average per Capita Income, 2001.....	35		
Table 5.2 Employment by Major Economic Activities, 2001.....	36		
Table 5.3 Unemployment Rate, 2001.....	36		
Table 5.4 Households Employing Domestic Child Labor by Caste and Occupation 2001.....	36		
Table 5.5 Number and Nature of Business Establishments, 2005.....	37		
Table 5.6 Households Operating Small Scale Non-agricultural Activities, 2008.....	38		
Table 5.7 Households Having Agricultural Land, Livestock and Poultry, 2008.....	39		
		Table 5.8 Tourist Arrival in Nepal, 2005-2008.....	39
		Table 5.9 Hotel Accommodation by Category, 2005.....	42
		Table 6.1 Urban Land Use, 1995.....	44
		Table 6.2 Land Area per Land Use Type, 2001.....	44
		Table 6.3 Registered and Approved Building Permits, 1999-2009.....	47
		Table 6.4 Purpose of Registered and Approved Building Permits, 2004-2009.....	48
		Table 6.5 Registered and Approved Building Permits by Lot Size, 2004-2009.....	48
		Table 6.6 List of Land Pooling Projects, as of 2009.....	49
		Table 6.7 Land Use Distribution, 2001.....	52
		Table 6.8 Land Area per Land Use Type, 2006.....	54
		Table 6.9 Areas under Different Land Use (in hectares).....	55
		Table 6.10 Percentage of Land Use Type per Ward, 2001.....	56
		Table 7.1 Vehicle Population, 2001.....	59
		Table 7.2 Vehicle Registration in Bagmati Zones, 1998-2006.....	60
		Table 7.3 Annual Vehicle Growth, 2000-2006.....	60
		Table 8.1 Waste Generation and Collection, 2004.....	66
		Table 8.2 Solid Waste Generation Rate per Ward, 2005.....	67
		Table 8.3 Physical Composition of Solid Waste, 2003.....	68
		Table 9.1 Legislative Seats by Party.....	71
		Table 9.2 Policies and Land Use.....	77
		Table 9.3 Sources of Revenue, FY 2000-2003.....	77
		Figure 1 EMI's Mainstreaming Framework.....	3
		Figure 2.1 Location Map.....	7

## List of Figures

Figure 2.2 Geographic Distribution of Recent Major Disasters.....	9
Figure 2.3 Epicentral Distribution around Nepal, 1255-2001.....	12
Figure 2.4 Faults and Lineaments in Kathmandu Valley.....	12
Figure 3.1 Population Growth Rate, 2001.....	17
Figure 3.2 Population Densities of Different VDCs and Municipalities.....	17
Figure 4.1 Slum and Squatter Location, 2006.....	29
Figure 4.2 Administrative Position of Fire Stations in KMC, 2009.....	31
Figure 4.3 Disaster Management Framework in Nepal.....	32
Figure 4.4 Dissemination of Earthquake Information and Disaster Management.....	33
Figure 5 Types of Industry Base, 2005.....	38
Figure 6.1 Proposed Land Use Map, 2001.....	45
Figure 6.2 Land Use Map, 2007.....	47
Figure 6.3 Building Permit Certificate Registered and Issued, 1999-2009.....	48
Figure 6.4 Land Use, 2001.....	51
Figure 6.5 Land Use Distribution, 2001.....	52
Figure 6.6 Land Use Map, 2006.....	53
Figure 6.7 Land Use, 2006.....	53
Figure 7.1 Sewerage Network Map, 2006.....	61
Figure 7.2 Utilities Map, 2006.....	63
Figure 8 SWMRM Organizational Structure.....	65
Figure 9.1 Organizational Structure of KMC Government.....	73
Figure 9.2. Entities Concerned with Land Use/Urban Planning.....	75

ADB	Asian Development Bank
BLR	Bishnumati Link Road

## List of Acronyms

CBS	Nepal Census Bureau of Statistics
CDIA	Cities Development in Asia
CDRC	Central Disaster Relief Committee
CDS	City Development Strategy
DKKV	Deutsches Komitee Katastrophenvorsorge
DDRC	District Disaster Relief Committee
DCL	Domestic Child Labor
DOTM	Department of Transport Management
DRA	Disaster Risk Assessment
DRMMP	Disaster Risk Management Master Plan
DRR	Disaster Risk Reduction
DUDBC	Department of Urban Development and Building Construction
EIA	Environmental Impact Assessment
EMI	Earthquakes and Megacities Initiative
EPA	Environment Protection Act
EPR	Environment Protection Rule
FFO	Federal Foreign Office
GoN	Government of Nepal
GTZ	German Technical Cooperation
ILO	International Labour Organization
IWO	Implementation Work Output
JICA	Japan International Cooperation Agency
KMC	Kathmandu Metropolitan City
KVERMP	Kathmandu Valley Earthquake Risk Management Project
KVMP	Kathmandu Valley Mapping Program
KVTDC	Kathmandu Valley Town Development Committee
LSGA	Local Self-Governance Act
LSMC	Lalitpur Sub-Metropolitan City
MBT	Main Boundary Thrust
MCT	Main Central Thrust
MFT	Main Frontal Thrust
MHO	Minister of Home Affairs
MMI	Modified Mercalli Intensity
MOC	Memorandum of Cooperation
MOF	Ministry of Finance
MOHA	Ministry of Home Affairs
MOLD	Ministry of Local Development
MPCO	Metropolitan Police Commissioner's Office
MPPW	Ministry of Physical Planning and Works
NSET	National Society of Earthquake Technology-Nepal
NTC	Nepal Telecommunication Corporation
NWSC	Nepal Water Supply Corporation
PIU	Project Implementation Unit
PWC	Project Working Committee

## Executive Summary

RSLUP	Risk-Sensitive Land Use Planning Project
SWMRMC	Solid Waste Management and Resource Mobilization Center
TNA	Training Needs Assessment
UDD	Urban Development Department
UDLE	Urban Development through Local Efforts
UEIP	Urban and Environmental Improvement project
UNEP	United Nations Environment Program
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
VDC	Village Development Committee
3cd	Cross-Cutting Capacity Development

This report is prepared by Earthquakes and Megacities Initiative (EMI) as part of its contractual obligations to the German Federal Foreign Office (FFO) thru the German Committee on Disaster Reduction (DKKV) to develop a risk-sensitive land use plan for Kathmandu Metropolitan City (KMC). The KMC Risk-Sensitive Land Use Plan is prepared under the project titled, “Mainstreaming Disaster Risk Reduction in Megacities: A Pilot Application in Metro Manila and Kathmandu.” The FFO/DKKV-EMI contract covers the Second Phase of the project undertaken from 1 March 2009 to 31 December 2009.

The Risk Sensitive Land Use Plan (RSLUP) for Kathmandu City and accompanying Sectoral Profile and Preliminary Zone Plan are the major outputs of Activity 1.1 of this project. The RSLUP was prepared as a collaborative undertaking between Kathmandu Metropolitan City (KMC), the Earthquakes and Megacities Initiative (EMI) and the National Society for Earthquake Technology - Nepal (NSET-Nepal). The overall goal of the project is to develop a rational land use plan of KMC that fully integrates disaster risk reduction within its spatial and physical development strategies, its regulatory and non-regulatory tools, and its related bylaws and procedures. The project demonstrates that land use planning is an effective tool to lessen the physical, social and economic vulnerabilities of a city. The Sectoral Profile compiles all the data and parameters necessary to develop the RSLUP. In addition, it provides relevant projections and trends of future growth. The outcome of this effort are summarize in this report, which serves as an annex to the main report of Activity 1.1 under the heading of Risk Sensitive Land Use Plan of Kathmandu Municipal City.

This report includes the following components:

- Executive summary;
- About the project;
- General information on Kathmandu;
- Profiles of the following sectors: Physical Environment, Population, Social, Economic, Land Use, Infrastructure and Utilities, Environment, and Development Administration; and
- List of references.

The Sectoral Profile is an official city document that presents a whole range of information about KMC. It provides a compendium of data and information on the physical, social, economic, cultural, infrastructure, environmental, and institutional characteristics of the city, including its disaster risk landscape, which can serve as a chief source of information for planning, research, investments, decision-making, and other purposes.

Part 1 provides a brief introduction about the document and a short narrative of Kathmandu City, its geography and history. Chapter 2 presents information on the natural physical environment of the city. Chapter 3 discusses the people of Kathmandu and the key features and trends of the city's growing population. Chapter 4 tackles the general condition of Kathmandu's social sector including the city's education, health and protective services. Chapter 5 presents an overview of the city's economy. Chapter 6 talks about the city's built environment. Chapter 7 focuses on the land use pattern in the city. Chapter 8 describes the infrastructure and utilities sector in Kathmandu. Chapter 9 discusses the development administration of KMC, including its legal and institutional arrangements.

The KMC Sectoral Profile contains primary and



secondary information collected from various agencies and organizations in Kathmandu and Nepal. The preparation of the profile required months of collecting official data, completing data gaps, generating and validating data, and performing data projections for future urban population and future demands for services and facilities in KMC. Majority of the information contained in the profile were collected from secondary sources and official documents such as the Nepal Census Bureau of Statistics (CBS), World Bank City Development Strategy (CDS), Kathmandu Valley Mapping Program (KVMP), JICA Study on Earthquake Disaster Mitigation in the Kathmandu Valley, and other relevant materials. Primary information was also collected by the KMC Project Working Committee (PWC) through field investigations, windshield surveys and direct observations in key areas of the city. Key informant interviews were conducted to collect information from representatives of various national and local agencies including KMC, Kathmandu Valley Town Development Committee (KVTDC), Ministry of Home Affairs (MOHA), Ministry of Local Development (MOLD), Ministry of Physical Planning and Works (MPPW), Department of Roads, Department of Transport and Traffic Management, and National Society of Earthquake Technology-Nepal (NSET), as well as international organizations such as the Japan International Cooperation Agency (JICA), German Technical Cooperation (GTZ), Urban Development through Local Efforts (UDLE), Cities Development in Asia (CDIA), among others.

The Sectoral Profile provides the necessary base information to support the intra- and inter-sectoral analyses for the development of KMC's risk-sensitive land use plan. Most of the decisions and situations made in the project were based on the facts and information contained in the KMC Sectoral Profile.

The KMC Sectoral Profile is not for the exclusive use of the project only. Other potential users of the profile include the KMC departments, offices and wards, the central government of Nepal and its ministries, local government

units, the academe, international developmental institutions, international and regional financial institutions, and other institutions and organizations involved in development work in Nepal. Even the private sector, business investors and citizens of Kathmandu may find the information presented in the Sectoral Profile useful for various purposes.

One major limitation of the document is the lack of timely and updated information about the city. This is partly due to the lack of regular data collection and data management system at the city-level in Kathmandu. The preparation of the KMC Sectoral Profile aims to initiate an effective, continuous and up-to-date data collection system in the city level. Hence, it should be seen as a living document that needs to be constantly revised and updated. As it is owned by the city and its people, anybody can add, update, revise, challenge or correct the information contained in the document in order to improve its accuracy, validity and reliability.

This report is a collective output of the PWC composed of technical specialists from KMC, NSET and EMI.

KMC entered into a formal partnership with

## About the Project

EMI in January 2005 with the signing of a Memorandum of Cooperation (MOC), which endorsed the participation of the city in EMI's Cross-Cutting Capacity Development (3cd) Program. Under the 3cd Program, EMI, along with its partner institutions, provided technical, managerial and technological assistance to structure and implement a citywide Disaster Risk Management Master Plan (DRMMP) for KMC. The DRMMP is EMI's disaster risk reduction mainstreaming model developed to promote the integration of risk reduction measures into local governance, advocating the idea that significant disaster risk reduction (DRR) occurs at the local level.

and systems that are already in place and making use of available resources. The 3cd Program promotes participatory and collaborative partnership in order to develop consensus, optimize the use of resources, and create local ownership and sustainability mechanisms. It also seeks to build from existing and previous initiatives and not to duplicate them.

The 3cd Program in Kathmandu was conducted from 2005 to 2007 as a collaborative project between EMI, Kathmandu Municipal City (KMC), and the National Society of Earthquake Technology, Nepal (NSET). It involved several international partners including the United Nations Development Program, Bureau of Crisis Prevention and Recovery (UNDP/

As shown in the DRMMP mainstreaming

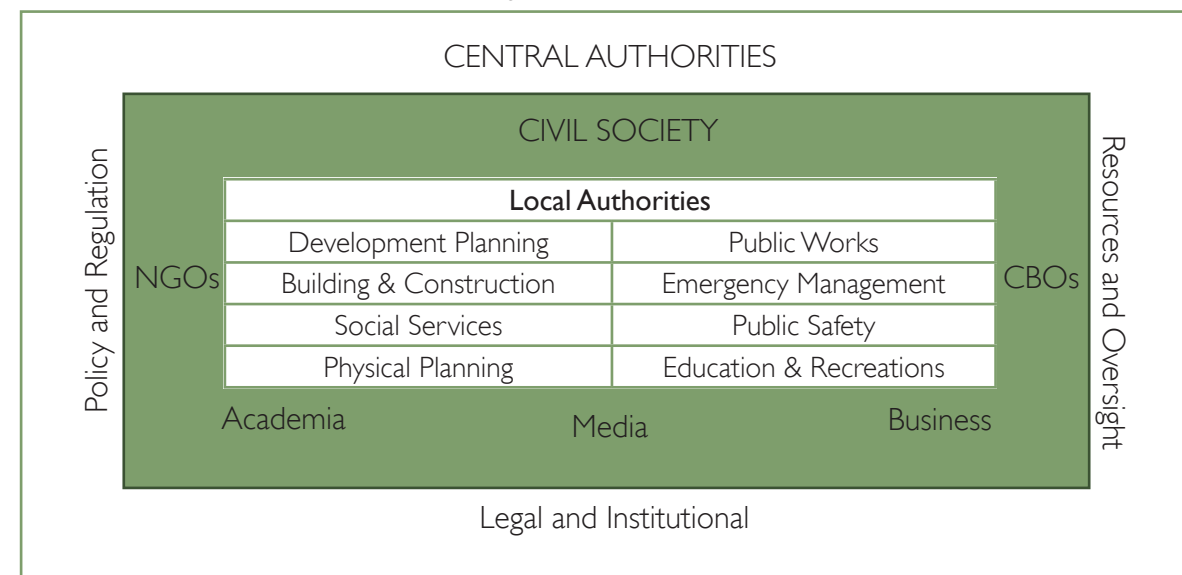


Figure 1 EMI's Mainstreaming Framework

framework, disaster risk reduction (DRR) can be effectively mainstreamed when local authorities integrate DRR measures and objectives in various aspects of local governance such as urban planning and investment programming. This framework also suggests that DRR can be mainstreamed in local governance by harnessing existing mechanisms, processes,

BCPR), ProVention Consortium, the Pacific Disaster Center (PDC), the Earthquake Disaster Mitigation Center (EdM/NIED) of Kobe, Japan, and EMI. NSET served as the Local Investigator of the 3cd Program in Kathmandu, while EMI and other partners provided technical and managerial assistance to help KMC in structuring and supporting disaster risk



# CHAPTER I. INTRODUCTION

management initiatives at the city level.

In Phase 1 of the 3cd Program, three field investigations in Kathmandu were undertaken: in September 2005, June 2006, and November 2006. It involved a series of investigative work, stakeholders' workshops, and discussions with various departments of KMC, as well as with local and national partner institutions. Reports from the 3cd Program are available on the EMI website ([www.emi-megacities.org](http://www.emi-megacities.org)). A preliminary city profile and a collection of sound practices from Kathmandu have also been compiled in EMI's cityriskpedia website ([www.cityriskpedia.com/?title=Kathmandu](http://www.cityriskpedia.com/?title=Kathmandu)). The DRMMP of KMC resulted in the proposed DRMMP framework, which is composed of four (4) Implementation Work Outputs (IWO) or priority areas for DRR in KMC and Kathmandu Valley, namely:

- IWO 1: Strengthen the organizational and operational disaster response, rescue and recovery capabilities of KMC and Kathmandu Valley.
- IWO 2: Incorporate hazards and disaster management parameters in land use and urban development planning.
- IWO 3: Provide technical and managerial support to KMC in developing a process for Building Code implementation.
- IWO 4: Develop KMC-specific risk communication and information technology tools.

The KMC Risk-Sensitive Land Use Planning Project (RSLUP) takes the DRMMP forward as it addresses IWO No. 2.

## The KMC Risk-Sensitive Land Use Planning Project

The RSLUP was prepared as a collaborative undertaking between Kathmandu Metropolitan City (KMC), the Earthquakes and Megacities Initiative (EMI) and the National Society for Earthquake Technology - Nepal (NSET-Nepal). It is undertaken with support from the German FFO through German Committee for Disaster

Reduction (DKKV) in a multiple activity project untitled "Mainstreaming Disaster Risk Reduction in Megacities: A Pilot Application in Metro Manila and Kathmandu." This particular element of the project relates to Activity 1.1 Developing a Risk Sensitive Land Use Plan for Kathmandu Municipal City.

The overall goal of RSLUP is to ensure that the detailed land use plan of KMC fully integrates DRR provisions and emergency management considerations, particularly in its spatial and physical development strategies, regulatory and non-regulatory planning tools, and other related bylaws, regulations and procedures. The project also aims to improve the capacity of KMC's Urban Development Department (UDD) in terms of incorporating risk information and parameters in KMC's planning process and procedures. It likewise aims to open avenues for other national and local partner institutions such as the KVTDC, Department of Urban Development and Building Construction (DUDBC) of the Ministry of Planning and Public Works (MoPPW), the Ministry of Local Development (MoLD), the neighboring municipalities and cities, international development partners in Nepal, and other stakeholders to take an active part in formulating the risk-sensitive land use plan of the city. This planning project facilitated knowledge sharing with these institutions and offered KMC the necessary capacity, institutional support and conducive environment to sustain the planning process even up to the stage of plan implementation.

## 1.1. Geography

Kathmandu is the capital city of Nepal and its under the jurisdictional authority of the Kathmandu Municipal City (KMC), which as local government institution needs to carry several duties and responsibilities to its citizens including the development and implementation of the land use plans. Kathmandu is the historic, political, commercial, cultural, and tourist center of the country. It is the largest city in Nepal and the cosmopolitan heart of the Himalayan region. The principal language in the city is Nepali and the major religions are Hinduism and Buddhism. With a history and civilization dating as far back as 2,000 years ago, the city, along with the other towns and villages in Kathmandu Valley, ranks among the oldest human settlements in the central Himalayas.

Kathmandu has a multi-ethnic demography although Newars, one of the indigenous groups, still comprise a large segment of the population. Old Kathmandu corresponds to the current City Core, encompassing a compact zone of temple squares, court yards and narrow streets. The Durbar Square, the old king's palace complex, is located at the center of Old Kathmandu and is a designated UNESCO World Heritage Site.

## 1.2. History

In ancient times, Kathmandu Valley was once a lake surrounded by hills. People believed that the lake attracted pilgrims from all over because of the historic visits of different Buddhas in various eras in the past. It was said that the valley was created upon the arrival of a saint

Table I. KMC at a Glance  
Source: KMC Website

Country	Nepal
Region	South Asia
Longitude/Latitude	850 20' East / 270 42' North
Elevation	1,350 meters above sea level
City Area	5,076 ha (51 sq. km.)
Population	671,846 (CBS 2001)
Annual Growth Rate	4.53%
Population Density	13,225 / sq. km.
Number of household	152,155(CBS 2001)
Per capita income	360 US\$
Major religions	Hinduism, Buddhism
Principal Language	Nepali, Nepal Bhasa (Newari)
Number of wards	35
Number of sectors (by road addressing)	N5 (Core, Central, North, East, West)
Number of World Heritage sites	4

## CHAPTER 2. PHYSICAL ENVIRONMENT

named Manjushree who used a sword to let out the water from the lake by cutting open a portion of the southern rim of the valley at Chobhar Gorge. Civilization then started to emerge on the fertile lake bed of the valley.

Archeological remains from Hadiagaon, a suburb of Kathmandu, show that the valley ranks as one of the oldest human settlements in central Himalaya. Various types of pottery, bricks, structures and art objects from 167 BC to 1 AD were discovered in the excavations. Stone Age tools have also been unearthed in the southern part of the valley in the village Lubhu.

During the Lichhavi dynasty (300 - 879 AD), Kathmandu existed as two adjoining settlements, Yambu and Yangal. Yambu (Yamby - “northern land” in Newari language) or Koligram forms the northern half of Kathmandu. It is presently the north area of Makhan Tole which is next to the Durbar Square. The southern sector Yangal was also known as Dakshin Koligram. It is now a name of a locality in the southern part of the city.

King Gunakama Deva established Kathmandu in the 10th century at the sacred confluence of the Bagmati and Bishnumati rivers by absorbing the first settlements of Yambu and Yangal. The town was laid out in the shape of Manjushree’s sword and the temples of the eight mother goddesses defined its perimeter. The temples still stand to this day.

Old Kathmandu (Kasthamandap) corresponds to the current city core. It has a compact network of temple squares and narrow streets lined with multi-storey houses. The old king’s palace complex, Durbar Square, occupies the center of the old city. The northern section is marked by Thanhiti (the stone spout). The southern section is marked by Koheti (the lower stone spout). Centuries-old stone spouts are scattered around the city and are still a major source of drinking water for the inhabitants.

The rich cultural heritage of Kathmandu, such as the soaring pagodas, ancestral houses, exquisite open-air shrines and courtyards filled

with brilliant sculptures were put together during the Malla period (1200-1768 AD). Kathmandu was already a relatively large city by that time. A Capuchin missionary named Father Giuseppe who was lived in Kathmandu in the 1760’s wrote that ‘Catmandu’ contained about 18,000 houses.

The catastrophic earthquake of 1934 destroyed parts of the city but these had been rebuilt to almost like the original since then. From the 1980s onwards, the city has been spreading out on the surrounding farmland in an unprecedented building frenzy. The capital now consists of new settlements, medium- and high-rise buildings, and residential suburbs along the fringes.

### 2.1. Location

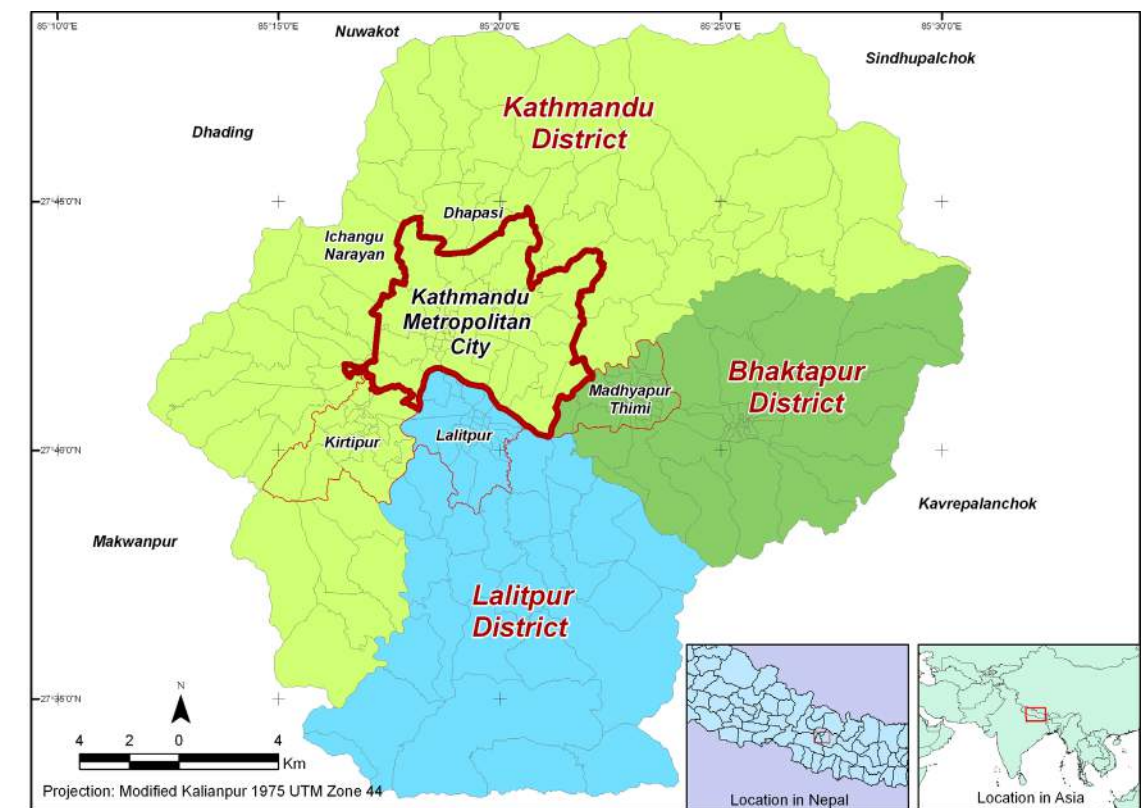
KMC is located in Kathmandu District, Bagmati Zone, Central Development Region of Nepal. Situated in the northwestern part of Kathmandu Valley, it is bounded by the Madhyapur Thimi Municipality, Gothatar Village Development Committee (VDC) and Kapan VDC in the east, Ichangu Narayan VDC, Sitapaila VDC, Khadka Bhadrakali VDC, Mahankal VDC and Siuchatar VDC in the west, Lalitpur Sub-metropolitan City in the south, and Gongabu VDC and Dhapasi VDC in the north. Snow-covered mountains rise

behind the green hills in the north to provide an awe-inspiring backdrop to the city. The city is located at 27°42’ north Latitude and 85°20’ east Longitude.

### 2.2. Land Area

KMC is divided into five sectors: Central, East, North, West and the City Core. Administratively, the city is divided into 35 Wards (Annex 1.1).

The city covers a total land area of 5,076.6 hectares (roughly 51 square kilometer) with a



Kathmandu Valley Location Map  
Source: Kathmandu Metropolitan City Government

Map and projection modified by EMI-GIS, 2010

Figure 2.1 Location Map  
Source: Modified by EMI-GIS, 2010



**Table 2.1 Land Area per Sector**  
Source: KMC Ward Profile, 2005

Sector	Ward No.	Land Area (hectares)	%Share
Total	Kathmandu	5,076.60	100
Central	1	138.4	2.73
	5	79	1.56
	11	183.9	3.62
	31	103.7	2.04
	32	128	2.52
	33	85.7	1.69
	Total	718.7	14.16
East	6	366.8	7.23
	7	153.5	3.02
	8	253.8	5
	9	301.9	5.95
	10	156.8	3.09
	34	232.1	4.57
	35	395	7.78
	Total	1859.9	36.64
North	2	81.3	1.6
	3	329.7	6.49
	4	324.1	6.38
	16	437.4	8.62
	29	218.6	4.31
Total	1391.1	27.4	
City Core	17	65.7	1.29
	18	18.9	0.37
	19	15.5	0.31
	24	8.9	0.18
	25	10.3	0.2
	26	4	0.08
	27	7.6	0.15
	28	6.8	0.13
	30	25.4	0.5
	12	51	1
	20	15.7	0.31
	21	15.4	0.3
	22	18.8	0.37
23	10.2	0.2	
Total	274.2	5.39	
West	13	213.3	4.2
	14	302.9	5.97
	15	316.5	6.23
	Total	832.7	16.4
Total	Kathmandu	5,076.60	100

built-up area of 3,844.56 hectares. Ward No. 16 is the biggest ward in terms of land area with 437.4 hectares. It encompasses the Balaju industrial zone in the northern section of the city. The second largest ward is Ward No. 35 with 395 hectares and includes the Koteswar region located in the eastern section of KMC. The urban core areas of KMC are Wards No. 12, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, and 30. The other remaining wards are considered as urban fringe areas.

### 2.3. Topography

Kathmandu Valley is a bowl-shaped valley with rivers draining towards the centre of the basin. The rivers merge into the Bagmati River, which starts from the Bagdwar in the northern part of the city and drains out through the Chobhar Gorge located at the southwest corner of the valley. The eight rivers that meander through the city are Bagmati, Bishnumati, Dhobi Khola, Samakhusi, Tukucha, Bhaucha Khusi, Balkhu and Manamati. Kathmandu Metropolitan City lies at an average altitude of 1,350 meters above sea level.

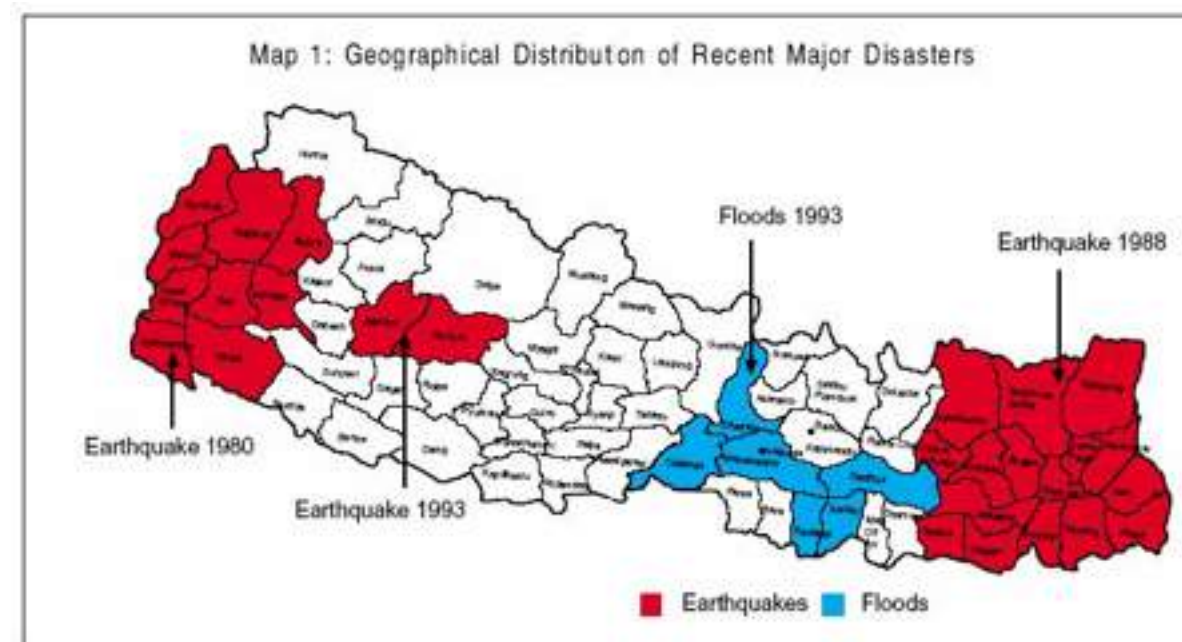
The city has two principal landforms, namely, alluvial plains or floodplains along the rivers and the slightly more elevated river terraces locally called “tars”. The city area is generally flat, with slopes of less than 1 degree, and the soils are predominantly loamy and boulder texture (Haack and Khatiwada, 2007).

### 2.4. Climate

KMC has a temperate climate and experiences four seasons a year. Temperature ranges between 1°C during winter and 35°C in summer. The annual rainfall is 1,407 millimeters, with most of it occurring during the rainy months of June, July and August.

### 2.5. Geology

The geology of Kathmandu makes it vulnerable to natural hazards. The basement rock of KMC is covered by a thick 500-meter, semi-



**Figure 2.2 Geographic Distribution of Recent Major Disasters**  
Source: UNDMI, 2001

consolidated fluvio-lacustrine, a soil type that makes KMC unstable. The liquefaction potential of areas along river banks is high. Kathmandu is also facing the threat of several natural hazards such as flooding, landslides, river erosion and earthquakes.

### 2.6. Natural Hazards Identification

According to the Kathmandu Valley DRM Profile (EMI, 2005), the most frequent natural disasters in Nepal are flood, landslide, and

fire causing loss of life and severe damage to property. The middle hills are mainly prone to landslides while the flat Tarai region is susceptible to flood and fire. While earthquakes are not frequent historically, Nepal has experienced several destructive earthquakes with more than 11,000 people killed in four major earthquakes just in the past century. Nepal’s recently developed and published “Three-Year Interim Plan (2007-2010)” recognizes disasters as one of the major impediments to national development. It tries to address disaster risks by devoting one separate chapter on Disaster Risk Management (Chapter 26). DRM issues were also noted in chapters pertaining to other development sectors i.e., social, economic, infrastructures, Institutional and environmental sectors

### Flood, Landslide and Debris Flow

There are more than 6,000 rivers and streams in Nepal, most of which flow from north to south generally at high velocity due to steep river gradient. The majority of the larger rivers are snowfed from the Himalayas. Since the topography of the country is steep and rugged,

**Table 2.2 Lives Lost Due to Different Disasters, 1983-2005**

Source: Dhakal, 2006

Type of Disaster	1983-2005
Earthquake	727
Flood and landslide	6,982
Fire	1,191
Epidemics	11,933
Wind & Hailstorm, Thunderbolt	622
Avalanche	116
Stampede	71
Total	21,642

with high-angle slopes and complex geology, large quantities of rainfall during the monsoon season lead to floods, landslides, and debris flows in a number of cities. Costly yet ineffective land conservation causes flooding and landslides. Unplanned settlements and structures built without consideration of natural hazards aggravate the situation. In addition, landslides caused by torrential rains add enormous volume to streams and rivers causing floods and debris flows downstream that kill numerous people and inflict immense harm to agricultural lands, crops, and properties.

In July 1993, the Tarai region experienced a destructive flood which claimed the lives of 1,336 people and affected another 487,534. In 1998, floods and landslides struck various parts of the country, mainly the Tarai and middle Hill regions, killing 273, injuring 80, and impacting 33,549 families. The floods and landslides also ruined 45,000 hectares of crops. Similar flooding occurred in 1999 and continues to occur annually.

#### Fire

Fire occurs mainly between April and June during the dry season when it seldom rains and temperatures in the Tarai region reach higher than 35°C. Fires are common to the rural Tarai and Hill regions where 90.8 percent of the total population live in very poor housing conditions. Houses in rural regions, especially Tarai, are composed of straw or timber and tend to be very close to each other, thereby increasing the risk of fire and fire spread. In 1999, a blaze killed 39 people, injured 10, and affected 1,065 families. The fire, with estimated total losses of NRs 45.23 million, destroyed 1,035 houses, 52 cattle sheds and 148 livestock.

Fire occurs in urban areas mainly due to electricity short circuits, fire in petrol pumps and gas depots, improper handling of gas cylinders and stoves and due to fire spread from candle lights and similar sources. Fire can be hazardous to Kathmandu especially to the historic city cores. Traditional buildings in city cores are constructed using materials like

wood which is prone to fire. In addition, there is a problem of accessibility for Fire Brigades during fire hazards.

Many instances of fire have been recorded in different parts of Kathmandu. Fire at historic area of Makhan occurred few years back had to face a problem of bringing Fire Brigades due to narrow streets. The building caught by fire is a traditional residential house.

In Kathmandu, fire in petrol pumps and gas depots could bring the worst scenario as they are not equipped with fire fighting system. Such fire hazards have potential to destroy the entire area. It is to be noted that out of 74 petrol pumps in Kathmandu, 90% of them are located in inner city area where population density is high (Source: ISU, KMC / Tribhuvan Pradhan). The pumps are found unnecessarily in very close proximity (500M or even less). Moreover, most pumps have not submitted drawing application to KMC and are in run without permission.

#### Earthquake

##### *Tectonic Setting and Seismicity of Nepal and Kathmandu*

The historical earthquake catalogue of UNDP/ UNCHS (1994) showed high seismicity along the Himalaya. Historically, Nepal has experienced several destructive earthquakes with more than 11,000 people killed in four major earthquakes just in the past century. Based on the earthquake catalog, Nepal faces one earthquake of Magnitude 7 or greater every 75 years, on average. Such magnitude earthquake could be extremely damaging to urban metropolises as demonstrated by the M7.0 January 2010 Haiti earthquake. Even more alarming is that since 1800 five (5) events of  $M \geq 7$  have affected Kathmandu, the most recent severe earthquake was the 1934 M8.3 earthquake. On average earthquake intensities equal to or greater than 8 take place every 36 years while earthquake intensities of 9 or greater take place every 75 years. The last significant earthquake took place in 1980 of

EARTHQUAKE INTENSITY	AVERAGE RETURN TIME
Intensity $\geq 6$	21 years
Intensity $\geq 8$	36 years
Intensity $\geq 9$	75 years
Last Significant Quake	1980
Large Likelihood of $I \geq 8$ by 2020	

**KATHMANDU**  
5 Events of  $M \geq 7$  since 1800 with one event of  $M=8.3$  (1934)

Average return time for various levels of earthquake intensities in Nepal and Kathmandu  
(Source: EMI from historical earthquake catalogue)

magnitude 6.6. Based on these observations, it is reasonable to conclude that there is a high likelihood of an earthquake which will cause intensities of 8 or greater in Kathmandu. Such intensities will create catastrophic damages in the city.

For example, it was reported that in 1833, a strong earthquake resulted in the destruction of 643 houses, death of 22 people, and injuries to 30 more. In the 1934 Bihar-Nepal Earthquake, damage to Kathmandu Valley included 725 houses completely destroyed, 3,375 heavily damaged, 4,146 slightly damaged, and 479 casualties.

Figure 2.3 presents the historical epicentral distributions in and around Nepal. The epicentral distribution map indicates the following characteristics:

- There are three main tectonic lines running across Nepal, namely, the Main Central Thrust (MCT), Main Boundary Thrust (MBT) and Main Frontal Thrust (MFT), and many of the past earthquakes occurred in the area between MCT and MBT.
- Seismicity is active in the west of Nepal.
- The central part of Nepal has suffered relatively few earthquakes.

Based on a study by JICA and the Ministry of Home Affairs titled, "The Study of Earthquake Disaster Mitigation," risk assessment was prepared in 2002. It was, however, conducted

within a short duration of time under limited resources. At that time, there was no official building inventory of the area so the total number of buildings was estimated from population and household distribution as reported in the 1991 census. Information on building vulnerability was based on an inventory survey of only 1,000 buildings and from onsite observation of the main sites.

There are several faults in Kathmandu Valley. If one of them moves, part of this lineament in the Valley will be severely damaged, even if the damaged area is not so large. The nature of damage from the earthquake in the valley will be different from that of a huge earthquake that occurs outside the Valley. Faults and lineaments in the valley are shown in Figure 2.4. Earthquake damage is dependent on the type and location of the earthquake. Hence, two or three types of earthquakes scenarios should be taken into account for disaster mitigation planning.

Seismic intensity is a proxy measure for the damage at various location. The seismic intensity is larger if the earthquake magnitude is larger or the distance from the source area is smaller, or the type of structures are highly vulnerable. It is also affected by the type of soil in a particular location. Unconsolidated soils tends to amplify the shaking motion whereas rock sites tends to reduce the earthquake shaking amplification. The intensities provided earlier were expressed in the so-called Modified Mercalli Intensity (MMI) scale.. Intensity is basically a subjective indicator,



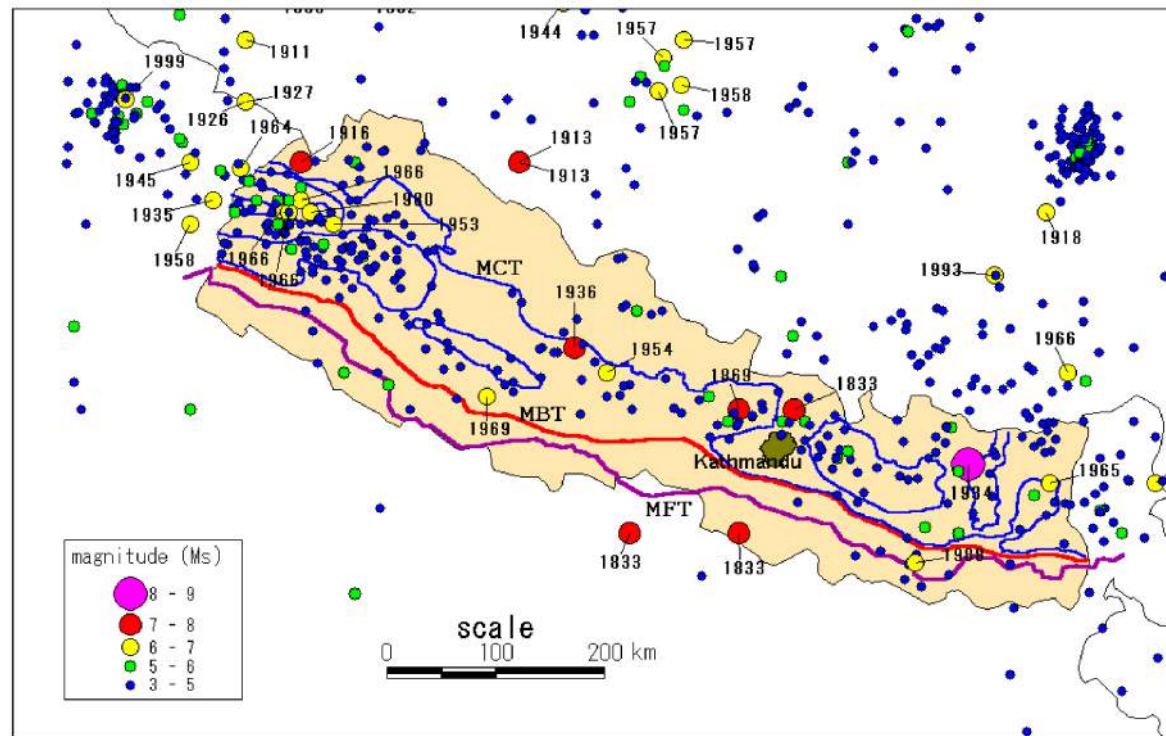
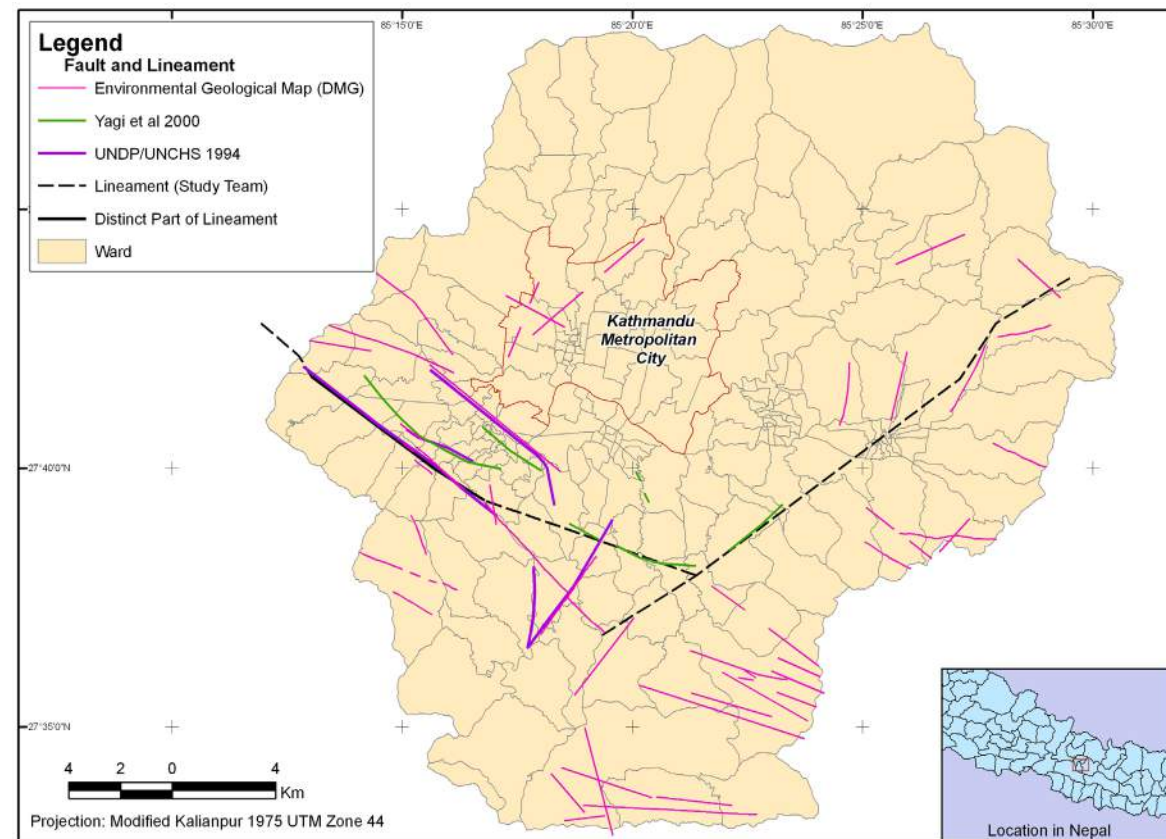


Figure 2.3 Epicentral Distribution Around Nepal, 1800-2001  
(Source: Earthquake Disaster Mitigation in the Kathmandu Valley, March 2002)



Kathmandu Valley Faults and Lineaments Map  
Source: Kathmandu Metropolitan City Government, JICA

Map and projection modified by EMI-GIS, 2010

Figure 2.4 Faults and Lineaments in Kathmandu Valley  
Source: Modified by EMI, 2010

Table 2.3 Modified Mercalli Intensity Scale

MMI	Description of damage
I	Not felt except by a very few under especially favorable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motorcars rocked noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

based on the human sensations and/or damage during an earthquake. A description of the MMI scale is shown in Table 2.3

According to the same earthquake study, the main source of seismic activity in Nepal is the subduction of the Indian plate under the Tibetan plate or Himalayas. Another earthquake generator in the Valley is the identified seismic gap zone in the middle of Nepal. Based on seismic records dating back to 1255, destructive earthquakes (estimated to have reached M7 or

greater) have occurred in 1255, 1408, 1681, 1803, 1810, 1833, and 1869, 1913, 1916, 1934 and 1936 with the M8.3 1934 earthquake being the largest magnitude recorded earthquake.

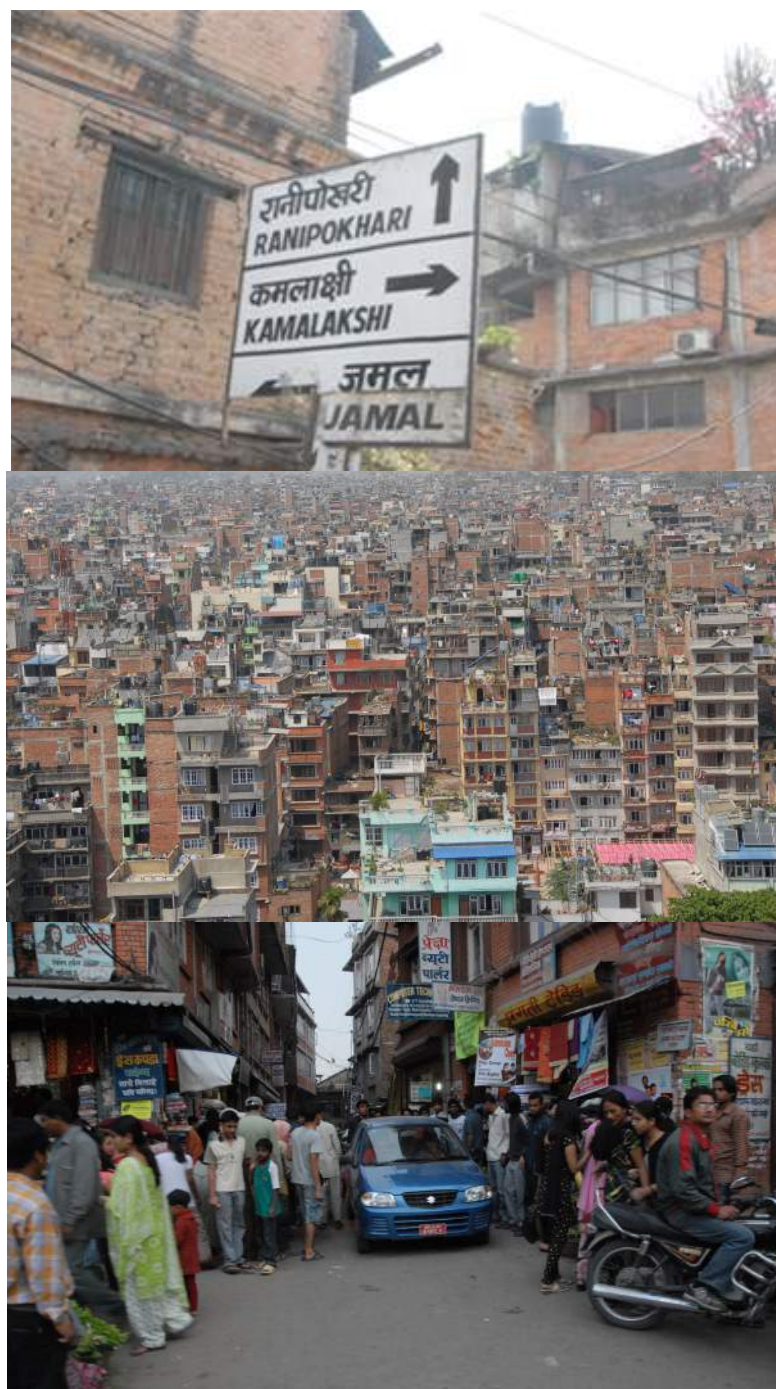
#### Earthquake Vulnerability

The concerns over the seismic risk to Kathmandu are driven not only by the high rate of seismicity but also by the extreme vulnerability of structures and infrastructure, and the high density of the built environment.



The percent of building construction that could be considered to be earthquake resistant is negligible, whereas the overwhelming majority of buildings and structures indicate a high to very high vulnerability. The density of buildings and population, the extreme vulnerability, the difficulties of access due to narrow roads and the potential for secondary effects such as fire following an earthquake, hazardous material

release, landslides, liquefaction and others are indicators of a large scale urban catastrophe waiting to happen with a level of destruction that is unprecedented. Further, Kathmandu is also subject to other hazards such as flooding, landslides and has high exposure to climate change because of its location and fragile environment, which aggravate the vulnerability of the city to natural hazards.



Pictures showing the type of vulnerable construction in Kathmandu as well as the high density of buildings and population (Source: EMI)

## CHAPTER 3. POPULATION

The land use and development policies of the city should be designed in careful consideration of the demographic structure and composition of the area. The city's population structure provides a good estimate on the size and character of the general population, age and sex composition, reproductive population, labor force, school age population and dependent population including young children and old people. According to the Nepal Living Standards Survey 2003 (CBS, 2003), this structure is based on current and past trends in fertility, mortality, among others, which in turn influence the existing levels and patterns of migration, birth rates and death rates in the city. The population structure also provides significant bases for planning and for the provision of social services for various population groups living in the city. Land use changes and environmental problems are also caused and influenced by the changing population characteristics of the city.

### 3.1. Population Size and Annual Growth Rate

The population of KMC has been swelling rapidly over the past ten years. This is due to the economic opportunities, urban comforts, facilities and services offered by the city. Boundary readjustments at different times also played a role in the city's population increase. As a result, KMC's population has grown by about 57 percent over a ten-year period (1991-2001), from 427,045 people in 1991 to 671,846 people in 2001 (see table 3.1 for more details). In addition, roughly 20 percent of Nepal's urban population, or around 701,962

people, call KMC their home (CBS, 2001) as they come to the city for work, schooling or trade.

Kathmandu's population increase from 1991 to 2001 represents an annual population growth rate of 4.53 percent, which is double than that of the country's average estimated at 2.25 percent (UNESCAP, 2003). However, while this is relatively high, the city's growth population rate appears to be declining on a decadal basis, from 5.19 percent in 1991 to 4.53 percent in 2001. The ISRC (2008) predicts that the population growth rate of Kathmandu would be somewhere around 3.56 by 2010. Given current population growth rate of 4.64 (Table 3.1) of the city, Kathmandu is expected to break the 1 million population mark by 2010. Table 3.1 also indicates that the population of Kathmandu is also expected to grow to about 1.27 million by 2015 and around 1.58 million in 2020.

The spatial distribution of the annual growth rate from 1991 to 2001 is shown in Fig. 3.1.

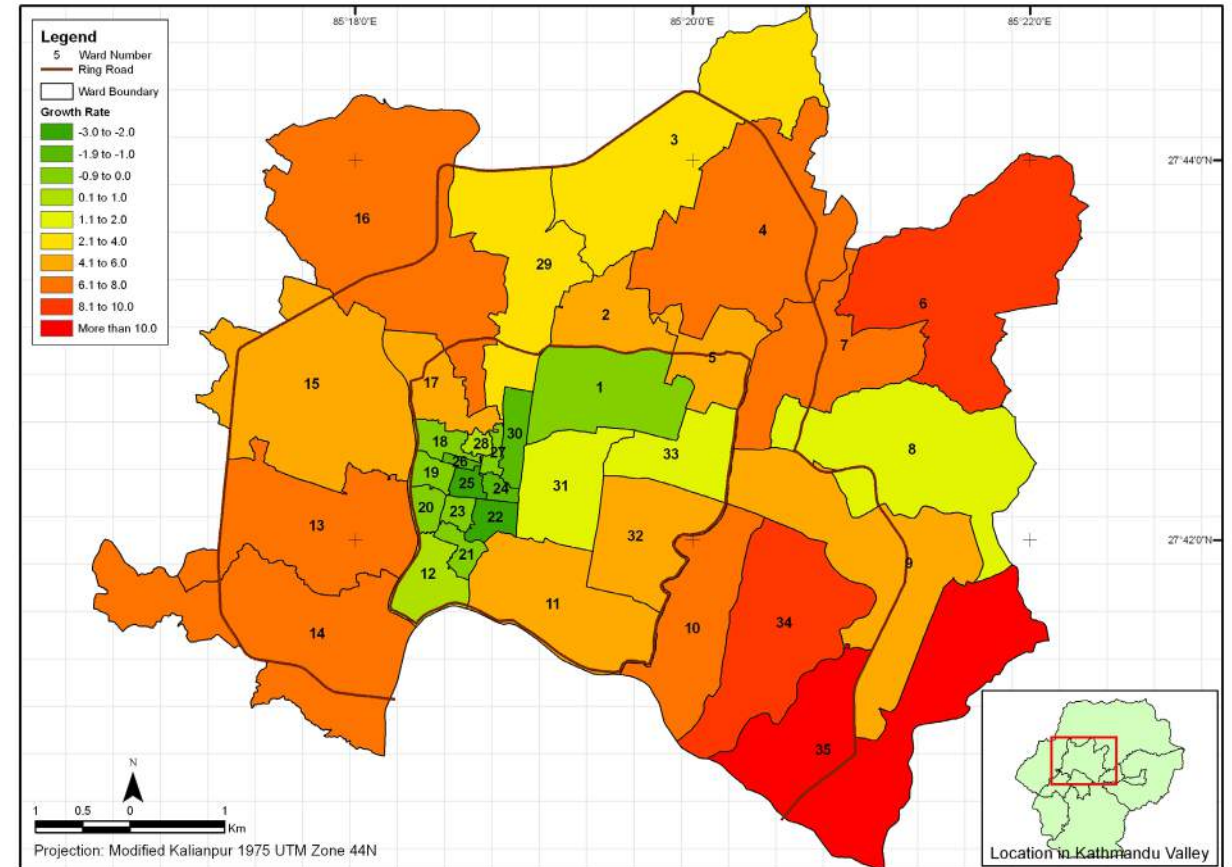
### 3.2. Population Distribution and Density

Population density indicates the amount of pressure placed by people on land. KMC is the most densely populated city in Nepal followed by the neighboring cities of Bhaktapur and Lalitpur. It has a population density of 132.34 people per hectare which is higher compared to the aggregate urban population density of all the cities of Nepal recorded at 98.5 persons per hectare. (Sharma, 2003) The city's population density increases during the day as an additional 50,000 people from nearby cities and villages come to Kathmandu to work, study or trade.

Table 3.1 Population Projection by Ward, 2010-2020

Sources: Population Census 2001, CBS, Kathmandu Valley Mapping Project, T. Pradhan, KMC GIS Section  
www.kathmandu.gov.np/index.php?cid=6&pr\_id=6

SECTOR	WARD	LAND AREA (Hectares)	POPULATION CENSUS			POPULATION PROJECTION		
			ANNUAL GROWTH RATE	1991	2001	2010	2015	2020
	KMC	5,077	4.64	427,045	671,846	1,010,151	1,267,022	1,589,214
EAST	6	366.8	8.43	17,509	39,316	81,423	122,011	182,833
	7	153.5	7.16	19,797	39,530	73,658	104,084	147,078
	8	253.8	1.98	7,756	9,434	11,252	12,410	13,687
	9	301.9	5.89	16,516	29,263	48,966	65,178	86,757
	10	156.8	7.33	12,806	25,977	49,096	69,925	99,592
	34	232.1	8.68	20,045	46,136	97,695	148,213	224,856
	35	395	10.93	12,467	35,184	89,510	150,370	252,612
	Total	1,859.9	7.72	106,896	224,840	439,030	636,723	923,436
CENTER	1	138.4	-0.31	8,731	8,464	8,231	8,104	7,979
	5	79	5.9	8,646	15,340	25,700	34,233	45,598
	11	183.9	4.3	10,055	15,244	22,169	27,296	33,609
	31	103.7	1.5	12,455	14,502	16,630	17,945	19,364
	32	128	5.24	14,613	24,355	38,570	49,794	64,284
	33	85.7	1.88	17,925	21,597	25,541	28,035	30,773
	Total	718.7	3.23	72,425	99,502	132,428	155,222	181,938
	NORTH	2	81.3	4.07	9,163	13,655	19,553	23,870
3		329.7	3.77	14,347	20,782	29,008	34,913	42,019
4		324.1	6.77	15,337	29,539	53,283	73,946	102,622
16		437.4	7.88	21,286	45,450	89,956	131,447	192,074
29		218.6	2.5	19,179	24,543	30,642	34,663	39,212
Total		1,391.1	5.38	79,312	133,969	214,735	279,085	362,718
CORE		12	51	0.37	9,940	10,313	10,661	10,859
	17	65.7	5.53	11,605	19,876	32,259	42,217	55,249
	18	18.9	-0.02	8,081	8,065	8,051	8,043	8,035
	19	15.5	-0.25	7,588	7,400	7,235	7,145	7,056
	20	15.7	-0.79	8,920	8,240	7,672	7,374	7,088
	21	15.4	-0.01	12,383	12,369	12,356	12,349	12,342
	22	18.8	-2.96	7,884	5,840	4,458	3,837	3,302
	23	10.2	-0.50	8,711	8,289	7,927	7,732	7,543
	24	8.9	-1.75	6,288	5,272	4,499	4,119	3,772
	25	10.3	-2.83	5,744	4,310	3,328	2,883	2,497
	26	4	-1.20	4,248	3,764	3,376	3,178	2,991
	27	7.6	-0.41	8,112	7,789	7,509	7,358	7,210
	28	6.8	0.73	5,077	5,462	5,833	6,051	6,276
	30	25.4	-1.08	11,033	9,896	8,973	8,498	8,049
	Total	274.2	0.11	115,614	116,885	118,041	118,688	119,339
WEST	13	213.3	7.26	14,746	29,721	55,849	79,288	112,565
	14	302.9	6.47	18,425	34,488	60,632	82,953	113,491
	15	316.5	5.15	19,627	32,441	50,993	65,559	84,285
	Total	832.7	6.23	52,798	96,650	166,544	225,331	304,868
	KMC	5,077	4.64	427,045	671,846	1,010,151	1,267,022	1,589,214



KMC Population Growth Rates, 2001  
Sources: Kathmandu Metropolitan City Government, JICA

Figure 3.1 Population Growth Rate, 2001  
Source: Modified by EMI, 2010

Map and projection modified by EMI-GIS, 2010

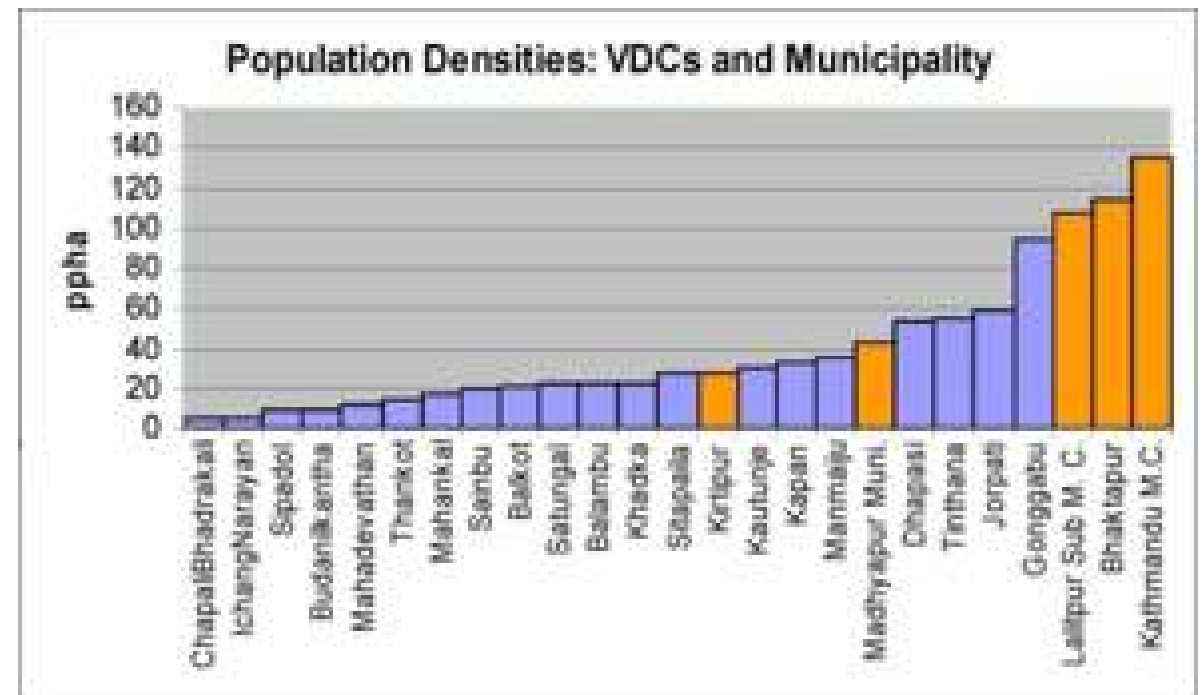


Figure 3.2 Population Density per Ward, 1991 and 2001  
Source: Modified by EMI, 2010, Kathmandu Valley Mapping Project  
T. Pradhan, KMC-GIS Section



**Table 3.2 Population Density per Ward, 1991 and 2001**  
Sources: Population Census 2001, CBS , Kathmandu Valley Mapping Project  
T. Pradhan, KMC-GIS Section

Sector	Ward No.	Land Area (Has.)	Population 1991	Population Density 1991	Population 2001	Population Density 2001
Total	KMC	5,076.6	427,045	84.12028	671,846	132.3417
East	6	366.8	17509	47.7	39316	107.19
	7	153.5	19797	129.0	39530	257.52
	8	253.8	7756	30.6	9434	37.17
	9	301.9	16516	54.7	29263	96.93
	10	156.8	12806	81.7	25977	165.67
	34	232.1	20045	86.4	46136	198.78
	35	395	12467	31.6	35184	89.07
	Total	1859.9	106896	57.5	224840	120.89
Central	1	138.4	8731	63.1	8464	61.16
	5	79	8646	109.4	15340	194.18
	11	183.9	10055	54.7	15244	82.89
	31	103.7	12455	120.1	14502	139.85
	32	128	14613	114.2	24355	190.27
	33	85.7	17295	201.8	21597	252.01
	Total	718.7	71795	99.9	99502	138.45
	North	2	81.3	9163	112.7	13655
3		329.7	14347	43.5	20782	63.03
4		324.1	15337	47.3	29539	91.14
16		437.4	21286	48.7	45450	103.91
29		218.6	19179	87.7	24543	112.27
Total		1391.1	79312	87.7	133969	96.30
City Core	12	51	9940	194.9	10313	202.22
	17	65.7	11605	176.6	19876	302.53
	18	18.9	8081	427.6	8065	426.72
	19	15.5	7588	489.5	7400	477.42
	20	15.7	8920	568.2	8240	524.84
	21	15.4	12383	804.1	12369	803.18
	22	18.8	7884	419.4	5840	310.64
	23	10.2	8711	854.0	8289	812.65
	24	8.9	6288	706.5	5272	592.36
	25	10.3	5744	557.7	4310	418.45
	26	4	4248	1062.0	3764	941.00
	27	7.6	8112	1067.4	7789	1,024.87
	28	6.8	5077	746.6	5462	803.24
	30	25.4	11033	434.4	9896	389.61
	Total	274.2	115614	421.6	116885	426.28
West	13	213.3	14746	69.1	29721	139.34
	14	302.9	18425	60.8	34488	113.86
	15	316.5	19627	62.0	32441	102.50
	Total	832.7	52798	63.4	96650	116.07
Total	KMC	5076.6	427,045	84.12028	671,846	132.3417

**Table 3.3 Household Population and Household Size, 1991 and 2001**

Source: Population Census 2001, CBS

Sector	Ward No.	1991		2001		
		HH	Average HH Size	HH	Average HH Size	
Total	KMC	82,293	5.2	152,155	4.4	
Central	1	1555	5.6	1689	5.0	
	5	1691	5.1	3573	4.3	
	11	1814	5.5	3488	4.4	
	31	2260	5.5	3252	4.5	
	32	3339	4.4	5694	4.3	
	33	3636	4.9	5064	4.3	
	East	6	3292	5.3	8768	4.5
		7	3810	5.2	9332	4.2
8		1607	4.8	2165	4.4	
9		3209	5.1	6708	4.4	
10		2684	4.8	6168	4.2	
34		4202	4.8	11039	4.2	
35		2613	4.8	8716	4.0	
North		2	1804	5.1	3195	4.3
	3	2756	5.2	4569	4.5	
	4	3086	5.0	6768	4.4	
	16	4121	5.2	10789	4.2	
	29	3885	4.9	5582	4.4	
	City Core	12	1774	5.6	2084	4.9
17		2263	5.1	4559	4.4	
18		1428	5.7	1730	4.7	
19		1284	5.9	1477	5.0	
20		1702	5.2	1701	4.8	
21		2343	5.3	2507	4.9	
22		1288	6.1	1009	5.8	
23		1580	5.5	1709	4.9	
24		1044	6.0	925	5.7	
25		954	6.0	744	5.8	
West	26	766	5.5	757	5.0	
	27	1417	5.7	1542	5.1	
	28	845	6.0	1088	5.0	
	30	1974	5.6	2041	4.8	
	Total	KMC	82,293	5.2	152,155	4.4

The city core is the most densely populated sector of Kathmandu with an average density of 426 people per hectare. It is where most of the schools, government office buildings and commercial establishments can be found. Wards no. 27 and 26 of the city core registered the highest population density among the wards with 1,024.87 and 941 persons per hectare, respectively.

### 3.3. Household Population and Household Size

The number of households in Kathmandu totals 152,155 households according to the Population Census (CBS, 2001). The number of households increased by 54 percent over a ten-year period (1991-2001), from 82,293 households in 1991 to 152,155 households in 2001. Although the number of households increased in KMC, the average household size decreased. From 5.2 members per households in 1991, the average household size in the city decreased to 4.4 members per household in 2001. Average number of household per building was recorded at 2.30 households per housing unit.

### 3.4. Population by Age and Sex

Age and sex composition are two important elements of a city's population structure. In 2001, 53.2 percent of the city's population was male. Sex ratio was recorded at 115.51, which means that there were about 115 males for every 100 females in Kathmandu in 2001. About 191,522 women or 61.44 percent of the total female population of Kathmandu were in their reproductive ages of 15-49 years.



**Table 3.4 Population by Sex, 1991 and 2001**

Sources: Population Census 2001, CBS  
Kathmandu Valley Mapping Project  
T. Pradhan, KMC-GIS Section

Ward	Population by Sex				Sex ratio (%)	
	1991		2001		1991	2001
	Male	Female	Male	Female		
1	4644	4087	4433	4031	113.63	109.97
2	4757	4406	7249	6406	107.97	113.16
3	7769	6578	10667	10115	118.11	105.46
4	8055	7282	15329	14210	110.62	107.87
5	4502	4144	8162	7178	108.64	113.71
6	9261	8248	20549	18767	112.28	109.50
7	10344	9453	21081	18449	109.43	114.27
8	4131	3625	4993	4441	113.96	112.43
9	8646	7870	15675	13588	109.86	115.36
10	6871	5935	14168	11809	115.77	119.98
11	5488	4567	8336	6908	120.17	120.67
12	5059	4881	5386	4927	103.65	109.32
13	7794	6952	16209	13512	112.11	119.96
14	9631	8794	18600	15888	109.52	117.07
15	10288	9339	17150	15291	110.16	112.16
16	11077	10209	24506	20944	108.50	117.01
17	5973	5632	10627	9249	106.05	114.90
18	4166	3915	4220	3845	106.41	109.75
19	3843	3745	3800	3600	102.62	105.56
20	4734	4186	4329	3911	113.09	110.69
21	6429	5954	6462	5907	107.98	109.40
22	4063	3821	3025	2815	106.33	107.46
23	4478	4233	4364	3925	105.79	111.18
24	3328	2960	2926	2346	112.43	124.72
25	3056	2688	2199	2111	113.69	104.17
26	2191	2057	1911	1853	106.51	103.13
27	4117	3995	4021	3768	103.05	106.71
28	2342	2735	2812	2650	85.63	106.11
29	10280	8899	13204	11339	115.52	116.45
30	5729	5304	5154	4742	108.01	108.69
31	7015	5440	8354	6148	128.95	135.88
32	8248	6365	13604	10751	129.58	126.54
33	9922	8003	11686	9911	123.98	117.91
34	10755	9290	25617	20519	115.77	124.85
35	6689	5778	19295	15889	115.77	121.44

**Table 3.5 Population by Five-Year Age Group, 2001 and 2008**

Source: ISRC, Municipality Profile of Nepal-2008

Age Group	2001 Census			2008 Projection		
	Total	Male	Female	Total	Male	Female
0-4	51,141	26,521	24,620	70,392	36,504	33,888
5-9	59,495	30,956	28,539	81,891	42,609	39,282
10-14	66,541	34,251	32,290	91,589	47,144	44,445
15-19	76,530	41,908	34,622	105,339	57,684	47,655
20-24	93,264	50,374	42,890	128,372	69,337	59,035
25-29	80,013	43,321	36,692	110,133	59,629	50,504
30-34	65,037	36,493	28,544	89,519	50,230	39,289
35-39	47,920	26,673	21,247	65,959	36,714	29,245
40-44	35,525	19,785	15,740	48,898	27,233	21,665
45-49	26,270	14,483	11,787	36,159	19,935	16,224
50-54	20,872	11,229	9,643	28,729	15,456	13,273
55-59	15,248	8,422	6,826	20,988	11,592	9,396
60-64	11,287	5,585	5,702	15,536	7,687	7,848
65-69	8,835	4,063	4,772	12,161	5,592	6,568
70-74	5,997	2,756	3,241	8,254	3,793	4,461
75+	7,871	3,283	4,588	10,834	4,519	6,315

All age groups in KMC appear to be increasing according to ISRC's eight-year age-group projection from 2001-2008. The working age sector (ages 15-59) comprises the biggest sector at 68.57 percent of the city's population. The young population (ages 0-14) comprises 26.37 percent while the elderly (ages 60 and above) comprises 5.06 percent of the total population of the city. This shows that the city population is generally young with a steady supply of economically active population. The increase in the young and working population also presents the growing need for facilities, programs and services for these age groups, such as programs and services for education, health, employment, leisure and entertainment, among others.

**Table 3.6 Population Age Group, 2008**

Source: ISRC, Municipality Profile of Nepal-2008

Age Group	Children (0-14)	Working Age (15-59)	Elderly (60+)
Total	177,177	460,679	33,990
Percentage	26.37%	68.57%	5.06%

It must be noted that both the young and elderly are among the most vulnerable segments of the population in terms of responding to disasters (Clark et al., 1998). Children without adequate family support are specifically at a major disadvantage in emergency situations (Morrow, 1999), while elderly people, in general, normally do not have sufficient physical and economic resources to cope with disasters (Rygel et al., 2005), are more susceptible to health-related repercussions and slow recovery (Morrow, 1999), and tend to be more reluctant to evacuate to safer areas (Gladwin and Peacock, 1997). Given these general observations in disaster management literature, the actual vulnerability of these sectors in KMC needs to be further investigated.

### 3.5. Population by Caste/Ethnicity

Kathmandu's population comes from a wide array of ethnic groups. As already noted, the Newars form the biggest ethnic group in the city representing about 32 percent of KMC's population. They are followed by the Brahman Hill (22%) and Chhetri (16%). Tamang,

Gurung, Shrepa, Magar and Rai also have sizeable numbers in KMC.

**Table 3.7 Major Caste/Ethnicity, 2008**  
Source: ISRC, Municipality Profile of Nepal-2008

Caste/ Ethnicity	Percentage
Newar	32%
Brahman Hill	22%
Chhetri	16%
Tamang	6%
Gurung	3%
Sherpa	3%
Magar	3%
Rai	2%

**Table 3.8 Major Languages Spoken, 2008**  
Source: ISRC, Municipality Profile of Nepal-2008

Language	Percentage
Nepali	53.11%
Newar	27.85%
Tamang	5.25%
Hindi	2.43%

**Table 3.9 Major Religion, 2008**  
Source: ISRC, Municipality Profile of Nepal-2008

Religion	Percentage
Hindhu	74.91%
Boudha	21.61%
Islam	1.59%
Kirat	0.86%

**Table 3.10 Population by Place and Birth, 2008**  
Source: ISRC, Municipality Profile of Nepal- 2008

Total	671,846
Native Born	646,882
Same District	375,854
Other District	
VDC	240,207
Municipality	30,821
Foreign Born	24,964

Nepali is the most widely spoken language in Kathmandu as more than half of the population can speak and understand the language. Newar is the second most widely spoken language followed by Tamang and Hindi.

Almost seven in ten people in Kathmandu are Hindhu. Hindhus comprise over 74.91 percent of KMC's population. This is followed by Boudhists which comprise 21.61 percent of the population, Islam with 1.59 percent, and Kirat with 0.86 percent.

### 3.6. Migration

Migration is a key driving force in the population growth of Kathmandu because of the concentration of services and economic opportunities in the city. As the administrative, political and economic capital of Nepal, KMC experiences a high rate of migration with people coming from municipalities and districts outside of the valley. The number of foreign-born people in the city in 2001 totaled 24,964 while about 271,028 or 41.9 percent of the population are considered migrants having been born from other VDCs and municipalities outside Kathmandu. In 2008, there were 646,882 native-born residents of Kathmandu City.

The Nepal Living Standards Survey 2003/04 listed down the major causes of migration to KMC. Among the major causes include family reasons (54%), job searching (18%), easy lifestyle (14.2%), education/training (9.1%), natural disaster in area of origin (0.6%), political reasons (0.3%) and other purposes (3.8%). (CBS, 2004) Most Nepali women would live with their husband after marriage which might be a major factor for (family reasons) migration in Kathmandu. External migrants are mainly concentrated in the city core area and migrate to the city for business, work, schooling and diplomatic purposes. (Thapa et.al., 2007)

### 3.7. Women-headed Households

Women-headed households comprise 14.4 percent of all households in Kathmandu. Women-headed household require special attention and assistance in disaster planning as women suffer the impacts of disasters disproportionately due to their traditional roles as mothers and caregivers. (Rygel et al., 2005) When disaster strikes, their ability to seek safety is restricted by their responsibilities to the very young and the very old, both of whom require help and supervision. (Fothergill, 1998) While these findings have been validated and generally accepted in the literature, vulnerability is culture-specific, hence, the vulnerability of women, specifically women-headed households in Kathmandu City, needs deeper investigation.

### 3.8. People with Disability

According to the Census of 2001, there are about 2,002 people with disability in KMC. They account for about 0.30 percent of the population. People with disability require special programs, services and assistance especially in times of disasters. Wards No. 6 and 15 registered the most number of people with disability with 184 and 178 persons, respectively.

### 3.9. Situational Analysis

Kathmandu is facing a number of problems related to its growing population. One major population issue of the city is population congestion due to high population density. Population density in the city reaches over 1,000 persons per hectare in some wards particularly at the city core. Population congestion presents several related concerns such as increased traffic, high level of waste generation, increased demand for urban services and facilities, and emergency management concerns during disasters. These existing conditions contribute to the increase in vulnerability levels of communities, reducing their capacity to respond to disasters and cope

**Table 3.11 Percentage of Population with Disability, 2001**

Source: Population Census 2001, CBS

	People With Disability	Population	Percentage (%)
<b>KMC Total</b>	<b>2,002</b>	<b>671846</b>	<b>0.30</b>
Ward			
1	4	8464	0.05
2	41	13655	0.30
3	35	20782	0.17
4	85	29539	0.29
5	29	15340	0.19
6	184	39316	0.47
7	136	39530	0.34
8	32	9434	0.34
9	40	29263	0.14
10	106	25977	0.41
11	28	15244	0.18
12	11	10313	0.11
13	44	29721	0.15
14	35	34488	0.10
15	178	32441	0.55
16	95	45450	0.21
17	52	19876	0.26
18	102	8065	1.26
19	44	7400	0.59
20	15	8240	0.18
21	8	12369	0.06
22	6	5840	0.10
23	10	8289	0.12
24	47	5272	0.89
25	8	4310	0.19
26	2	3764	0.05
27	2	7789	0.03
28	2	5462	0.04
29	58	24543	0.24
30	14	9896	0.14
31	23	14502	0.16
32	27	24355	0.11
33	36	21597	0.17
34	289	46136	0.63
35	174	35184	0.49
<b>KMC Total</b>	<b>2,002</b>	<b>671846</b>	<b>0.30</b>

with the disruption of critical infrastructures and services and the destruction of physical assets.

The city is also experiencing a high rate of urbanization and a rapid influx of migrants from outside KMC. There is also a reported increase in the floating population of KMC, as there are people who live outside the city but work, study or trade in KMC during day time.

### 3.10. Challenges and Opportunities

Some of the urgent challenges to land use planning presented by these demographic issues include the need to respond to the present and future demands for housing and urban services. There is also a necessity to systematically address issues of congestion, traffic, waste generation, among others. Additional facilities, utilities and services are likewise needed to provide for the large population and the expected population in the future.

## CHAPTER 4. SOCIAL SECTOR

### 4.1. Education

#### 4.1.1. Literacy Rate

Literacy rate in KMC is recorded at 77.65 percent which is higher compared to the literacy rate in the whole of Nepal (48.6 percent). However, it is disproportional with males registering 88 percent literacy rate as compared against the female's 67.3 percent.

Public and private schools in KMC offer different levels of basic education. In public schools, there are four general levels of education. These are primary (Grades 1-5), lower secondary (Grades 6-8), secondary (Grades 9-10), and higher secondary (Grades 11-12). Private schools offer an additional pre-primary level.

According to the Population Census of 2001, a little over half (51.19 percent) of the population

Table 4.1 School-Educated Persons, 2001

Source: Population Census 2001, CBS

Level	Number of School-Educated Persons		
	Male	Female	Total
Primary	54,969	47,148	102,117
Lower secondary	37,728	31,289	69,017
Secondary	35,810	29,204	65,014
SLC	42,951	32,087	75,038
Total	171,458	139,728	311,186
Population of 6 years and above	326,904	281,037	607,941
Percent of population 6 years and above who have completed education	52.45	49.72	51.19

Table 4.2 Tertiary Graduates, 2001

Source: Population Census 2001, CBS

Tertiary Level	Number of tertiary graduates		
	Male	Female	Total
Certificate level	43,560	28,729	72,289
Bachelor's degree	41,003	16,686	57,689
Master's degree	14,858	4,823	19,681
PhD degree	964	225	1,189
Total	100,385	50,463	150,848
Population of 15 years and above	268,375	226,294	494,669
Percentages of tertiary graduates in adult population	37.40	22.30	30.49

with ages 6 years old and above have completed secondary level education. The school-educated rate for women is slightly lower at 49.72 percent, as compared to 52.45 percent of the male population.

There are 150,848 tertiary-level graduates in Kathmandu. These include Certificate, Bachelor's, Master's and Doctorate degree holders. They account for about 30.49 percent of the city's adult population.

#### 4.1.2. Number and Type of Schools

There are 517 educational institutions all over Kathmandu. Primary school accounts for the biggest number of schools with 236 institutions, followed by pre-primary with 110 institutions. There are 23 colleges in the city.

In terms of teaching force, there are 3,918 teachers in the city. This number does not include teachers in the pre-primary and college levels, of which information is not available.



The biggest bulk of teachers are working in primary schools.

**Table 4.3 Number of Schools, 2001**

Source: Population Census 2001, CBS

Education Institutions	Number
Pre-primary Schools	110
Primary Schools	236
Lower Secondary Schools	50
Higher Secondary Schools	98
Colleges	23
Total	517

**Table 4.4 Number of Teachers, 2001**

Source: Population Census 2001, CBS

Teachers	Number
Pre-primary Schools	No data
Primary Schools	2,141
Lower Secondary Schools	948
Higher Secondary Schools	829
Colleges	No data
Total	3,918

KMC has a high enrolment rate of 94.81 percent. This means over 94 percent of children ages 3-15 years are currently attending school. The enrolment rate is higher among boys than among girls.

**Table 4.5 Primary and Secondary School Enrollment Rate, 2001**

Source: Population Census 2001, CBS

Enrolment	Pre-Primary	Primary level	Lower Secondary level	Secondary level	Total School Enrollment	3-15 Age Group Population	Enrolment Rate
Boys	15,340	37,665	18,726	10,438	82,169	83,601	98.29
Girls	12,912	33,209	15,910	8,890	70,921	77,873	91.07
Total	28,252	70,874	34,636	19,328	153,090	161,474	94.81

**Table 4.6 Higher School Enrollment Rate, 2001**

Source: Population Census 2001, CBS

Enrolment	Higher secondary	16-17 Age Group	Enrolment Rate
Boys	9,944	15,523	64.06
Girls	5,837	13,283	43.94
Total	15,781	28,806	54.78

At the high school level, the enrolment rate is lower with only 54.78 percent of those with ages 16-17 years attending school. Boys have far higher enrolment rate of 64.06 percent compared to 43.94 percent for girls.

## 4.2. Health, Nutrition and Family Planning

The tempo of urbanization is rapidly increasing in Kathmandu putting intense pressure to sufficiently address various urban problems such as the provision of basic health services. Many people, especially those who are living in slums and old settlements are not getting adequate health care services. In 1994, KMC has identified public health as a major priority of the city government and conducted needs assessment study within its jurisdiction. As a result of the assessment, KMC launched the Community Urban Basic Health Service Program by establishing seven community urban health clinics at ward level and a Medical Facility Section at the central level ([www.kathmandu.gov.np](http://www.kathmandu.gov.np)).

### 4.2.1. Health

There are several incidents of illnesses in Kathmandu. Most cases of epidemics such as cholera, gastroenteritis, encephalitis,

meningitis, typhoid, jaundice and malaria occur during the summer months and in the rainy season. They occur mainly due to poor sanitation in the city and the lack of proper health care. In 1999, 1,207 people died of epidemics affecting 6,119 families in various parts of Nepal.

### 4.2.2. Health Facilities

There are 50 hospitals and nursing homes in Kathmandu with a combined bed capacity of 1,763 beds. This means that based on the 2001 Population Census, Kathmandu has 381 persons per hospital bed ratio. The largest hospital in Kathmandu is located in Ward no. 3.

**Table 4.7 Persons per Hospital Bed, 2001**

Source: Population Census 2001, CBS

Medical Facilities	Number
Number of hospitals/nursing home	50
Number of bed	1,763
Person per hospital bed	381

Kathmandu's infant mortality rate was recorded at 18.27 percent with 107 deaths against 6,530 births in 2001. This high infant mortality rate needs to be addressed immediately by the city government.

**Table 4.8 Infant Mortality Rate (per '000 infants), 2001**

Source: Population Census 2001, CBS

	Below 1 year of age		
	Male	Female	Total
Number of infant deaths during last 12 months	72	35	107
Number of births during last 12 months	3,941	2,589	6,530
Infant mortality rate	13.52	16.39	18.27

Crude birth rate is 9.72 percent with births of 6,530 recorded in 2001. Kathmandu's crude birth rate is quite high by international standards, which indicates that Kathmandu is a growing city.

**Table 4.9 Crude Birth Rate (per '000 population), 2001**

Source: Population Census 2001, CBS

	Male	Female	Total
Population	360103	311743	671846
Number of Births	3941	2589	6530
Crude Birth Rate	10.94	8.30	9.72

**Table 4.10 Crude Death Rate (per '000 population), 2001**

Source: Population Census 2001, CBS

	Male	Female	Total
Population	360103	311743	671846
Number of Deaths	1630	1156	2786
Crude Death Rate	4.53	3.71	4.15

Kathmandu's crude death rate is 4.15 percent with 2,786 recorded deaths in 2001. This is relatively low as compared to other countries, indicating that Kathmandu has lesser health-related problems.

## 4.3. Social Welfare

Social welfare programs such as community development and sports programs are provided by the Public Health and Social Welfare Department which runs under the Metropolitan Health Council. At ward level, the Community Urban Health Clinics are managed by the Community Urban Ward Health Committee, which is chaired by the Ward Chairperson. Three health workers are deputized in each clinic to provide basic health service to the people. The Community Development and Social Welfare Section ensures the welfare of citizens by educating and empowering the people, and including women, children, youth, elderly, people with disability, and other marginalized sectors in the process of development. The Sports and Education Division ensures the implementation of the city's sports development programs.

## 4.4. Housing

The city's housing sector is primarily concerned with the accommodation of people into housing units. The well-being of the urban population is dependent on the quantity and quality of housing available in the city, as well as the support facilities and infrastructure provided. To date, several housing projects have been undertaken in different areas of the city. These include the Kuleswar Housing Project, the first such effort by His Majesty's Government, in Ward no. 14; the Dallu Housing Project in



Ward no. 15; the Khusibun Housing Project, an initiative to create planned settlements, in Ward no. 16; and the Gongabun Housing Project in Ward no. 29, which was spearheaded by the then Housing and Urban Development Department. Inner city ward settlements typically consist of an open courtyard enclosed by houses.

#### 4.4.1. Floor Area per Person

There are 58,149 houses in Kathmandu according to the 2001 Population Census. These houses have a total surface area of 81,677,951 square feet. This means the city's population occupies an average of about 138.48 square feet per person (12.87 per square meters per person).

Table 4.11 Floor Area per Person, 2001

Source: Population Census 2001, CBS

Houses from population census 2001	58,149
Surface area (sq ft)	8,1677,951
Surface area per house	1,404.632
Houses from population census 2001	66,236
Surface area of total houses from Census	93,037,211
Population	671,846
Floor area per person (sq ft)	138.48
Floor area per person (sq m)	12.87

#### 4.4.2. Occupancy Status

According to the CBS Census 2001, more than half (59%) of the households in Kathmandu are renters. The households who own their housing units comprise about 38 percent; those who occupy institutional housing units, 3 percent; and those who are not paying any rent, 0.41 percent.

Table 4.12 Occupancy Status, 2001

Source: Population Census 2001, CBS

Tenure Type	Number	Percentage
Owned	57832	38.01
Rented	89526	58.84
Official	3900	2.56
Rent free	631	0.41
Other	266	0.17
Total	152155	100.00

Over 87 percent of Kathmandu's households live in permanent housing structures, a good indication of development in the housing sector. Only 8.81 percent and 3.25 percent of the total number of houses are made of semi-permanent and temporary structures, respectively.

Table 4.13 Types of Housing Construction, 2001

Source: Population Census 2001, CBS

Construction Type	No. of Households	%
Permanent	133,812	87.94
Semi-permanent	13400	8.81
Temporary	4943	3.25
Total	152155	

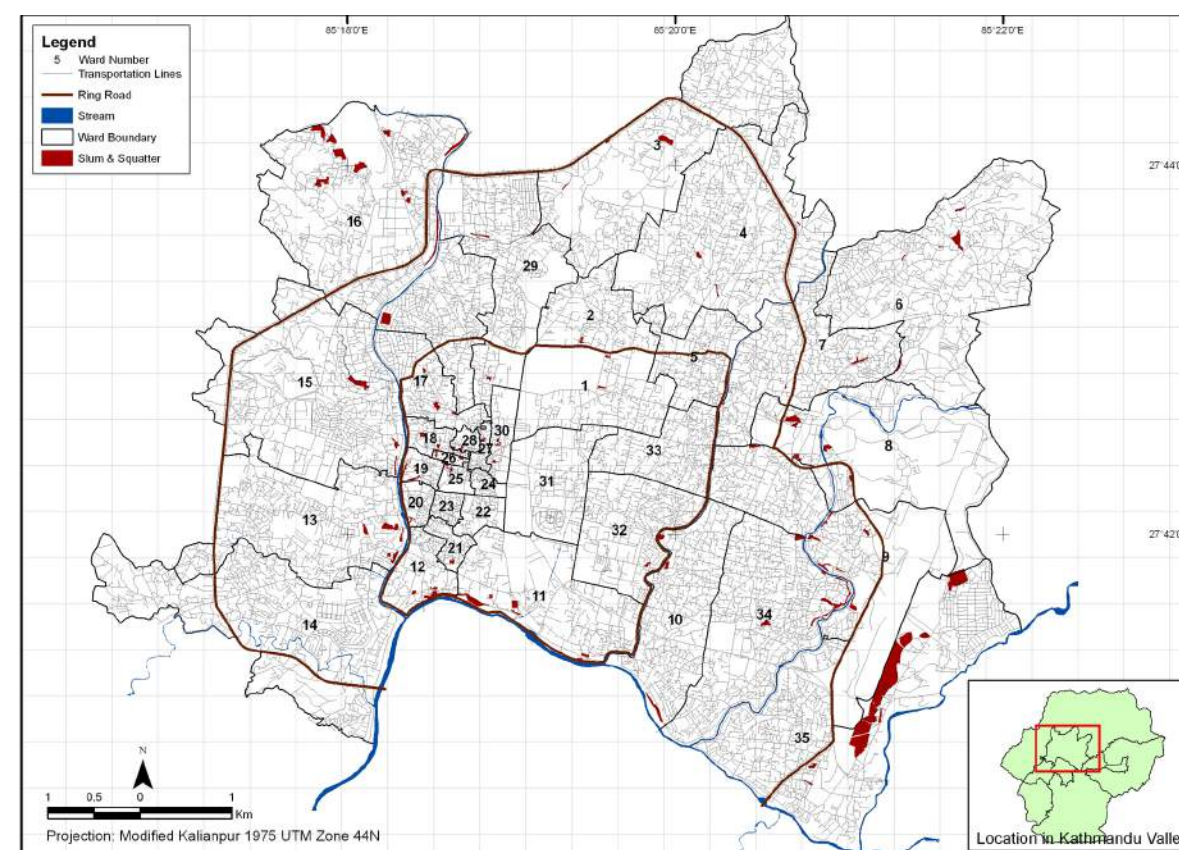
Over 65 percent of the housing units in Kathmandu have walls made of cement bonded bricks/stones and concrete. Walls made of mud bonded bricks and stones comprise 34 percent of the structures.

More than half of the houses have concrete roof while 30 percent have roofs made of galvanized iron sheet. In terms of flooring material, cement-tile comprises 64 percent of the total houses in the city. Houses with earth flooring comprise 27 percent of the houses.

Table 4.14 Types of Housing Construction Materials, 2001

Source: Population Census 2001, CBS

Walls	%
Cement Bonded Bricks/Stones and Concrete	65.8
Mud Bonded Bricks/Stones	34.2
Roof	
Straw/Thatch	0.0
Galvanized Sheet	30.1
Concrete	64.4
Roof	
Tile/Slate	4.5
Others	0.9
Floor	
Earth	27.1
Cement/Tile	64.2
Wood	1.0
Others	7.7



KMC Slum and Squatter Areas

Sources: Kathmandu Metropolitan City Government, JICA

Map and projection modified by EMI-GIS, 2010

Figure 4.1 Slum and Squatter Location, 2006

Source: Modified by EMI, 2010

#### 4.4.3. Informal Housing

Rapid urbanization has changed the social, economic and political conditions in cities all over the world. These changes presented several challenges in terms of adequate housing and proper planning in urban areas. Some of these challenges include the emergence of squatter settlements and the high rate of migration to cities including Kathmandu.

Squatter settlements in Kathmandu started to emerge in the 1950s when rural migrants moved into cities looking for employment. Management of squatter settlements has been one of the major challenges in Nepal. In Kathmandu, it has grown in number from 17 squatter settlements with 2,134 inhabitants in 1985 to 61 settlements with a population of 11,862 in 2000. (Pradhan and Perera, 2005) Majority of these are located in marginal public land along riversides like the 200

squatter families along the banks of Samakhushi River. Squatter settlements in Kathmandu are increasing at the rate of 12-13 percent, which represents 2.9 percent of the city's total population. (Shrestha, 2000)

There are 19,770 squatter houses in Kathmandu occupying about 18.24 hectares of land area in the city (Annex 3). It is estimated that 40 percent of this population are occupying public buildings while others are in squatter settlement areas. At present, there are about 63 informal settlements in Kathmandu, popularly known as "Sukumbasi Basti", that provide housing for about 2,600 families or nearly 15,000 people (Annex 1.7). See Figure 4.1 indicates the location of slums and squatter.

One of the objectives of the KVTDC is to provide access to land for housing and to plan and control development. In the past 20

years, KVTDC has adopted various innovative approaches to address housing issues such as land pooling. Land pooling is regarded as one of KVTDC's most successful programs, although its scope has been limited as it focuses mainly on small scale cases involving mostly middle and upper income people. Private developers and owners are responsible for making the bulk of Kathmandu's land available to the general public. There are no policies or development plans in place to assist the poor in accessing land; nevertheless, efforts are being made for 5-7 percent of the land in KVTDC's land pooling project to be allocated for the poor. Directives are being given to developers to do the same.

#### 4.5. Peace and Order

##### 4.5.1. Police Protection

The primary law enforcement agency for Kathmandu, Lalitpur and Bhaktapur Districts within the Kathmandu Valley is the Metropolitan Police. The Metropolitan Police Commissioner's Office (MPCO) established in 2007, which is directly under the supervision of the Police Headquarters, has authority to command all police components located in its area of responsibility. The present MPCO consists of several separate sections for Administration, Public Security, Intelligence, Inspectorate, Crime, and Traffic. It also exercises control over the Armed Police Battalion, Riot Control Battalion, Garrison Battalion, Control Room, three Ranges, seven Circles, 39 Sectors, three Area Police Offices and 19 Police Posts. Other Divisions and Sections will become functional in due course. The central jail of Nepal is situated in Ward no. 11.

The Chief of Metropolitan Police (Police Commissioner or Additional Inspector General of Police, AIGP) reports to the Inspector General of Police. The Additional Inspector General of Police is responsible and accountable for all activities involving the MPCO and establishes professional standards to maintain a high level of integrity and ethical conduct.

According to the KMC Enforcement Division, there are four police stations in KMC, one for each sector (East, Central, West and North). The total number of police officers in Kathmandu is 2,648, of which 219 are under KMC while 2,429 are under the Nepal Police Force.

##### 4.5.2. Crime Rate

KMC has a crime rate of 0.233 per thousand population. The most common reported crimes in the city include murder, theft, rape and drug-related crimes. A crime pattern analysis shows that the crime and criminal activities mostly occur between 10 PM and 4 AM.

Table 4.15 Crime Rate (per '000 population), 2001

Source: Population Census 2001, CBS

Type of crime	Number of cases	Crime rate per '000 population
Murder	43	0.064
Theft	44	0.065
Rape	34	0.051
Drug related crime	36	0.054
Total	157	0.233

##### 4.5.3. Fire Protection

Kathmandu has a very low fire protection capacity given the high number of reported cases of fire in 2008. According to the KMC enforcement section, there were 15,167 reported cases of fires in in 2008 alone.

In terms of firefighting capacity, the city has only one fire station located in Basantapur. There are two fire trucks and one ladder which can reach up to the 7th storey of a building. Fire hydrants in the city are no longer functional. There are only 17 firefighters to protect the whole city from fire breakouts. The ten leading causes of fire in KMC include electric short circuits, gas stoves and cylinders, candle lights, electric load sharing and highly flammable wood in old buildings.

Table 4.16 Inventory of Personnel and Firefighting Facilities, 2009

Source: Enforcement Division, KMC, 2009

SN	Description	Number	Remarks
1	Fire protection in KMC	420	Fiscal 2008-2009
2	Fire men	17	
3	Other personnel at fire station (Driver, Administrative staff, etc.)	13	Besides, 11 staffs from Armed Police Force are also working, soon to be removed form job
4	Fire trucks in KMC	3	2 trucks and 1 ladder
5	Fire station	1	At Basantapur (4 other stations are proposed)
6	Fire information in KMC	-	-
7	Fire hydrant	-	-

Note: Fire station was handed over to KMC by MOHA in June 2009

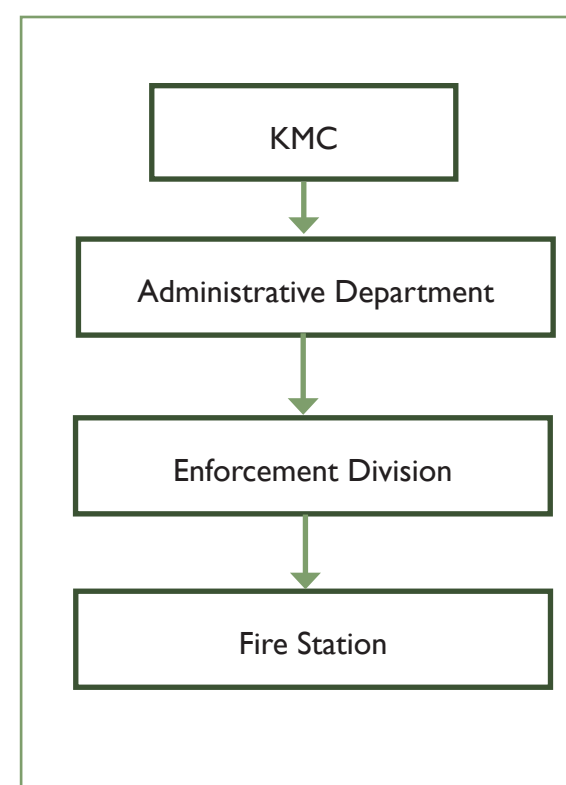


Figure 4.2 Administrative Position of Fire Stations in KMC, 2009

Source: Enforcement Division, KMC 2009

##### 4.5.4. Traffic Management

The road traffic volume in Kathmandu Valley (i.e., comprises the three districts of Kathmandu, Lalitpur and Bhaktapur) is increasing at an alarming rate. Development in expansion of the roads and other infrastructures are limited. The number of vehicles especially in Kathmandu City is increasing along with the rise in the city's population. The main burden

for the traffic is the increasing congestion in major roads of the city.

The MPCO Traffic Division is responsible for managing traffic flow in the Kathmandu valley to minimize traffic accidents through proper traffic management. There are three traffic enforcement facilities in Kathmandu City; these are located in Thapathali (Ward 11, Central Sector), Kalimati (Ward 4, Northern Sector) and Koteswori (Ward 35, Eastern Sector) areas. A total of 850 traffic management personnel and traffic enforcers are regulating the traffic situation in the city.

Traffic jam is gradually increasing around city core as well as within Ringroad areas with average vehicular speed reaching around 25 km/hour. Most traffic-prone areas in KMC include several portions of Ringroad such as Koteswori, Chabbil, Gongabu, Maitighar as well as the City core areas such as Ratna Park, Jamal and Kalimati. There are on average 7.57 reported traffic accidents per day in the streets of Kathmandu. Most common traffic accidents in KMC are due to alcohol consumption by rider, especially those riding motor bikes, improper installation of road divider, improper installation of traffic lights, lack of sidewalks and protective railings, lack of awareness among drivers especially those driving public vehicles, and irresponsible driving.

The overall Kathmandu Valley has experienced a large growth in vehicle numbers as the



urbanization takes place in a rapid manner. The huge growth in the number of vehicles is accompanied by simultaneous lack of improvement in the existing facilities and disorganized movement of traffic thereby resulting in increased congestion and accidents which in turn have decreased vehicle speeds affecting road capacity. The road network within the valley is inadequate. Roads are not classified according to vehicle types. With increased vehicular traffic and common tracks for all types of vehicles in the valley, traffic congestion is increasing and contributing to excessive vehicular emissions.

#### 4.5.5. Disaster Management

The national agency responsible for disaster management in Nepal is the Ministry of Home Affairs (MOHA) through its Department of Narcotics, Drug Control, and Disaster Management. MOHA is in charged with the formulation and implementation of national policies related to preparedness and disaster mitigation, immediate rescue and relief works, data collection and dissemination, and collection and distribution of funds and resources. 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 function of the department is to actively and efficiently coordinate and carry out emergency preparedness and disaster management activities with concerned agencies.

In the past 20 years, the Nepalese Government has formulated a number of natural disaster preparedness plans, programs, and acts. Most prominent among these is the Natural Calamity (Relief) Act of 1982, which defines the official disaster management system at central, regional, district, and local levels. The Central Disaster Relief Committee (CDRC) oversees the disaster response system. Headed by the Minister of MOHA, CDRC consists of the Minister of Health, Minister of Physical Planning and Works, secretaries of other ministries, representatives of the Royal Nepal Army and Nepal Police, the Director Generals of the Department of Mines and Geology and the Department of Hydrology and Meteorology, and representatives of the Social Welfare Council, Nepal Red Cross Society, and Nepal Scouts.

Following a disaster, the CDRC meets as required to immediately address the needs of the affected population. The committee is also involved in coordination of rehabilitation efforts. At the district level, the District Disaster Relief Committee (DDRC) is the active agency for coordinating relief support. This committee,

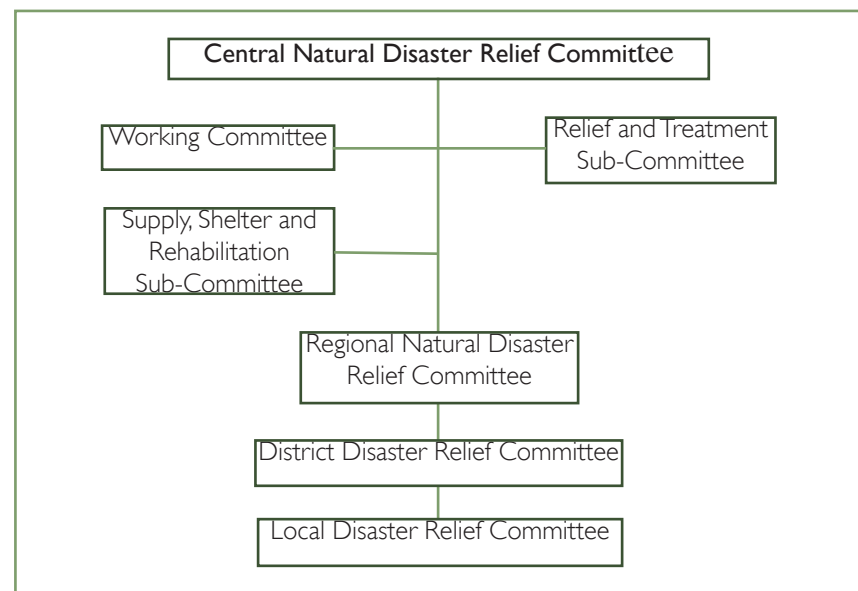


Figure 4.3 Disaster Management Framework in Nepal  
Source: MOHA

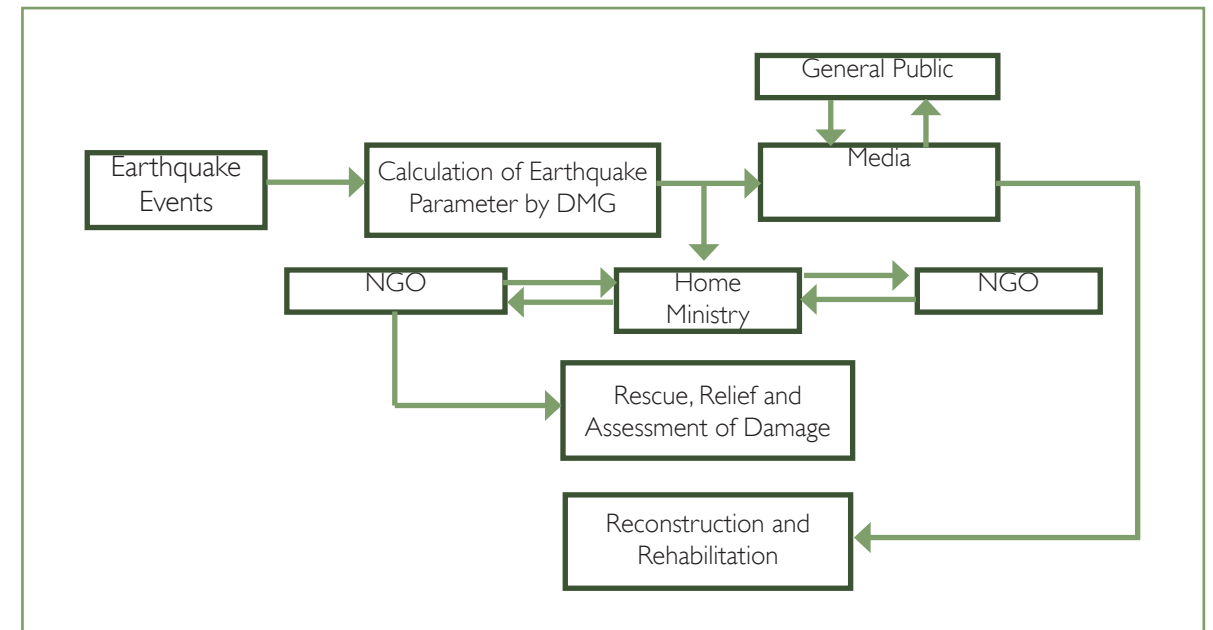


Figure 4.4 Dissemination of Earthquake Information and Disaster Management  
Source: ICIMOD, 2007

chaired by the Chief District Officer, consists of representatives from public sector organizations, such as the District Health Office, the Nepal Red Cross Society, and similar agencies. DDRC is responsible for coordinating district-level relief efforts, including medical support and distribution of food and other essential supplies.

The following legislation provides the legal framework that assigns roles and responsibilities to different disaster management entities:

- Constitution of the Kingdom of Nepal, 1990
- Natural Calamity Relief Act, 1982
- Local Administration Act, 1971
- HMG Rules for Allocation of Functions, Second Amendment, 1996
- Local Self Governance Act, 1999
- Kathmandu Valley Town Development Act, 2000
- Building Act, 1998 or Draft Building Council Act, 1994

The Royal Nepal Army and Nepal Police play important roles in rescue operations. Police officials are responsible for collecting first-hand information and relaying the same to concerned officials. In the event of a catastrophic disaster,

the Nepal Police establishes command posts to facilitate rescue operations.

#### 4.6. Situational Analysis

KMC is experiencing a number of pressing social issues. These includes the high rate of migration in the city, increasing crime rate, child trafficking, rising incidence of child labor, and poor quality of public education. The high rate of migration to KMC has been attributed to ineffective development policies in Nepal characterized by lack of services, facilities and opportunities outside the nation's capital. The ongoing political conflicts, poverty and disasters in the countryside also contributed to the increased influx of migrants to the city. The existing crime rate is primarily due to ineffective crime protection system in the city. The poor quality of public education is attributed to inadequate funds, services and facilities for education and ineffective monitoring of the quality of the public school system. Transport system in the city is rapidly getting saturated and traffic management is generally quite poor with little mechanism for controlling traffic flow and traffic organization. Parking is difficult to find in the commercial section of the city. Pedestrians often share the road with vehicles,

street vendors, and shoppers.

With the increase in density comes the increase of physical vulnerability to disasters as very few buildings are designed and constructed with any regards to earthquake codes or earthquake safety. Emergency management will be a real challenge after an earthquake due to the congestion, but also to the debris and closure of roads from falling objects and collapsed buildings. Livelihood means in the city will also be severally impacted.

#### 4.7. Challenges and Opportunities

The social issues hounding KMC present a number of challenges and opportunities to risk-sensitive land use planning. Current conditions call for the provision of spaces to strengthen and develop the social welfare and social protection services of the city. This includes the identification, allocation and establishment of strategic areas for schools, police and fire stations, day care centers and welfare centers throughout the city. Finding the adequate size and proper location for these service delivery centers is crucial for the effective delivery of such services to the city's residents.

## CHAPTER 5. ECONOMIC SECTOR

Kathmandu is Nepal's main industrial and commercial center. The city's economic output is recorded to be worth over NRs. 170 billion (US\$2.2 billion) each year. Trade, tourism and service sectors are the main economic engine of the city with trade accounting for over 21 percent. Manufacturing comes next in economic importance with 19 percent contribution to the city's economy. Kathmandu is known to manufacture and export world-class garments and woolen carpets. Other major economic industries in Kathmandu include agriculture (9%), education (6%), transport (6%), and tourism (5%). (www.kathmandu.gov.ph)

Kathmandu is host to several manufacturing centers for the production of carpets, garments and handicrafts. However, the growth of carpet and garments industry in Kathmandu is constrained by its contribution to the city's worsening environmental pollution. Information technology, financial institutions and other service sectors have reportedly shown an increasing contribution in recent years. (World Bank, 2001)

#### 5.1. Per Capita Income

As of 2001, KMC's annual income per person was recorded at NR 24,561 (\$360). This figure is relatively higher compared to Nepal's national per capita income pegged at \$240 (World Bank, 2001).

#### 5.2. Households below Poverty

According to the Cities Data Book 2001, almost 35.6 percent of the total households in

**Table 5.1 Annual Average per Capita Income, 2001**

Source: World Bank, 2001

Sources of Income	Income in RS	in %
Total Monthly Income	24,561	100
Current Cash Income	18,632	75.9
Wages and Salaries	8,667	35.3
Enterprise Income	5,183	21.1
(agricultural)	(317)	(1.3)
(non agricultural)	(4866)	(19.8)
Property Rental Income	2,828	11.5
Pension and Assistance	1,586	6.5
Other Cash Income	367	1.5
Income in kind	5,929	24.1
Home Produced	71	0.3
Free of Cost	689	2.8
Received as Part of Pay/ Wages	5	
Enterprise Income	940	3.8
(agricultural)	(911)	(3.7)
(non agricultural)	(28)	(0.8)
Rental Value of a Self-owned Home	4,225	17.2

Kathmandu live below poverty line. This means that about a third of the households in the city have a household income of \$95 per month or lower. (ADB, 2001)

#### 5.3. Labor Force

Kathmandu has a predominantly young population with the working age sector (ages 15-59) comprising the biggest sector (68.57%) of the city's population structure. However, according to the Population Census of 2001, about 52 percent of this labor force is considered to be economically inactive.



### 5.3.1. Employment by Major Economic Activities

Wage-earners or those employed by the government and private companies represent the biggest employment sector in Kathmandu. They comprise 30.28 percent of the economically active population. They are followed by those who have their own economic enterprise and those working in the agriculture sector, accounting for 15 percent and 1 percent, respectively.

**Table 5.2 Employment by Major Economic Activities, 2001**  
Sources: Population Census 2001  
CBS and Information System Unit

	Male	Female	Total	%
Economically active	179,094	54,997	234,091	47.32
Agriculture	4867	3,965	8,832	1.79
Wages	115,091	34,703	149,794	30.28
Own economic enterprise	59,136	16,329	75,465	15.26
Population of age 15 years and above	268,375	226,294	494,669	

The 2001 census calculated the unemployment rate at 3.09 percent. (CBS, 2001) Women have a slightly higher unemployment rate at 3.40 percent, compared to males which have an unemployment rate of 3 percent.

**Table 5.3 Unemployment Rate, 2001**  
Sources: Population Census 2001  
CBS and Information System Unit

Indicators	Male	Female	Total
Economically active population of age 15 years and above	179,094	54,997	234,091
Population of age 15 years and above who are seeking for job	5,535	1,936	7,471
Unemployment rate (%)	3.00	3.40	3.09

### 5.3.2 Child Labor by Major Economic Activities

About 25.5 percent of children ages 6-14 are economically active in Nepal, while about 4.4 percent are wage workers. The informal sector is largely comprised of domestic labor where majority of these children are employed. The five types of child labor belonging to the 'worst forms' category are domestic child labor, bonded child labor, child ragpicking, child portering and girl trafficking for commercial sexual exploitation.

**Table 5.4 Households Employing Domestic Child Labor by Caste and Occupation, 2001**  
Source: Shama et al., 2001

Caste/Ethnicity of Employer	%	Occupation	%
Brahmin	43.8	Service (employees)	47.3
Chhetri	16.2	Trade	25.4
Newar	21.1	Grihathi	13.2
Terai	3.7	Retired	4.5
Thakuri	3.2	Wage Earner	2.5
Praja/Chepang	0.5	Agriculture	2.0
Janajati*	8.2	Student	1.2
Marwari	1.0	Social Service	0.5
Others	1.0	Politician	0.8
Not stated	1.3	Not stated	2.6
Total	100.0	Total	100.0

Domestic child labor (DCL), internationally defined as children working in an employer's house with or without wage, is quite common in the urban areas of Nepal. According to a joint study done by the International Labour Organization and UNICEF (ILO/UNICEF 2000), one in five households employ a domestic child laborer in Kathmandu or an estimated 21,191 children ages 18 years old and below. It also stated that approximately 10.4 percent of core urban households, 21.3 percent of urban (Ward no. 1, 2, 3, 9, 10, 11, 29, 31, 32 & 33) and 18.3 percent of semi-urban households (Ward no. 4, 5, 6, 7, 8, 13, 14, 15, 16, 34 & 35) were found to employ domestic child laborers. DCLs involving children aged

15 years and above are relatively lower than DCLs 14 and below, which may be attributed to the fact that DCL salaries increase with age and that teenagers tend to be more difficult to manage. Newars are the largest DCL employers in core urban wards, while Brahmins are the most frequent employers in urban and semi-urban wards. (Shama et al., 2001)

### 5.4. Trade and Commerce

Kathmandu has been a trading city from time immemorial. Because of its position on the ancient trade route between India and Tibet, commerce has always been important in the lives of the inhabitants. Until not so long ago, Kathmandu's merchants used to travel in

**Table 5.5 Number and Nature of Business Establishments, 2005**  
Source: KMC Ward Profiles, 2005

Ward No.	Manufacturing	Agriculture and Forest-based	Tourism	Services	Energy Based	Construction Related	Mining
1	9		118	1			
2	12	5	14	2			
3		8	4	6			
4	30	5	3	6			
5	6				1		
6	37			3			
7	31		2				
8	3						
9	25	11	5			5	
10	6					8	
11							
12	4		5			1	
13	8		5	5			
14	7	1	5				
15	4	1		10		5	2
16	16	18					5
17							
18	38	16	20	16	1	18	2
19	5	3					
20		4					
21	7			7			
22	10		15	5			
23	6		8	13			
24	5		22	10		2	
25	2		9	3			
26		3					
27	1						
28	18		1	9			
29	4	10	250	8	3	15	
30	4		35	10			
31	17						
32	16	5				12	
33	11	3		2			
34	18			2			
35	18					17	
Total	378	93	521	118	5	83	9

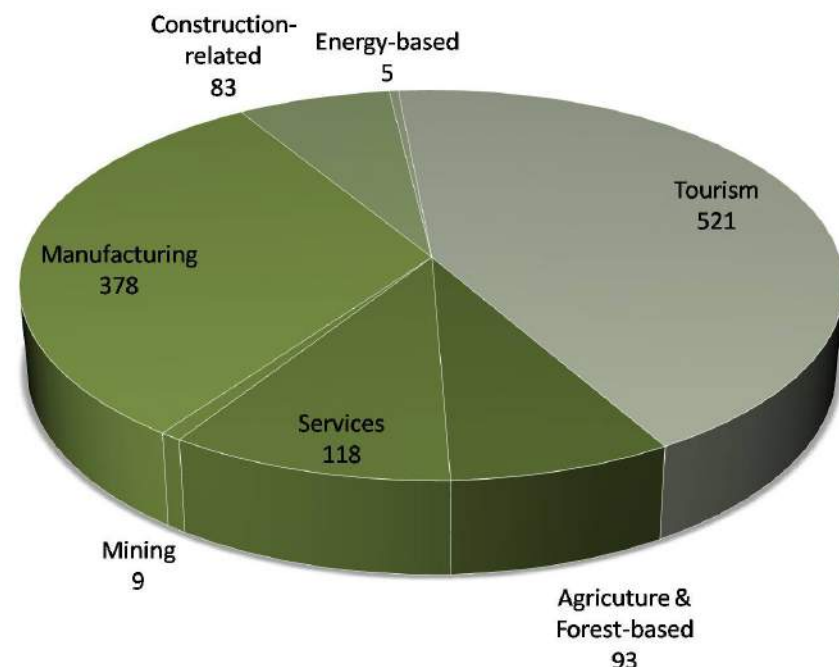


Figure 5 Types of Industry Base, 2005  
Source: KMC Ward Profiles, 2005

caravans across the Himalaya to run business in Lhasa, China, an institutionalized tradition that goes back to centuries. Farming, metal casting, woodcarving, painting, waving and pottery are the other popular traditional occupations. Tourism is the highest revenue earner for the economy of Nepal. (www.kathmandu.gov.np)

There are 1,207 registered business establishments in Kathmandu. The tourism sector comprises the biggest number with 512 establishments, followed by manufacturing and services with 378 and 118 establishments, respectively. Wards no. 29 and 1 have the most number of tourism establishments, while Wards no. 4, 6, 7 and 18 have the most number of manufacturing establishments.

Table 5.6 Households Operating Small Scale Non-agricultural Activities, 2008

Source: ISRC, Municipality Profile of Nepal-2008

Type of Activity	Percentage
Manufacturing	6.86
Trade/Business	49.49
Transport	3.49
Services	30.26
Others	9.90

A number of the economic activities in Kathmandu are household-based. Almost half of the city's households are engaged in trade and business. Those involved in service-related activities comprise 30.26 percent of the city's total households.

### 5.5. Agriculture

Of the total number of households in the city, 17,000 (or 9 percent) are involved in agriculture and related activities in the city fringes. They grow paddy, wheat, maize, beans, mushroom, vegetables and various fruits such as banana and orange. They also rear cattle and poultry as livestock husbandry. In recent years, the traditional agricultural system in the periphery has undergone significant transformation and farmers in the city have shown increasing interest in commercial farming such as floriculture and horticulture. (Thapa et. al., 2007)

According to ISRC, there are 8,396 households that maintain agricultural lands in Kathmandu. Some of the households have lands specifically for livestock and poultry raising while others use their land for both agricultural and livestock production.

Table 5.7 Households Having Agricultural Land, Livestock and Poultry, 2008

Source: ISRC, Municipality Profile of Nepal -2008

Household Having:	No. of Households
Agricultural Land Only	8,396
Livestock Only	614
Poultry Only	595
Land & Livestock	833
Land & Poultry	367
Livestock and Poultry	197
Land, Livestock and Poultry	282
None of all	140,871
Total	152,155

### 5.6. Tourism

As in the whole of Nepal, tourism is a major economic industry in Kathmandu. This is due to several natural and human-made tourist attractions that the city offers, which include temples, heritage sites, palace squares and the majestic view of the Himalayas. Kathmandu is Nepal's tourism gateway. Almost 90 percent of foreign visitors arrive by air at the Tribhuvan International Airport which is the only international airport in the country. Kathmandu is also the hub of the national transport system, with road connections to various parts of Nepal. There are direct air links from Kathmandu to all neighboring countries in East Asia, the Middle East and Europe. (www.kathmandu.gov.np)

The inflow of tourists via air surged to 367,900 in 2007-2008, an increase of 10.9 percent from 331,600 of the preceding year. The inflow of third-country tourists surged by 21 percent to 277,900 in 2007-2008 compared to a growth of 23.2 percent in the previous year. However, the inflow of Indian tourists via air declined

Table 5.8 Tourist Arrival in Nepal, 2005-2008

Source: Macroeconomic Situation (2007/08 Nepal Rastra Bank)

	Numbers			Percent change		Percent share	
	2005/06	2006/07	2007/08	2006/07	2007/08	2006/07	2007/08
India	101,231	101,862	90,016	0.6	-11.6	30.7	24.5
Third country	186,488	229,779	277,927	23.2	21	69.3	75.5
Total	287,719	331,640	367,943	15.3	10.9	100	100

sharply by 11.6 percent to 90,200 contrary to a marginal rise of 0.6 percent in the preceding year.

### 5.6.1. World Heritage Sites

#### Kathmandu Durbar Square

The Kathmandu Durbar Square lies in the heart of the city. It is also called the Hanuman Dhoka Palace Square, an ancient seat of the Nepalese Royalty. The complex houses a huge Royal Square imposing a tremendous variety of temples dedicated to different Hindu gods and goddesses. Most of the buildings in the area date back to the 15th-18th centuries.

The palace complex is named after a monkey god called Hanuman. The stone statue of Hanuman painted all red can be seen right next to the main entrance (the golden gate) of the palace. Hanuman is regarded as a powerful protector of the entire Durbar Square. Some of the important monuments found inside Durbar Square are:

- Taleju temple- Tallest structure built by King Mahendra Malla in 1549 A.D.
- Jagannath temple- A 16th century temple known for having erotic figures carved in the wooden struts leaves.
- Kal Bhairav- One of the largest stone idols in Kathmandu representing the terrifying aspects of Shiva.
- Statue of King Pratap Malla in praying gesture to Digu Taleju, the royal family deity right across.
- Kumari Ghar - A 17th century Kumari temple, an example of the highly developed Nepalese temple craft.
- Kasthamandap- Built from the timber of a single tree.



Another fascinating part of this palace complex is the Nautale Durbar overlooking the beautiful cityscape and the vast Basantapur square where Prithivi Narayan Shah built a mansion to commemorate his victory in 1768 A.D. This building complex is famous for the intricately carved wooden doorways, roof struts and massive lattice windows full of mythical figures. Pasupatinath is considered as one of the holiest shrines of all Hindu temples. The temple has remained the presiding deity of the ruling Nepalese Royalty. Located on the banks of



View of Pashupati Nath Temple, a World Heritage Site (Photo credit: KMC website)

the Bagmati River, this magnificent two-tiered golden temple with four triple silver doorways is a unique example of Nepalese temple architecture. It is one of the largest Hindu temple complexes in South Asia with hundreds of Shiva lingams, shrines, and icons of various Hindu gods and goddesses inside. This temple site occupies an area of 281 hectares in total. The main entrance of this temple is in the western side facing a small street of Deopatan market. As non-Hindus are not allowed to enter this temple courtyard, they are advised to go on the other side of the river in the East to have a glimpse of the temple complex.

In the middle of spring (February-March) every year, a festival called Shivaratri is celebrated. The word Shivaratri means the holy night of Lord Shiva. Many devotees visit the Pashupati Nath temple and make the ceremonial fire during the festival. Most of the devotees spend the night offering prayers to Shiva. This festival attracts tens of thousands of pilgrims from India besides the locals. Historically, during the pre-Christian era, this temple seems to have its origin way back to the early Kirat period. Stone sculptures found in the vicinity support the antiquity of this place. This holy site is 6 km east of downtown Kathmandu. Regular bus and taxi services are easily available from city points. Boudha Nath Stupa

One of the oldest and the biggest Buddhist monuments ever built in Nepal is Boudhanath. It stands 36 meters tall and lays on a massive three-level mandala style platform surrounded by colorful buildings and religious edifices. The basic feature of this great stupa is very much like that of Swoyambhunath stupa except for its finial displaying and larger size. It lies on the valley floor whereas the former one stands on the hill top. This stupa is said to have been built in 5th century A.D. The site is considered very much like Mecca for the Tibetan Buddhists and every year, tens of thousands of pilgrims from all over the Himalayan region visit the stupa.

According to a very popular legend, the kingdom of Kathmandu was under a terrifying drought. King Dharma Deva was then advised by an astrologer that only a sacrifice of an ideal man with 32 virtues in front of the dry royal water spout could make the rain fall in the country. The following night, he commanded his son to go to the dry water spout inside the royal palace compound at midnight to behead a person shrouded in white robe without looking at him. The prince obeyed his father. But to his great horror, it was none other than his father. It was said that the prince built this great stupa to atone for the sin that he had committed.



View of Swoyambhu Nath Stupa, a World Heritage Site (Photo Credit: KMC website)

As an entry point of ancient Nepal-Tibet trade route, the site is popularly frequented by Tibetan visitors. During Lhosar festival the pilgrims worship the Buddhist deities, light the increase and butter lamp day and night. Every twelve years a special ceremony is observed with great gusto and fervor. During that time they dance, play musical instruments, chant and hymns.

Located in a lovely little hill rock, Swoyambhu Nath Stupa is one of the most fascinating architectural jewels of the world. This great stoup is said to have been built around 250 B.C.

Generally, a holy memorial site stoup represents a typical Buddhist architecture. Its main feature, the white dome, is identified with a spotless pure jewel of Nirvana and a 13-tiered golden spire in conical shape surmounted on the dome. Underneath this towering structure are pairs of all-seeing eyes of Buddha painted on all four sides of the stupa. The Stupa of Swoyambhunath stands on a typically stylized lotus mandala base, believed to originate from a legendary lake of Kathmandu Valley.

As the ancient legend goes, Kathmandu Valley was a lake a long time ago. Right in the center of this lake was a full-blown lotus with the divine light atop. When a saint from China

named Maha Manjushri heard about this, he came rushing all the way from China to the Valley. So, he cut through the southern wall hill of the valley with his divine sword and the cleft made by the sword immediately drained the entire lake water making the valley floor open for a close-up view of the divine lotus light.

This holy site is in fact the most massive stupa complex ever built in Nepal. Hundreds of votive shrines and other historical monuments built in and around this stupa speak a lot about the significance and antiquity of this famed stupa.

It lies about 3 km west of downtown Kathmandu. Other important things to be seen here include a magnificent two tiered golden temple dedicated to Harati. She is the grandmother deity of children and small pox who was said to be an ogress until Lord Buddha converted her to be the great caretaker of the children.

Not too far from this temple is Dewa Dharma monastery. It is well-known for a bronze icon of Buddha and traditional Tibetan paintings. The huge gold-plated vajra (a priestly symbol of Vajrayana Buddhism) set on the Dharmadhatu mandala at the side of the stupa is worth a close look.

### 5.6.2. Tourist Facilities

Attractions and amenities are important elements of tourism that motivate tourists to visit a particular site. These include facilities and services provided by hotels, airlines and transport companies, insurance agents, financial institutes, government, travel agencies/ middlemen/commission agents, etc. Natural attraction, cultural values and archaeological beauties are the main attractions in Kathmandu.



## CHAPTER 6. LAND USE

With numerous attractions in the city, the potential of tourism is very high.

### Hotels

Accommodation plays a central role in tourism. Accommodation can itself be an important tourist destination. There is no dearth of comfortable accommodation in Kathmandu as there are more than a hundred hotels and lodges in and around Kathmandu for all kinds of budgets. A wide variety of accommodation such as hotels, motels, lodges, guest houses, apartments, rented houses, paying guest house, local house, tea house, tents, inns, resorts, etc. are available in the city. Thamel today is an agglomeration of hotels, restaurants pubs and souvenir shops. (Maharjan and Guni, 2005)

Table 5.9 Hotel Accommodation by Category, 2005

Source: Maharjan and Guni, 2005

Categories	Hotel Count	Room Count	Average Single Room Rate (USD)
5 Star	7	1334	143.57
4 Star	9	819	105.55
3 Star	12	686	55.00
2 Star	23	834	27.08
1 Star	20	581	15.05
Non-star	81	1334	20.16

### Financial Services

Financial institutions are dispersed in different areas of Kathmandu City. These range from A class commercial Banks to B Class development banks to C class financial Companies to D class multipurpose Cooperative institutes. To date, there are around 20 commercial banks operating in the city. See Annex 4 for more details on Financial Institutions in Kathmandu.

### Civil Society

From 1978 to July 2006, there have been 6,719 non-government organizations (NGOs) working in Kathmandu alone. On the other hand, international non-government organizations (INGOs) number to 185 as of November 2007, according to the Social Welfare Council. Most NGOs and INGOs are involved in community

development (Annex 5). Although the Social Welfare Development is the prime unit to look after community development programs, its activities has reportedly been very limited (World Bank, 2001).

### 5.7. Situational Analysis

While tourism dominates KMC's economic landscape, there are other signs of growth fueled by trade and manufacturing. More industries and economic activities are expected to emerge as the city modernizes and enters a new era of democratization. However, the city continues to face a number of socio-economic difficulties. These include the following:

- Low economic capacity of the city as shown by the lack of facilities and support services for industries and commercial establishments;
- Power shortage and frequent power outages;
- Political instability which affects economic activities in the city such as tourism;
- Lack of government support to industries;
- High rate of unemployment;
- High rate of out-migration of skilled workers to foreign countries (brain drain);
- Widespread use of child labor;
- Lack of business skills;
- Growing informal sector;
- Improper management of heritage sites; and
- Land fragmentation.

### 5.8. Challenges and Opportunities

The economic issues and problems of Kathmandu present a number of key challenges and opportunities to risk-sensitive land use planning. These include the need to identify and establish economic centers and industrial areas to host and support existing and future industries, the improvement of power generation capacity and power supply in the city, provision of centers for employment and skills training, establishment of management system of heritage sites, programs to maintain the flow of the tourists if not increase especially from India among many others.

KMC has been one of the fastest growing urban areas in the world, but most of its growth has been organic and unplanned, a situation that has been exacerbated by very poor construction standards. Further, the old part of the city is congested with many old buildings and monuments that have little capacity to resist seismic ground shaking. Access to older neighborhoods is also very difficult due to narrow, winding and sometimes unpaved roads, making any rescue and relief effort extremely difficult. The risk of fire following an earthquake is also high in these neighborhoods.



A view of historic city core in Kathmandu which is highly vulnerable to earthquake disasters

Road construction in the east and northeast spurred KMC's growth outside the historic city core in the 1950s and 1960s. This generally took the form of low-density ribbon development along the thoroughfares as well as in the city fringes. Meanwhile, large swaths of land remained undeveloped within the city limits.

### Durbar Square, Old Kathmandu

With assistance from the United Nations, efforts to develop Kathmandu in a planned way began in 1962. Seven years later, a comprehensive document titled "The Physical Development Plan for Kathmandu Valley" was released, stipulating that any development within Kathmandu must be considered within the context of the Valley as a whole. However, the plan was neither endorsed nor implemented by the government. The same is true for the 1978 UNESCO-prepared "Master Plan for Conservation of Cultural Properties in Nepal" which remains unimplemented to date. Consequently, the absence of clear land use plans and land development regulations has contributed to haphazard and rapid urban growth in the Valley since the 1970s. The rapid urbanization in the 1970s and 1980s was a result of government-led urban development and economic expansion in trade, tourism and carpet industry sectors. Kathmandu has the only international airport in the country and more than 95 percent of incoming tourists arrive by air.

In the early 1990s, the concept of zoning appears to have been implemented with the execution of building bylaws, which effectively categorized the whole Kathmandu Valley into nine zones, namely, old city, residential, institutional, industrial, conservation, city extension, surface transport, airport, and sports.

The residential zone is further subdivided into four sub-zones: commercial, dense mixed habitation, other residential, and planned residential. However, zoning has not been enforced in Nepal very seriously. The lack of





Ribbon Development in Thoroughfares  
Photo credit: EMI, 2008



Substandard Structures  
Photo credit: EMI, 2008

a clear-cut segregation between the industrial and residential zones has been a case of worry in Nepal, as well as the conversion of residences into schools and medical nursing homes. (Pokharel, 2006)

Over the years, more fringe areas have been opened up for urban development due to the construction of access and arterial roads in and around KMC. By the 1990s, urban sprawl and ribbon development began to spread further to the outlying rural areas, now generally in the north-south direction. By 2000, the rural areas of the valley have been transformed by rapid urbanization, residential subdivision development and building construction.

Kathmandu Valley has also experienced intensive in-migration since the eradication of malaria in 1951. In addition, an influx of internally displaced people has created a huge demand for housing and basic services. Today, one-third of its residents live in slum dwellings and about 18,000 people are squatting (without land rights) in 64 informal settlements, many located in the periphery and villages around the urbanized area of the valley.

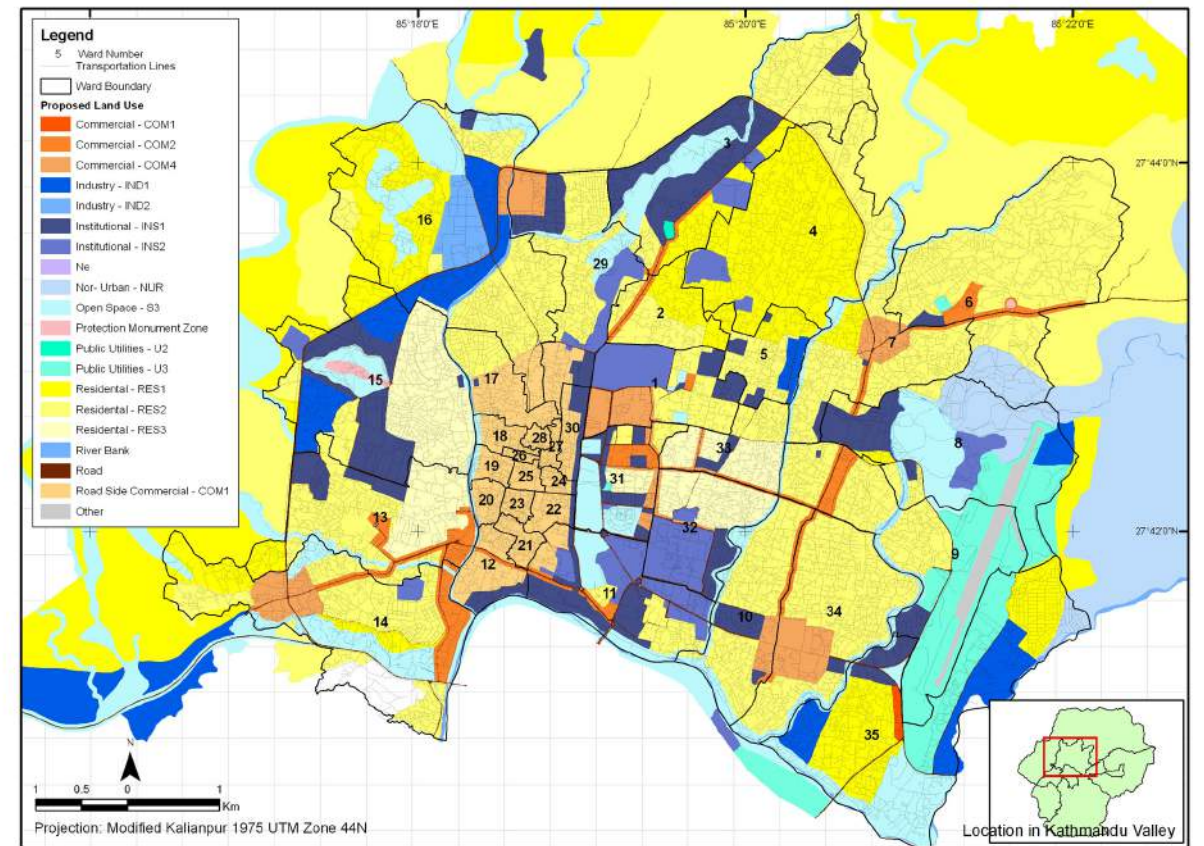
The land use pattern of KMC is dominated by mostly residential and mixed residential-commercial land uses. These occupy 3,273.6 hectares of land which make up 64.5 percent of the city's total land area. As Nepal's capital city and center of government, culture and religion, the institutional land uses make up 4.7 percent of the city's land area. Transportation

Table 6.1 Urban Land Use, 1995  
Source: Cities Data Book, KMC, 2000

Land Use	Area in ha.	%
Mixed residential/commercial	3,273.6	64.5
Commercial/Industrial	82.6	1.6
Institutional	239.2	4.7
Transport (airport/bus terminal)	166.3	3.3
Others	1,314.3	25.9
Total	5,076	100

Table 6.2 Land Area per Land Use Type, 2001  
Source: KMC Government

DESCRIPTION	Hectares	% Hectare
Commercial - COM1	5.16	0.10
Commercial - COM2	144.04	2.83
Commercial - COM4	172.98	3.40
Industry - IND1	186.54	3.66
Industry - IND2	40.06	0.79
Institutional - INS1	446.50	8.77
Institutional - INS2	224.54	4.41
Nor- Urban - NUR	106.11	2.08
Open Space - S3	557.60	10.95
Other	35.99	0.71
Protection Monument Zone	7.90	0.16
Public Utilities - U2	208.91	4.10
Residential - RES1	651.82	12.80
Residential - RES2	1647.93	32.36
Residential - RES3	292.39	5.74
River Bank	33.35	0.65
Road	73.44	1.44
Road Side Commercial - COM1	257.60	5.06
TOTAL AREA	5,092.85	100



KMC Proposed Land Use, 2001

Sources: Kathmandu Metropolitan City Government, JICA

Map and projection modified by EMI-GIS, 2010

Figure 6.1 Proposed Land Use Map, 2001  
Source: Modified by EMI, 2010

use comprises 3.3 percent, while commercial and industrial land uses comprise 1.6 percent of Kathmandu's total land area.

Considering the demand for land uses KMC proposed Kathmandu City land use Plan in 2001. Figure 6.1 shows proposed spatial distribution of land uses.

### 6.1. Existing Land Use

The predominant land use type in Kathmandu is mixed land use which comprises mostly of combined residential and commercial land uses. Currently, the lands are zoned based on the Building Bylaws of 2007 prepared and updated by the KVTDC.

According to the said Bylaws, KMC is responsible for the issuance of building permits for the construction of new buildings, including group housing and apartments. Record

shows that KMC issues about 4000 Building permits per year, 40 percent of which are for building extensions while the rest are for new constructions.

The Building Bylaws of 2007 provides for land use zoning of the Valley and the corresponding building controls allowed for specific zones. The Bylaws make use of the Floor Area Ratio (FAR) as a measure to control the amount of buildable area over a plot, as well as the regulations in the amount of open space that may be taken (Refer to Box 6.1 for the detailed explanation of FAR).

The description of the nine major zones in Kathmandu Valley, as prescribed in the Building Bylaws of 2007, is given below. The KMC zoning map is shown in Figure 6.2.

### Nine Major Zones in Kathmandu Valley

1. Old City Zone
  - a. Preserved Monument Sub-Zone. Many



historic temples are situated in the area. The sub-zone lies at the centre of KMC's core residential area.

- b. Preserved Cultural Heritage Sub-Zone. The sub-zone lies along the heritage walkway in the core residential zone, where some old buildings and temples stand. It is defined to preserve and promote the heritage character of old buildings and temples.
- c. Mixed Old Residential Sub-Zone. This central core is densely populated. Urban pattern has been developed since Malla Period with a trade centre located in Ason. Ason is connected by roads from six different directions, where old houses lie along. Many Bahals and Bahils (open court and courtyards) are also connected to the roads.

**Box 6.1. Explanation of Floor Area Ratio**

FAR (Floor Area Ratio) is a co-efficient which when multiplied by the plot area gives the total allowable area that can be built in that plot.

$$FAR = \frac{\text{Total Floor Area}}{\text{Area of the Plot}}$$

Floor area: the sum of the gross horizontal areas of all floors, except floors entirely located below ground level (basement), of any building, measured from the exterior faces of the external walls. The floor area of a building shall include attics, interior balconies, enclosed porches and floor area devoted to accessory uses. However, any ground floor area constructed and used for vehicle parking shall not be included as floor area.

For example: If a person has a plot of 1,000 sq ft in FAR=1.75 zone, he is allowed to build only 1,750 sq ft. And if he wishes to build a house having 800 sq ft, he can build only two stories with a staircase area of 150 sq ft. Similarly, if he wishes to build a house having 600 sq ft, he may build up to three stories.

FAR is not the same for all zones, and within zones, it also varies according to the purpose of the building. Basically, the rule allows the construction of at least five stories in a 4.5 FAR zone, three stories in a 2.5 FAR zone, and two stories in a 1.75 FAR zone.

**2. Residential Zone**

- a. Commercial Sub-Zone. This sub-zone is defined as plots adjacent to major roads, highways, ring road or roads having width of 14m or higher up to the depth of 25m from road edge. Certain roads have been defined as commercial zones, as shown in Fig. 6.2 below.
- b. Dense Mixed Residential Sub-Zone. This is an area where settlement expanded after the core city zone.
- c. Other Residential Sub-Zone. This is an area where settlements are less dense, normally adjacent to the dense mixed residential sub-zone
- d. Planned Residential Sub-zone. This sub-zone covers planned settlement areas usually resulting from land pooling.

**3. Institutional Zone**

These areas are for important institutions such as education, health centers, hospitals etc.

**4. Industrial Zone**

This is an area where industries are located.

**5. Protected Zone/Recreational Zone**

These are areas meant for the preservation and protection of parks, forest, greenery, open space, historical, cultural and religious spaces, etc.

**6. City Expansion Zone**

These are areas with potential for infill and densification and possible conversion, provided that they are not zoned as a protected area.

**7. Surface Transport Zone**

Bus parks, truck parks, car parks, roads, etc are located under this zone. Prior to any type of construction in this zone, permission should be granted from relevant offices.

**8. Airport Zone**

Tribhuvan International Airport and its nearby areas come under this zone. Development works related to airport are permitted here.

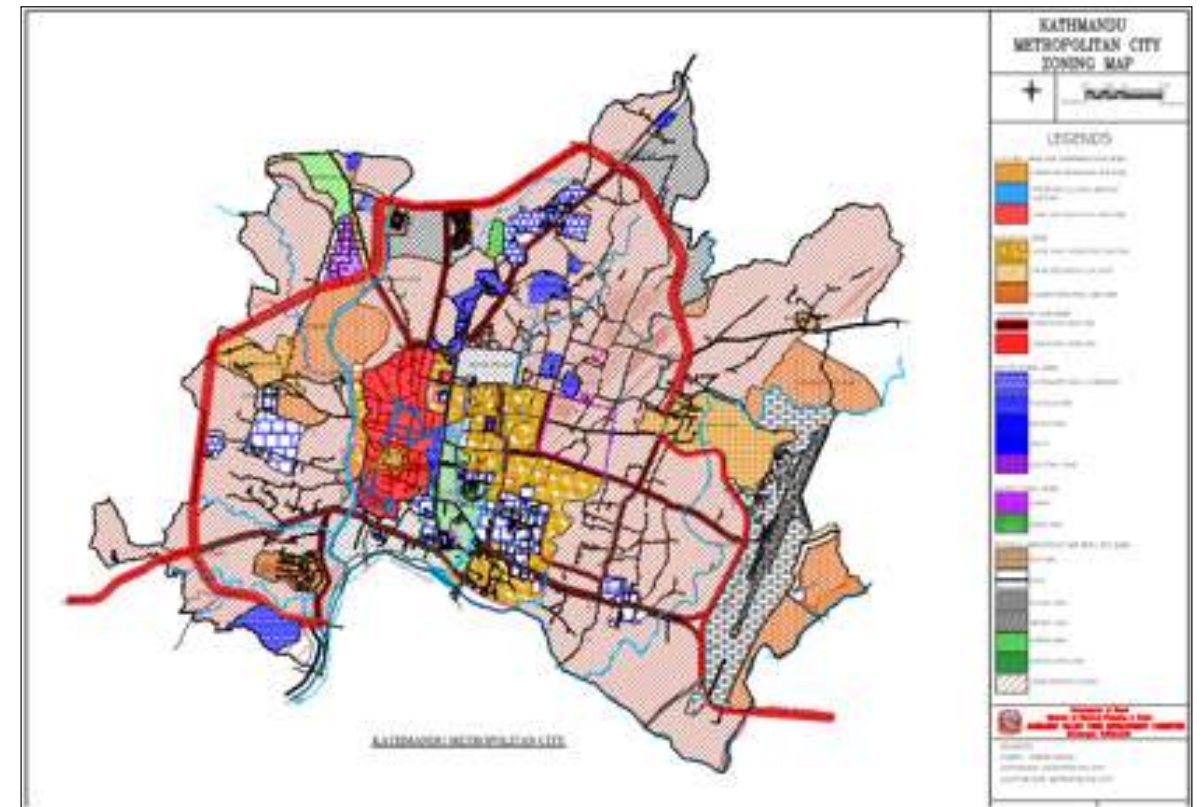


Figure 6.2 Land Use Map, 2007  
Source: Nepali Building Bylaws, KVTDC, 2007

**9. Sports Zone**

These are areas where indoor games and sports are held.

Note that the 2007 KVTDC land use map was updated only for urban areas by KVTDC.

**6.1.1. Trends in Building Construction**

Housing in KMC, like in most cities of the world, is considered a valuable asset and significant investment. However, unlike in other countries where land development precedes the construction of houses, infrastructure provision typically comes last in Kathmandu. Historically, the land development process has been dominated by brokers due to the limitations of land development initiatives undertaken by the government. Also, formal private sector initiatives are rare due to fragmented private land ownership and difficulty in land acquisition.

Current Building Bylaws, as prepared and updated by KVTDC in 2007, has specified

different development controls for various land uses as shown in Figure 6.2. As already noted, KMC is responsible for the issuance of permits for new constructions and building extensions, for both individual and group housing. Table 6.3 shows that KMC has issued the most number of permits in the 2001-2002 period.

Table 6.3 Registered and Approved Building Permits, 1999-2009  
Source: UDD, KMC, 2009

Fiscal Year	Registered	Approved
99/00	3460	2301
00/01	4606	3355
01/02	4995	4958
02/03	5225	4484
03/04	5233	4495
04/05	5002	4562
05/06	3746	4001
06/07	3985	4250
07/08	3939	3750
08/09	3245	3122
Average	4343.6	4240



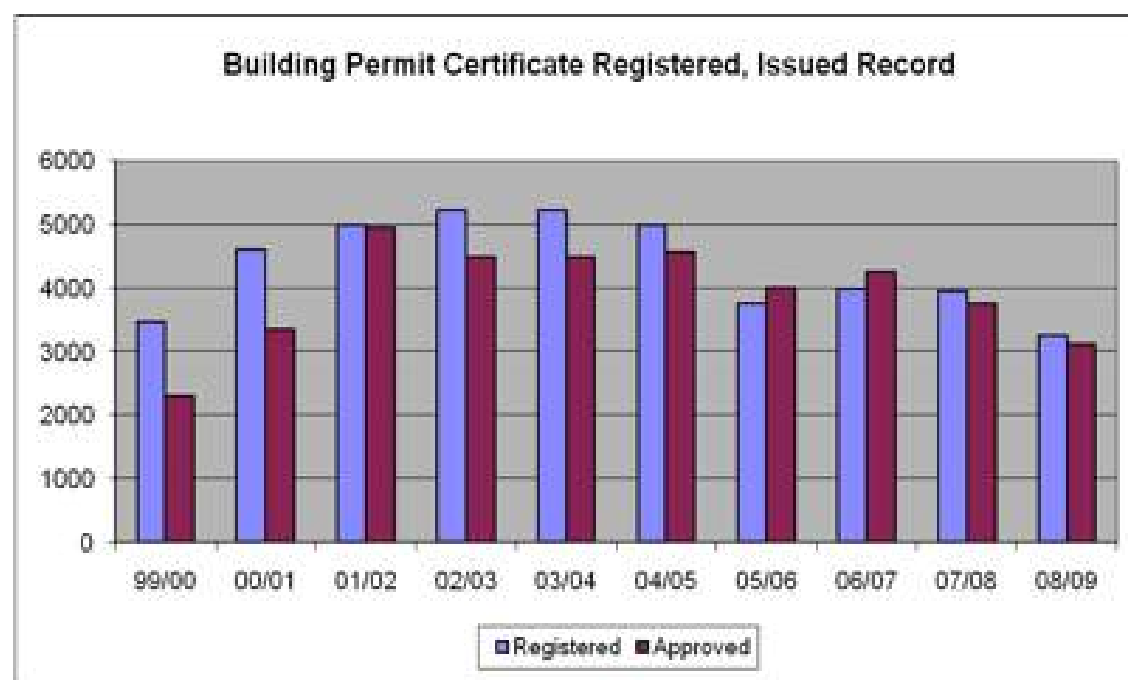


Figure 6.3 Building Permit Certificate Registered and Issued, 1999-2009

The number of building permits registered and issued in KMC over the ten-year period, 1999-2009, is presented in Table 6.3. It shows that KMC has received an average of about 4,343 applications for building permits each year. On the average, the city has approved about 4,240 of these building permit applications. Overall, building permit applications appear to be decreasing in recent years, with the most number of applications recorded in the year 2001-2002.

A large number of building permit applications are for the construction of new buildings, while about 40 percent of these applications are for the construction of building extensions and/or additional stories.

Most of the building permits registered and approved by KMC were for buildings with small lot size (less than 3,000 square feet). In the year 2008-2009 alone, over 75 percent of

Table 6.4 Purpose of Registered and Approved Building Permits, 2004-2009

Source: UDD, KMC, 2009

Fiscal Year	04/05	05/06	06/07	07/08	08/09
New Construction	3508	3080	3066	3080	3508
Extension/Storey addition	1054	921	1184	670	642

Table 6.5 Registered and Approved Building Permits by Lot Size, 2004-2009

Source: KMC, UDD, 2009

Fiscal Year	04/05	05/06	06/07	07/08	08/09
Less than 3000sq ft	3808	2884	3107	2944	3163
3000-5000 sq ft	912	626	661	723	760
5000-8000 sq ft	185	139	120	154	171
Greater than 8000 sq ft	59	65	52	56	78

the registered and approved building permits were for construction of buildings with lot size of less than 3,000 square feet. This is the latest trend in building construction in the city with majority of the new multi-storey buildings having a small base. This has an implication on structural safety of buildings because buildings with small base become relatively unsafe as their number of stories increase.

### 6.1.2. Land Pooling

Land pooling is one of the many approaches for managing urban sprawl. In Nepal, land pooling technique was first initiated in Pokhara in 1975. Since then, land pooling projects have been implemented in various parts of Kathmandu under the Town Development Act 045.

basic urban services. There is no formal contract between the owner and the contractor, or with the designer who prepares building drawings and supervises the construction.

One of the prominent features of owner-built system is the lack of community facilities and coherent built environment in residential neighborhoods. Land is fragmented in small parcels which are serviced by narrow and winding roads. Plotted development in most of the cities of Nepal has been responsible for inefficient land development and rising land price.

With the rising price of land and building materials, it has become very difficult for households to buy land and build a house.

Table 6.6 List of Land Pooling Projects, as of 2009

Source: KMC, UDD, 2009

No.	Name of project	Ward. no.	Project Period	Area (hectare)	Implementing agencies
1.	Gongabu land Pooling Project	29	1988-1996	14.24	KVTDC
2.	Dallu housing Project	15	1991-2002	20.0	KVTDC
3.	Sinamangal Land pooling project	35	1995-2002	35.98	KVTDC
4.	Chabahil Land Pooling Project	7	1995-2002	10.94	KVTDC
5.	Naya Bazar Land pooling project	16, 17	1995-2004	44.27	KMIIP / KMC
6.	Chamati Land pooling project	15, 16	2002- cont.	73.03	KMC
7.	Manohara Land Pooling Project	35	2002- cont.	134.90	KMC
8.	Bagmati river corridor Land Pooling Project	6,8	2003- cont.	63.46	KVTDC
9.	Dhobikhola river corridor Land Pooling Project	4,5,7	2003- cont.	14.25	UDPDD

### 6.1.3. Urban Housing Development

Housing is one of the key indicators of urban expansion and economic growth. In the case of Kathmandu, investments in housing by individual households far exceed investment in other sectors. Most of the housing is dominated by owner-built system which is more of an informal type of housing development. In this system, an owner is responsible for purchasing land, providing infrastructure and building the house. The role of public agencies is limited to issuing the building permit and providing

Nevertheless, the recent availability of certain financing schemes from banks and financial institutions is slowly transforming the housing development practice from owner-built system to organized housing development. Housing in major cities of Nepal is now being considered as a commodity rather than a social asset. Dwelling units can now be bought, sold and rented out as per the housing demand. Investors are finding housing as an attractive area for investment because of its expanding market and lucrative returns.

With the enactment of the Apartment Ownership Act in 1997, the legal framework for development, sale and management of apartments has been established. The law has been instrumental in initiating a formal housing market in Nepal where developers, design consultants, contractors and bankers have their own role to play.

The bankers have found housing market as the source of profitable products. Similarly designers and developers have emerged as the champion in the market because of their skill in bringing together all the above-mentioned parties in achieving their goal. Housing developers have been successful in creating a new kind of business entrepreneurship in the country that can guide planned urban development by the private sector.

#### 6.1.4. Cultural and Heritage Sites

Kathmandu's ancient and refined culture has been inspired by the convergence of the Hindu and Buddhist devotion of its inhabitants. The traditional customs, festivals, art and literature are all religious in character. Kathmandu's location on a key Asian trade route has exposed it to varied influences from ancient times, further enriching its local artistry. Kathmandu possesses one of the greatest concentrations of architectural treasures in the world. Not only are there hundreds of temples, stupas and open shrines in KMC, but also 106 monastic courtyards called "baha" or "bahi," which are centers of art and piety traditions. Other heritage sites are listed in Annex 6.

Most of the remarkable cultural wealth is located in the City Core. These artistic edifices are intimately linked with the daily life of the people. They provide places for worship and are the setting for a roster of annual festivals (Annex 7). As mentioned, UNESCO listed four of the temple complexes of Kathmandu as World Heritage Sites, namely, the Hanuman Dhoka Durbar Square, Swayambhunath, Pashupatinath and Bouddhanath. (www.kathmandu.gov.np, Nepal MCTCA, 2007)

Over the past millennium, the cultural heritage of Kathmandu Valley has developed a close association with earthquakes. The Integrated Management Framework (IMF) for the Kathmandu Valley World Heritage Site is a Road Map towards conserving the outstanding universal value of the Monument Zones of Kathmandu. While it is not a legal document, it defines a process consensually developed by concerned authorities. The IMF is said to set up the basic institutional, legislative and economic frameworks for managing the Monument Zones and Buffer Zones. Once in place, the next step is to establish a Risk Management and Disaster Prevention Programme. (Nepal MCTCA, 2007)

The Monument Zones are under the jurisdiction of the local authorities as defined by the Local Self Governance Act 1999, while the State Party is represented by the Department of Archaeology, Ministry of Culture, Tourism and Civil Aviation as stated in the Ancient Monument Preservation Act 1956. The Department of Archaeology is responsible for the coordination and monitoring of the graded monuments. Management is carried out by site managers specific to each of the Monument Zone but government authorities from other sectors also carry out work within the Monument Zones. The horizontal coordination among the Ministry of Culture, Tourism and Civil Aviation, Department of Archaeology and these respective government and semi-government agencies has only been partially achieved. Overlapping of responsibilities has been one of the major issues. (Weise, 2007)

#### 6.2. Land Use Trends

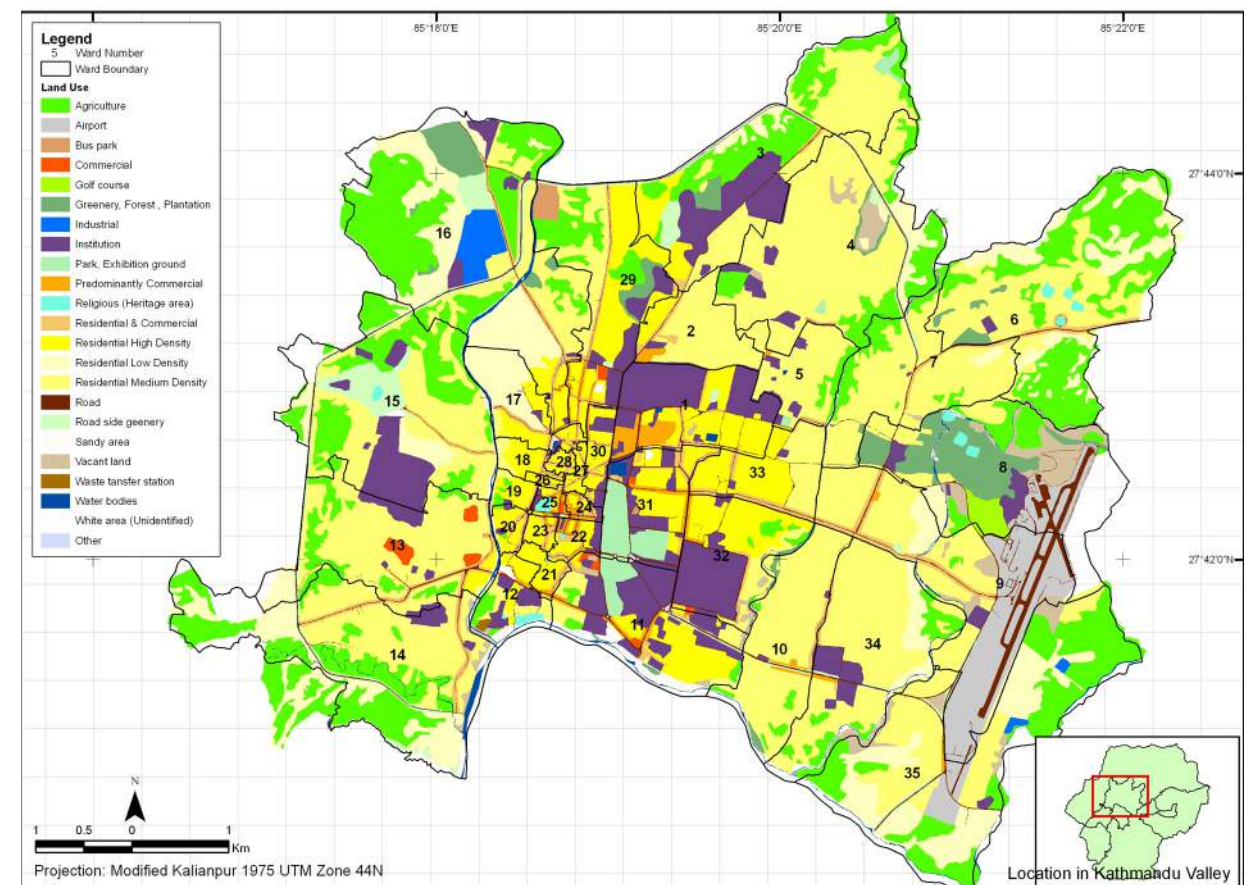
A 2001 study conducted by KVTDC showed that 32 percent of Kathmandu Valley used to be forest, while 40 percent used to be agricultural. Rice, wheat, corn, vegetables, and a variety of fruit including bananas and oranges were grown in the fertile Valley, providing vital support to people living uphill.

Kathmandu's agricultural landscape has dramatically transformed into urban form since the 1960's. Driven by vehicular arteries and migration into the city, rapid land use change and high population influx have caused undesirable impacts to the environmental conditions and livelihoods of inhabitants in the urban area.

In 1995, 64.5 percent (3,273 ha) of KMC's total area were mixed residential/commercial use. The urban built-up area accounted for 23 percent of the total land in 1989; this increased by 17 percent in 2005. On the other hand, the area for cultivated land decreased from 36 percent to 22 percent in the same period. Urban land use in Kathmandu Valley rose from 3,096 ha in 1984 to 9,193 ha in 2000, while agriculture land decreased from 40,950 ha in 1984 to 27,570 in 2000. (World Bank, 2001)

Developed in the 10th century based on the so-called "Mandala Principles," KMC has since expanded both horizontally and vertically by the end of the 20th century. Three distinct urban fabrics - inner core, outer periphery and urban fringe - exhibit the prevailing socio-economic conditions, planning and construction techniques, and the quality of master builders of that period. (Shresthra, 2000)

The urban area of Kathmandu has expanded from 24 percent of the total area in 1971 to 67 percent in 1991. New public and private construction took place with no advance planning, consultation, or review. There would still be formidable problems with implementation and enforcement even if land use regulations were enacted into law due to lack of workable institutional structure and planning capacity. The absence of public investment



**KMC Existing Land Use, 2001**

Sources: Kathmandu Metropolitan City Government, JICA

**Figure 6.4 Land Use, 200**

Source: Modified by EMI-GIS, 2010

Map and projection modified by EMI-GIS, 2010



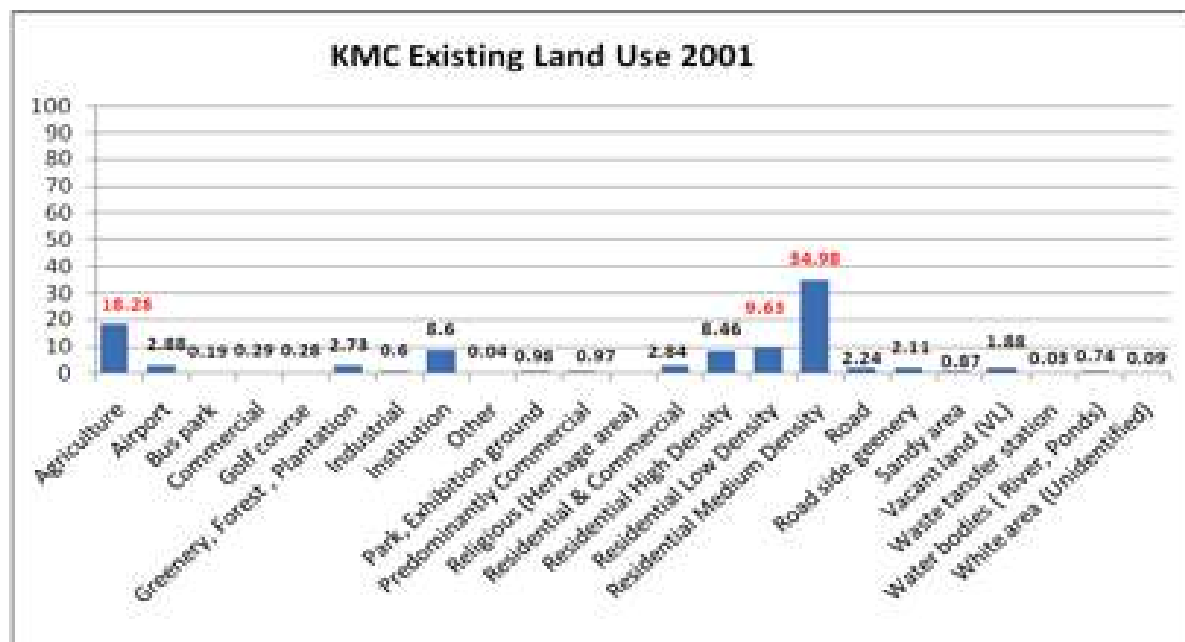


Figure 6.5 Land Use Distribution, 2001

Source: KMC Government

planning and coordination in the Valley is also a major cause of land use problems.

According to a study (HMG Secretariat), the built-up area, which has been rapidly increasing since 1989, will double by 2019 accounting for 60 percent of the total area, while agricultural land will be halved during the same period. It also estimated that for the ten-year period between 2009 and 2019, the water level and forest cover will decrease dramatically at less than 5 percent and 10 percent, respectively. Overall, it clearly indicated an alarming trend: the rapid expansion of urban built environment on one hand and the shrinkage of the cultivated land on the other. (Thapa and Murayama, 2007)

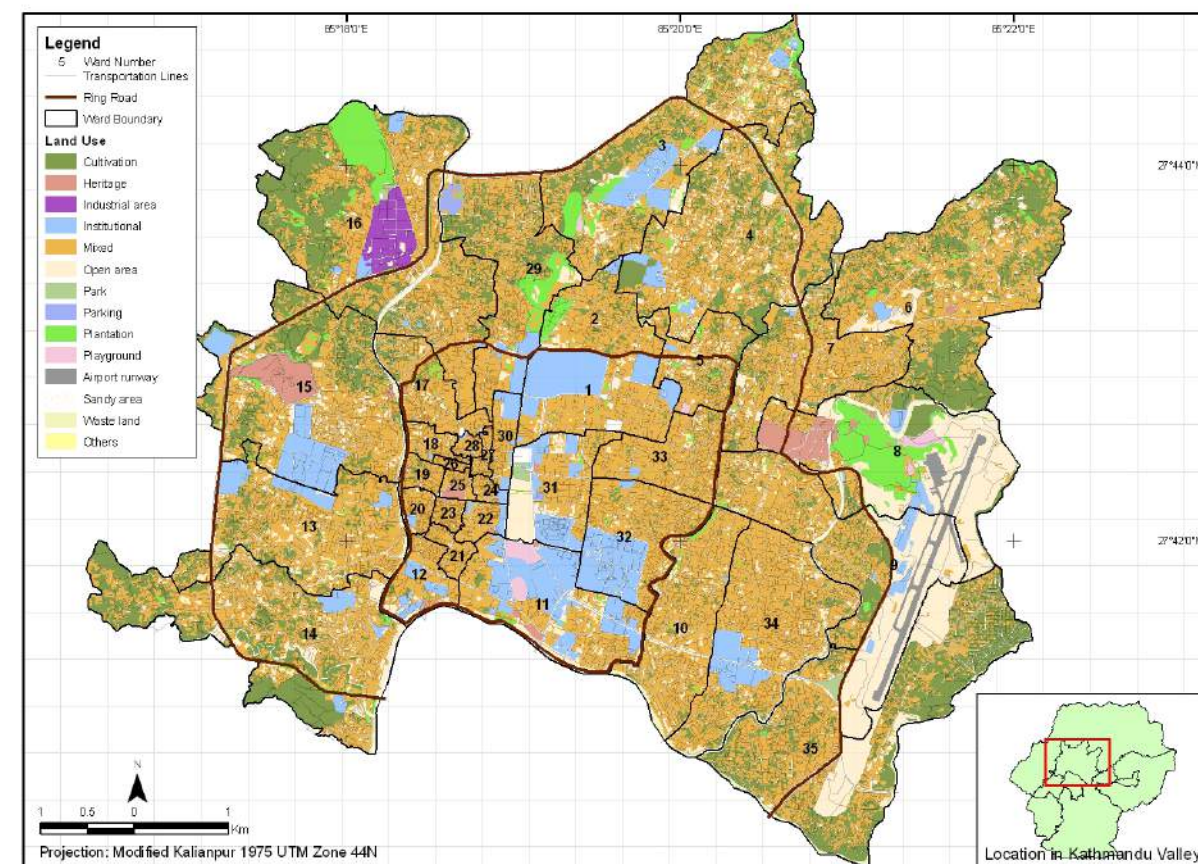
Figures 6.4 present the existing land use map of KMC in 2001, while Figures 6.5 show the land uses in the city in 2006. A tabulation of the different uses follows these descriptions.

Kathmandu is mostly a residential city with over half of its land area (56%) used for residential purposes in 2001. Residential medium density is the biggest sub-use using up 1,802 hectares of land or almost 35 percent of the city's total land area. Agriculture is the second biggest land use in 2001 with about 18 percent of the city's land devoted to agricultural uses. This is followed by

Table 6.7 Land Use Distribution, 2001

Source: KMC Government

Description	Area in Hectares	% in hectares
Agriculture	942.30	18.28
Airport	148.57	2.88
Bus park	9.61	0.19
Commercial	14.99	0.29
Golf course	14.31	0.28
Greenery, Forest, Plantation	140.96	2.73
Industrial	30.70	0.6
Institution	443.36	8.6
Other	1.92	0.04
Park, Exhibition ground	50.67	0.98
Predominantly Commercial	50.03	0.97
Religious (Heritage area)	15.03	0.29
Residential & Commercial	146.17	2.84
Residential High Density	435.83	8.46
Residential Low Density	496.38	9.63
Residential Medium Density	1,802.82	34.98
Road	115.72	2.24
Road side greenery	108.76	2.11
Sandy area	45.06	0.87
Vacant land (VL)	97.09	1.88
Waste transfer station	1.38	0.03
Water bodies (River, Ponds)	38.37	0.74
White area (Unidentified)	4.54	0.09
TOTAL (in hectares)	5154.5378	100



KMC Land Use Map 2006

Sources: Kathmandu Metropolitan City Government, JICA

Map and projection modified by EMI-GIS, 2010

Figure 6.6 Land Use Map, 2006

Source: Modified by EMI, 2010

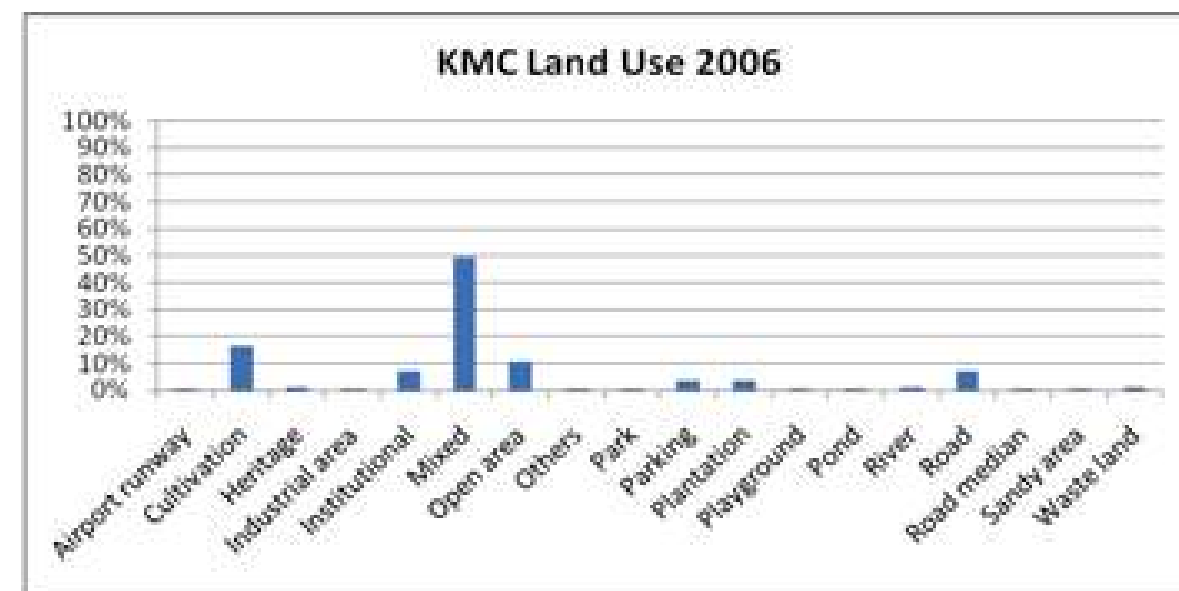


Figure 6.7 Land Use, 2006

Source: KMC Government



**Table 6.8 Land Area per Land Use Type, 2006**

Source: KMC Government

Description	Area in Hectares	% Hectares
Airport runway	33.07	0.63
Cultivation	855.10	16.41
Heritage	63.57	1.22
Industrial area	32.25	0.62
Institutional	385.85	7.40
Mixed	2574.71	49.40
Open area	562.41	10.79
Others	0.48	0.01
Park	10.19	0.20
Parking	6.22	3.64
Plantation	189.79	3.64
Playground	17.05	0.33
Pond	6.50	0.12
River	42.89	0.82
Road	375.25	7.20
Road median	1.25	0.02
Sandy area	0.42	0.01
Waste land	55.08	1.06
<b>TOTAL AREA</b>	<b>5212.07</b>	<b>100.00</b>

institutional land use with 8.46 percent of the city's land area.

By 2006, residential land use remains the biggest land use category of the city but the category has been changed to mixed residential-commercial use. It is quite common to see multi-level residential buildings in the city with the first floor being used for commercial uses. The mixed residential-commercial land use represents 49.4 percent of the city's land area in 2006.

Agriculture (cultivation) has decreased by about 2 percent from 2001 to 2006. In 2006, cultivation land uses accounts for about 16 percent of the city's land area. These agricultural lands are located in the urban fringes of the city which is expected to be converted into urban land uses in the near future.

Land for transportation purposes (road) has dramatically increased in 2006. Around 375 hectares of land has been appropriated for construction of roads. This accounts for about 7 percent of the city's land area.

Wards no. 16 and 1 register the biggest land area devoted to commercial activities with 28 hectares and 14 hectares, respectively. Wards no. 4 and 35, on the other hand, have the biggest land area for residential use, allotting 241 hectares and 206 hectares, respectively. The wards with the biggest land for agricultural uses are Wards no. 16, 6, 14 and 35

Kanti Path district in Ward no. 2 is densely built up and a bustling business center, whereas the eastern part is sparsely populated with much open land.

Almost the entire Ward no. 13 is made up of residential and commercial areas. Most of the land area of Ward no. 14 consists of residential and business areas. Dense settlements are observed in the ward's north, while houses are more scattered in the south. Ward no. 4 is densely settled. Even large tracts of farmland remain, for example, in the fields behind Nepal Rastra Bank, west of Chandol and around the Dhobi Khola. These cultivable lands are irrigated by the Dhobi Khola and Khahare rivers.

Ward no. 3 possesses the distinction of having more greenery than other wards because of the Ranibari forest. A large part of Ward no. 15 is an army area that consists mostly of high ground, except for the Chamati, Chagal, Ayra Hiti and Pande Phant regions. There are scattered rural settlements found in the northern part of Ward no. 16 and numerous public shelters, rest houses and stone water spouts in Ward no. 18.

### 6.3. Situational Analysis

Land use regulations and development are functions of both the city and national governments. Large-scale infrastructure within the city is under the central government's jurisdiction. However, city roads, solid waste management, street lighting and such are operated and promoted by city government. Land use management, though not currently existing in an integrated manner, is the

**Table 6.9 Areas under Different Land Use (in hectares)**

Source: ISU, KVMP/KMC - Tribhuvan Pradhan, 2001

	Residential	Agricultural	Business	Service	Greenery	Mixed used	Other	Total area (hectares)
KMC	2709	911	96	558	313	357	156	5100
Ward								
1	45	0	14	66	1	9	2	138
2	72	0	3	1	0	5	0	82
3	147	85	0	56	24	5	0	318
4	241	36	0	12	13	4	17	321
5	62	8	0	5	1	2	1	79
6	188	146	0	2	8	12	0	356
7	137	7	0	0	4	8	18	174
8	34	27	0	36	88	20	40	245
9	128	2	1	102	5	39	10	286
10	133	6	2	1	7	7	1	157
11	37	5	8	27	15	54	4	151
12	22	5	2	11	0	8	3	51
13	156	26	9	13	3	14	1	223
14	187	127	0	9	11	19	13	364
15	129	92	0	47	36	10	3	316
16	192	150	28	13	49	19	5	456
17	55	0	0	1	0	8	1	66
18	16	0	0	0	0	2	0	18
19	11	2	0	0	0	2	0	16
20	9	1	0	1	0	4	0	16
21	12	0	0	0	0	3	0	15
22	8	0	3	3	0	4	0	19
23	6	0	1	0	0	4	0	10
24	3	0	2	1	0	3	0	9
25	3	0	2	1	0	4	0	10
26	3	0	0	0	0	1	0	4
27	5	0	0	0	0	3	0	8
28	4	0	0	1	0	2	0	7
29	101	34	5	25	12	22	2	200
30	13	0	1	7	0	5	0	26
31	33	0	5	19	30	14	3	104
32	59	6	2	48	0	10	4	128
33	74	0	0	1	0	10	0	86
34	180	20	1	18	2	9	1	232
35	206	128	5	30	4	011	25	411
KMC	2709	911	96	558	313	357	156	5.00

**Table 6.10 Percentage of Land Use Type per Ward, 2001**

Source: ISU, KVMP/KMC - Tribhuvan Pradhan, 2001

	Residential	Agricultural	Business	Service	Greenery	Mixed used	Other	Total
KMC	53.12	17.87	1.87	10.94	6.13	7.01	3.06	100.00
Ward								
1	32.86	0.00	10.41	47.88	0.82	6.52	1.51	100.00
2	88.14	0.34	3.41	1.79	0.00	6.32	0.00	100.00
3	46.23	26.85	0.00	17.56	7.64	1.72	0.00	100.00
4	74.93	11.16	0.00	3.60	3.91	1.10	5.29	100.00
5	78.41	9.86	0.58	6.48	1.25	2.77	0.65	100.00
6	52.93	40.95	0.00	0.52	2.12	3.43	0.05	100.00
7	78.81	4.12	0.00	0.10	2.08	4.47	10.43	100.00
8	13.96	10.87	0.00	14.56	35.92	8.21	16.48	100.00
9	44.79	0.60	0.24	35.60	1.84	13.58	3.36	100.00
10	84.56	3.84	1.57	0.61	4.37	4.32	0.74	100.00
11	24.78	3.36	5.54	17.68	10.15	35.71	2.78	100.00
12	42.47	10.09	3.11	21.30	0.00	16.58	6.44	100.00
13	70.17	11.70	4.16	5.87	1.44	6.07	0.60	100.00
14	51.22	34.81	0.00	2.47	2.91	5.14	3.46	100.00
15	40.65	28.94	0.00	14.89	11.45	3.18	0.89	100.00
16	42.05	32.79	6.18	2.92	10.83	4.15	1.08	100.00
17	83.46	0.00	0.00	1.73	0.00	12.60	2.20	100.00
18	86.87	0.00	0.00	0.82	0.00	10.77	1.54	100.00
19	73.87	10.68	0.00	0.49	0.00	12.41	2.55	100.00
20	57.91	6.11	0.00	9.44	0.00	23.41	3.12	100.00
21	77.83	0.00	2.91	0.00	0.00	19.26	0.00	100.00
22	40.88	0.00	18.39	17.13	0.95	22.45	0.19	100.00
23	55.20	0.00	7.35	2.02	0.00	35.43	0.00	100.00
24	31.34	0.00	20.73	12.40	0.00	34.77	0.75	100.00
25	25.08	0.00	23.63	9.66	0.00	41.63	0.00	100.00
26	70.18	0.00	0.00	0.00	0.00	29.82	0.00	100.00
27	62.18	0.00	0.00	0.00	0.00	37.82	0.00	100.00
28	54.08	0.00	0.00	10.31	0.00	35.38	0.24	100.00
29	50.47	16.91	2.58	12.27	5.75	11.22	0.80	100.00
30	50.18	0.00	2.76	26.44	0.00	20.61	0.00	100.00
31	31.73	0.00	4.37	18.24	28.94	13.63	3.08	100.00
32	45.85	4.43	1.57	37.27	0.00	7.97	2.91	100.00
33	86.68	0.00	0.00	1.71	0.00	11.28	0.33	100.00
34	77.52	8.78	0.47	7.94	0.76	3.96	0.57	100.00
35	50.26	31.23	1.20	7.33	1.08	2.79	6.12	100.00

responsibility of the city government.

The lack of access of the landless and economically deprived groups to land, the continued existence of dual ownership in practice, fragmentation of agricultural land, non-implementation of land use project, and lack of management of the landless and freed bonded laborers remain the main challenges of land management in Nepal (Nepal Three-year Interim Plan 2007-2010).

As revealed during the course of key informant interviews and during the workshop on 8 February 2008, there were several issues that would have to be addressed in order to successfully institutionalize land use planning with DRR. These problems included the following:

- Unplanned land use and urban development characterized by haphazard construction of buildings, unplanned infrastructure development, and conflicting or incompatible land uses such as industrial activities in residential areas.
- Highly fragmented land parcels with many divided into small plots. It is quite common to see multi-level buildings with small base built on a small-sized land in Kathmandu.
- Encroachment or squatting on public lands.
- Conversion of agricultural land and ponds into built-up areas.
- Lack of a detailed proposed land use plan at the municipality level.
- Inadequate system to implement the bylaws. Implementation of plans and bylaws was still weak, which necessitated more affirmative political action on the ground by ministries and local governments.
- Lack of a monitoring system for land use. Monitoring actual land utilization is a big concern, as there is currently no system for doing this efficiently and effectively. The problem is compounded by the fact that there are no restrictions to convert agricultural lands to residential, commercial, or other purposes, despite the

presence of possibly incompatible adjacent land uses.

- There seemed to be a lack of in-depth coordination between concerned agencies that pointed to a need for clearer delineation of rules. In particular, the overlapping work of KVTDC and KMC would have to be rationalized.
- There seemed to be a lack of awareness of the relation between risks and land use planning, especially in the context of a city which still used old methods (no reinforced steel frames in houses) and whose landscape has been the result of inheritance practices that result in increasing smaller subdivision of residential lots.
- Lastly, the issue of how to deal specifically with existing and accumulated risks in developed areas was also mentioned, though this was considered to be of lower importance compared to the rest.

#### 6.4. Challenges and Opportunities

The land use issues and problems in Kathmandu provide the following challenges and opportunities:

- Improvement of existing land division standards and practices - minimum of 855 square feet (79.5 square meters);
- Encouragement of land consolidation process;
- Provision of incentives for preserving agricultural lands - increase property tax for urban lands, no infrastructure development in agricultural areas like roads, encourage urban agriculture;
- Encouragement of land consolidation process through land pooling;
- Development of a land use plan and digital-based cadastral mapping system; and
- Effective implementation and enforcement of the land use plan and zoning ordinance.

# CHAPTER 7. INFRASTRUCTURE AND UTILITIES

## 7.1 Transportation

Urban growth in Kathmandu has taken place without adequate transportation infrastructure. Conflicting land uses and inadequate road network have resulted in congestion and inefficient transportation facilities. Nevertheless, the historic city core does have an excellent pedestrian network and travel in the city is still dominated by walking. Buses and tempos are the dominant modes of public transport in which the private sector is playing a major role. Private vehicles like motorcycles and cars have increased in the valley numbering over 120,000 vehicles, slightly over 50 percent of which are motorcycles. A strategy plan suggests pedestrianizing the city core and already a short stretch of Kathmandu Durbar Square area has been pedestrianized, a move that locals often oppose. Recently, KMC implemented the Municipal Infrastructure Improvement Project which included upgrading roads, improving drainage, constructing pedestrian overhead bridges, and placing traffic signs in the city's historic core. The decision to upgrade the city's transportation system was borne out of the fact that 109,400 vehicles typically ply through the city within a 16-hour period. (ADB, 2006)

Almost all the vehicles in Bagmati zone run on the streets of Kathmandu. (Clean Energy Nepal, 2001) During the fiscal year of 2001 alone, 23,143 vehicles entered the streets of Kathmandu. Among these, 77 percent were motorcycles. Cars and two-wheelers have been dominating the total fleet in Nepal and now comprise about 22 percent and 51 percent of the total vehicle fleets, respectively. (Pokhrel, 2003)

Table 7.1 Vehicle Population, 2001  
Source: ESCAP, 2003

Vehicle type	No.	%
Bus	2187	1
Minibus	2264	1
Truck/Tanker	2264	3
Car/Jeep/Van	41595	24
Three-wheeler automobile	4788	3
Two-wheeler automobile	113660	66
Tractor	1672	1
Others	554	0
Total	172,405	

Density of roads if the Valley is 14 meters per hectare or 5.6 percent of developed land (KVTDC, 2002), which is lesser than international standards. Sixty percent of total vehicles run in roads of the Valley and with exploding population, the pressure on existing transportation facilities will continue to grow. The problem is also escalated due to lesser number of public transportation modes as compared to private.

According to the Department of Transport Management (DoTM), the total number of vehicles registered in Bagmati Zone was 246,760 up to 2003-2004. The total number of vehicles registered in 2005-2006 was 27,262. The present rate of vehicle accumulation in Bagmati Zone is estimated to be around 12 percent per annum.

Growth in motorized vehicles, particularly buses, has been tremendous in the last five years. The number of three-wheelers (tempos, etc.) has remained fairly static, but the number of buses (including minibuses) has more than doubled in the same period. One of the consequences of this has been increased competition for



**Table 7.2 Vehicle Registration in Bagmati Zones, 1998-2006**

Source: Department of Traffic Management

Vehicle type	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06
Bus	1,526	106	112	114	236	285	198	806
Mini-bus	1,577	33	194	368	232	116	445	242
Microbus			617	104	292	675	670	
Truck	5,226	69	189	751	744	540	440	1,007
Car	33,016	2,977	4,681	2,649	2,999	6,788	12,287	3,603
Three-wheeler	4,106	672	171	124		26	40	
Motorcycle	81,331	12,886	17,783	22,852	21,558	18,035	20,003	21,604
Total	126,782	16,743	23,747	26,962	26,061	26,465	34,083	27,262

passengers, with resultant congestion at passenger boarding points and unregulated rates.

Kathmandu Valley has experienced large growth in vehicle numbers as urbanization takes place in a rapid manner. Unfortunately, the increase in the number of vehicles is accompanied by simultaneous lack of improvement in the existing facilities and disorganized movement of traffic, thereby resulting in increased congestion and accidents which in turn have decreased vehicle speeds affecting road capacity. The road network within the valley is inadequate, while roads remain unclassified according to vehicle types. With increased vehicular traffic and common tracks for all types of vehicles in the valley, traffic congestion is increasing, contributing to excessive vehicular emissions.

**Table 7.3 Annual Vehicle Growth, 2000-2006**

Source: Department of Traffic Management

Vehicle type	Year		Average annual % growth
	2000/01	2005/06	
Three-wheeler	4,949	5,139	0.95%
Microbus	617	2,358	39.82%
Truck	5,484	8,966	13.08%
Bus	1,744	3,383	18.02%
Minibus	1,804	3,207	15.47%
Total	14,598	23,053	12.10%

**7.1.1. Road Network**

The commercialization of and external influences on KMC can be attributed to the construction of Tribhuvan highway linking the country to India in the 1950s and the Araniko highway to China during the 1960s. (Department of Road, 2004) These roads also enabled people from outer regions to migrate to Kathmandu. KMC has a fairly good radial road network connecting it to other parts of the country. The city is connected to the eastern and western parts of the valley by the Arniko and Tribhuvan highways, while feeder roads connect the northern and southern parts of the valley to the city. KMC has a total road length of 950.37 km. The city is served by a ring road, which also acts as the city boundary. An inner ring road has been proposed by experts, but few new roads have been added recently. There are many unplanned roads connecting properties to the road network. Poor road conditions are caused by its inefficient design, construction, and maintenance along with diggings for maintaining utilities such as water supply.

Public transport cannot operate in most settlements. Small public vehicles such as tempos and micro-buses have their own limitations in terms of handling passengers at affordable rates. Inefficient networks consume more land for less benefit all round.

**7.1.2. The Bishnumati Link Road**

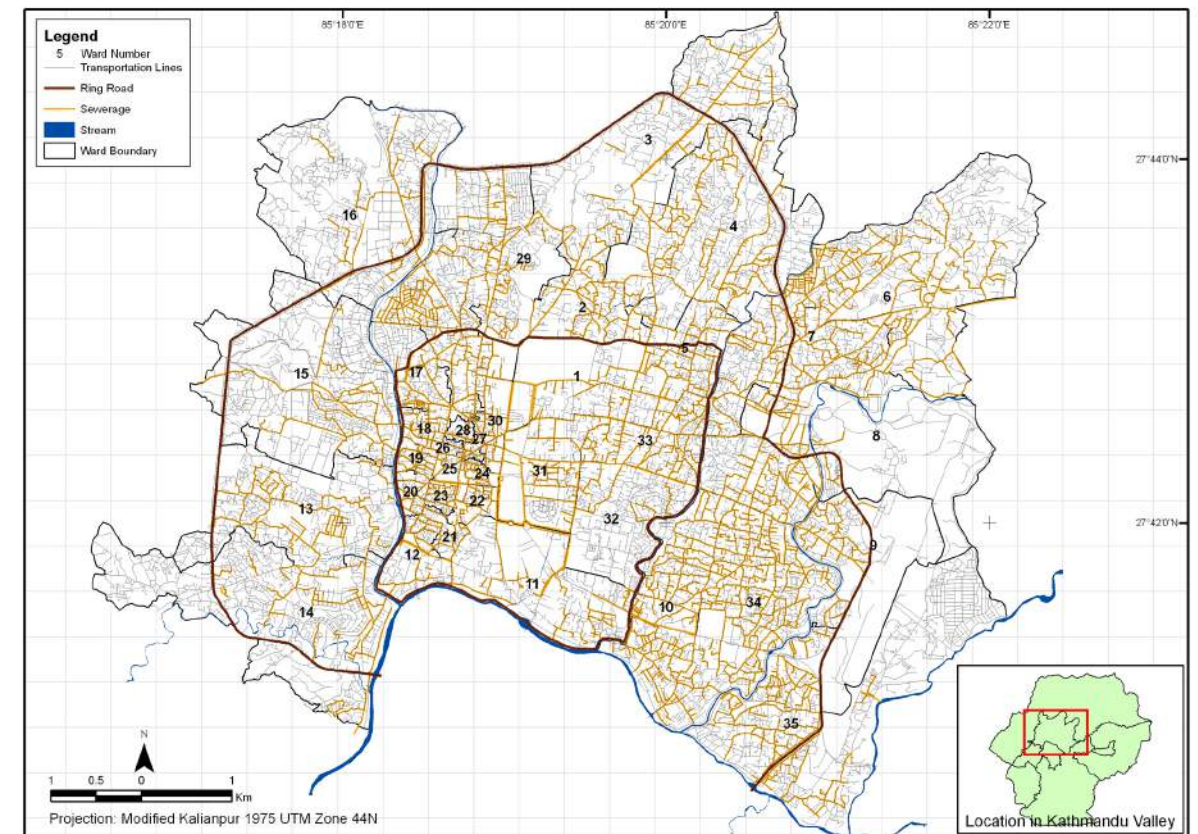
The Bishnumati Link Road (BLR) lies within the heart of KMC, Bagmati zone. This project is under the Project Implementation Unit (PIU) of the ongoing Urban and Environmental Improvement project (UEIP). The UEIP is a project being implemented under Loan No. 1966 NEP (SF) from Asian Development Bank (ADB). The DUDBC under MPPW is the executing agency of the UEIP-implemented sub-projects. The Bishnumati Link Road starts from Teku Bridge of Teku-Kalimati road section running along the west bank of Bishnumati River up to Lakha Tirtha of Chagal Area. Then it crosses the river and from Kankeshwori onwards, it runs along the eastern bank of Bishnumati River. From Kankeshwori, this road follows the eastern bank of the river up to Indrayani. From Indrayani, the road diverts toward Khusibu via Dhalko, thereby joining Thamel - Balaju road at Sorhakhutte Chowk.

The total length of Bishnumati Link Road is 2.8 km. The road is designed to have 20m width, 14m blacktop carriage way with 3m footpath on either sides of the road. The project cost estimate with contingency and VAT is NRs. 143,847,909.24 (US\$1,895,700). (www.nepal.gov.np)

**7.2 Drainage and Sewerage**

The Nepal Water Supply Corporation (NWSC) is a government corporation set up in 1990 from the former Water Supply and Sewerage Board. It is responsible for water supply and sewerage for Greater Kathmandu and 11 other towns.

The sewerage system in Kathmandu is combined with storm drainage, with rivers acting as sinks for domestic sewage, street discharges, and industrial effluents. There are 4 major wastewater treatment plants managed by NWSC, with a total capacity of 19 million



**KMC Sewerage Network Map**

Sources: Kathmandu Metropolitan City Government, JICA

Map and projection modified by EMI-GIS, 2010

**Figure 7.1 Sewerage Network Map, 2006**

Source: Modified by EMI, 2010



liters per day. About 22 percent of the valley population are connected to the sewerage system, comprising 48,000 households (10,000 of them illegally). Septic tanks are used by most of the other households. Investment from the different agencies for sewerage and drainage during 1997-2001 amounted to NRs155,133,000 (US\$1.98 million). There are four treatment plants which have a capacity of 17 million liters per day to treat sewerage produced by around 55,000 people on a year-round basis. The combined storm water and sewer system is about 50-70 years old that services 17 percent of KMC households.

### 7.3 Water Supply

The main water supply for the urban areas in Kathmandu consists of several subsystems fed by surface water sources and 37 deep wells. About two-thirds of the total supply is from surface water, the quality of which is satisfactory except during the rainy season when turbidity increases. However, the groundwater has high levels of iron and ammonia. The government has embarked on a long-term program for augmenting the water supply in Kathmandu Valley towns through inter-basin transfer from the Melamchi River, new water treatment plants, extension of the bulk distribution network, and additional storage capacity. (ADB Kathmandu Utility Profile)

The Government's National Water Supply and Sanitation Sector Policy of 1998 supports the involvement of the private sector in the operation and management of water supply and sanitation services in Kathmandu Valley towns and the establishment of a regulatory agency for economic regulation of service providers. It provides for full cost recovery for urban areas and recovery of at least operation and maintenance costs for rural areas. Preparation of legislation for the creation of the regulatory agency is ongoing.

#### General Data about water utility:

Connections : 123,062  
 Annual Operation : US\$2,938,200  
 & Maintenance Costs

Annual Revenue : US\$2,821,850  
 Annual Capital Expenditure : US\$2,108,470  
 Source of Investment Funds : 17% grant; 57% loan; 26% tariff

#### Production and Distribution:

Annual Production : 51,427,405 m<sup>3</sup>  
 Groundwater : 38%  
 Surface Water : 62%  
 Annual Consumption  
     Domestic : 31,201,660 m<sup>3</sup>  
     Nondomestic : 1,198,295 m<sup>3</sup>  
     Total : 32,399,955 m<sup>3</sup>

### 7.4 Power

Electrical power is sourced from the 132 Kilovolt national grid obtained from 14 power generation stations, delivering 242 megawatts. About 89 percent are generated from hydropower sources, while 11 percent are from diesel. Power consumption in KMC takes up 50 percent on the average of the nation's annual electricity.

The residential and commercial areas make use of 220 volt electricity supply. Approximately 100 percent of the population in KMC has access to electricity. The following statistics reveal the increasing demand for energy:

Maximum demand in KMC : 100 MW (approx)  
 Bulk sub-station capacity : 161.3 MW  
 Growing demand : 10% p.a. (average)

*\*132 Kilovolt national grid served from 14 power generation stations, deliver 242 megawatt (www.wako.ac.jp/~bambang/jica-disaster/Oct20/KathmanduMetropolitanCity.doc)*

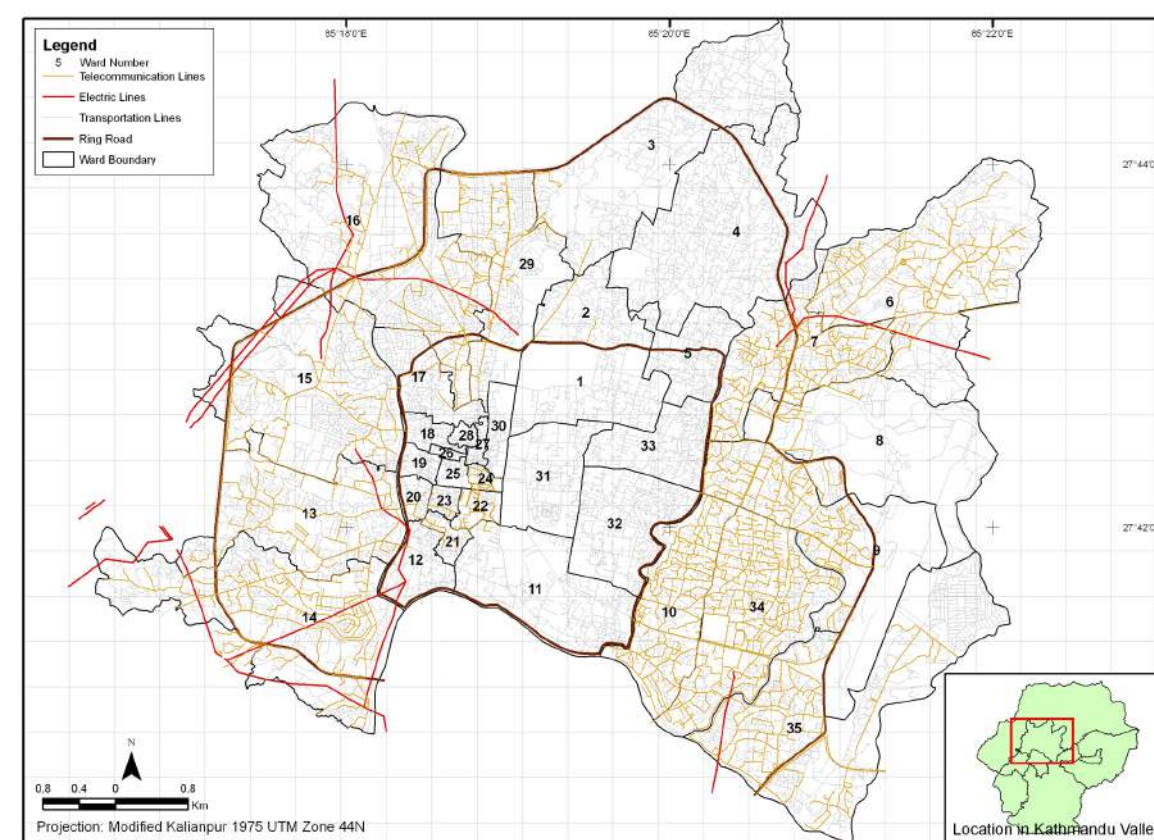
### 7.5 Telecommunications

Kathmandu has excellent telecommunication services and is interlinked by local, STD, ISD, cellular phones, e-mail, and Internet. The Nepal Telecommunication Corporation (NTC) is the only agency providing telephone services nationwide including distant telecommunication like STD and ISD. NTC has introduced a cellular system and distributed 4,100 mobile phones. There are 12 Internet service providers (ISPs) in the city with about 10,000 subscribers. The number of ISP and Internet users is increasing rapidly as services improve and prices decrease. The utilities may be seen in Fig. 7.2. ([http://www.adb.org/Documents/Books/Cities\\_Data\\_Book/06chapter6.pdf](http://www.adb.org/Documents/Books/Cities_Data_Book/06chapter6.pdf))

### 7.6 Situational Analysis

Due to poor road design and unplanned road network, the transportation and infrastructure system is found to be both inadequate and insufficient. During emergencies, the circulation network is found to be even unworkable. Besides, there has been lack of proper road maintenance and repair. Recent observations also show that most of the bridges located within the city are in poor structural condition. Moreover, due to the increasing number of vehicles and poor traffic management, the movement of traffic is getting slower contributing to traffic congestion and conflict. There is a huge lack of discipline among road users, both pedestrian and drivers. The city likewise faces acute shortage of power supply.

### 7.7 Challenges and Opportunities



**KMC Utilities Map**  
 Sources: Kathmandu Metropolitan City Government, JICA

Map and projection modified by EMI-GIS, 2010

**Figure 7.2 Utilities Map, 2006**  
 Source: Modified by EMI, 2010

## CHAPTER 8. ENVIRONMENT

A significant number of buildings (specially at the Core area) and monuments are old and unlikely capable of withstanding strong earthquakes. As a result, highly built up portions in these areas are likely to experience heavy casualties and injuries. Congestion of traffic is already experienced in some roads and streets, and add to the vulnerabilities arising from poor access into these highly dense areas. In addition, road and bridges (the Strategic Road Network) around the Core and Central areas, water distribution systems and sewage/storm collection system are expected to suffer major damages.

Some of the buildings are in liquefaction prone areas specially those along Bagmati river. Because of lack of demarcation and river protection, the river has changed its course over the years. Squatters and building encroachment and treatment of sewage continue to be major problems, as well as the practice of sewage disposal from toilets and households directly into the river, opening of sewerage outlet at various points along the river, and haphazard solid waste disposal at various patches. These contribute to the vulnerabilities to settlements and buildings in liquefaction prone areas

The land areas in the central and core areas, as well as along the rivers, are densely populated. In some portions of the rivers, new apartments have been constructed for commercial purposes. Various small scale industries also line river stretches such as garment factories (currently not operational), garment washing factory, steel factory (storage and working), small scale hand made paper industry, some educational institutions, and some healthcare facilities and hospitals (ex. Hams Hospital, Prasuti Griha Hospital) .

In terms of electrical power, the city suffers from acute shortage of power supply.

Kathmandu City is committed to address the mounting challenges of urbanization and take a leading role in promoting environmental stewardship and building mutual support and cooperation with cities in the Asia-Pacific region. (<http://kitakyushu.iges.or.jp/cities/cities/kathmandu.html>) Air pollution, solid waste management, sanitation and industrial pollution are some of the major environmental problems that KMC is facing.

The main legal documents for protecting the environment and controlling pollution in Nepal are the Environment Protection Act 1996 (EPA) and the Environment Protection Regulations (EPR) 1997. These laws call for the disclosure of environmental information and inclusion of public participation in the environmental impact assessment (EIA) process. Measures for controlling pollution such as environmental inspection, establishment of environmental

laboratories for monitoring pollution and conservation, creation of an environmental protection fund and an environment protection council, provision of incentives to business, and awarding of compensation for adverse environmental impacts, are indicated in both EPA and EPR. (ICIMOD and ADB, 2006)

Increasing population density and the lack of satisfactory management have made KMC vulnerable to solid waste disposal problems. Specific policies on wastes were only addressed in 1996 through the Solid Waste Policy of 1996. The wastes generated in KMC are mainly dumped on the streets and containers. Collected wastes are then disposed in Sisdole, a temporary landfill site that is 25 km away from the city.

The Solid Waste Management and Resource Mobilization Center (SWMRMC) is an autonomous body under MOLD that is

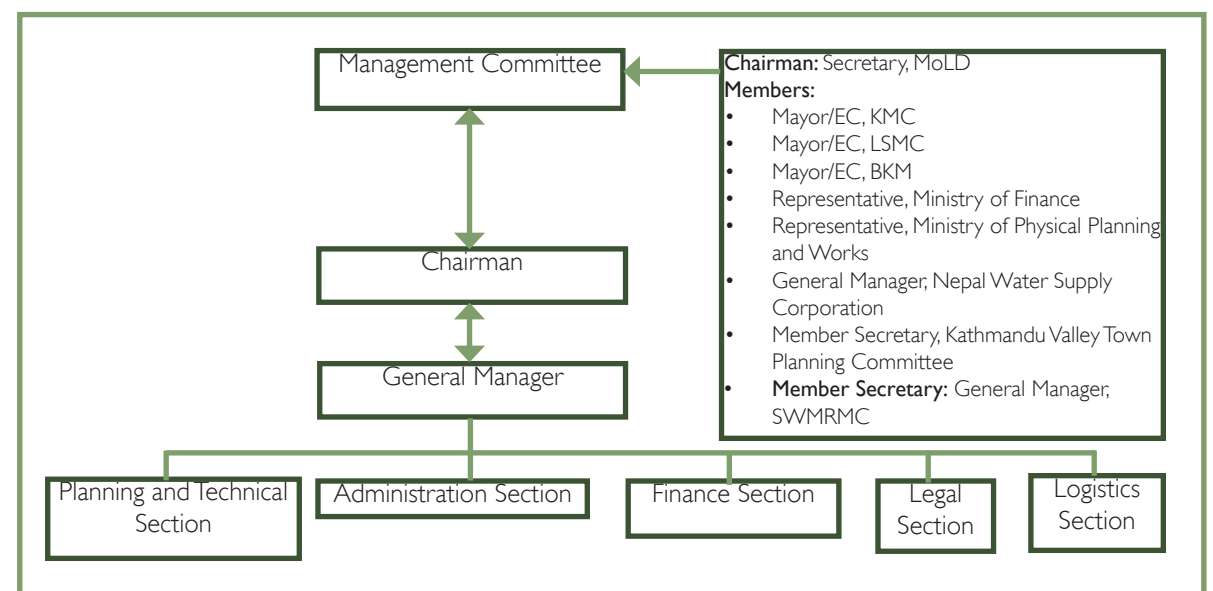


Figure 8 SWMRM Organizational Structure  
(Source: <http://www.mld.gov.np/swm/aboutus.htm>)



responsible for managing urban municipal waste. SWMRMC's area of responsibility is only limited within the Kathmandu Valley as stated in the Solid Waste Management and Resource Mobilization Act of 1987. After the implementation of the Local Self Governance Act of 1999, the Center has been focusing on research and development of a sanitary landfill site and handing it over to concerned municipalities. It also provides technical and financial assistance to KMC for emergency waste management activities.

Other legal and policy instruments that have some direct or indirect relevance to solid waste management in KMC are as follows:

- Town Development Act, 1988
- The Nepal Environment Policy And Action Plan, 1993
- National Waste Management Council, 1996
- Tenth Plan: Policy And Implementation Strategy
- Industrial Enterprise Act 1992
- Labor Act 1992
- Municipal Act 1992 (2048)
- Local Governance Act 1999
- EIA/IEE Policy 2061

### 8.1 Waste Generation Rate

Waste generation rates are affected by socio-economic development, degree of industrialization and climate. Generally, the larger the urban population, the greater is the amount of solid waste generated. According to KMC's 2005 Ward Profiles, the total generation rate of KMC is 921.82 m<sup>3</sup>/day. Source of waste is largely from households. Kathmandu's per capita waste generation is 0.39 which is slightly higher than the national average (0.34).

Solid waste generation was predicted to be 1,091 m<sup>3</sup>/d (245 tons/day) and 1,155 m<sup>3</sup>/d (260 tons/day) for the years 2005 and 2006, respectively. If it is any consolation, majority of the households (89%) in KMC are willing to segregate the organic and non-organic portions of their waste. (Alam et al., 2006). As

Table 8.1 Waste Generation and Collection, 2004

Source: SWMRMC, 2004

Municipality	Kathmandu	Bhaktapur	Lalitpur
Per Capita Waste Generation			
Household (kg/cap./day)	0.39	0.39	0.54
Municipal (kg/cap./day)	0.52	0.52	0.72
Estimated Population (2003)	737,588	75,002	174,504
Total Municipal Waste Generation	383.55	39	125.64
Total Municipal Waste Collection	250	20	48
Municipal Collection Coverage	65.18	51.28	38.2

a big city, Kathmandu does not generate a huge amount of waste; however, the absence of a waste management system makes the situation problematic. Simple solutions such as composting, recycling and private sector participation have been considered, but decision-making has been slow and implementation weak. A taskforce was set up and private sector was being promoted to participate in the collection and dumping of waste. Also, door-to-door collection system was adopted.

As far as the legal provisions are concerned, though EPA has no direct provisions relating to solid waste management, Sections 3 and 4 thereof provide for the conduct of Environment Impact Assessment and Initial Environmental Examination. The law needs to be strictly followed in selecting landfill sites. Similarly, Section 7 of the Act bars anybody from creating pollution in a manner that can cause nuisance, significant adverse impact on the environment or hazard to public life and health. However, to achieve these ends, public awareness is deemed to be the most crucial factor (Pradhan, 2004).

Table 8.2 Solid Waste Generation Rate per Ward, 2005

Source: KMC Ward Profiles, 2005

Sector	Solid Waste Generated per Sector Daily (cu. m.)	Ward No.	Solid Waste Generated per Ward Daily (cu. m.)
Central	159.05	1	19.18
		5	18.96
		11	22.08
		31	27.36
		32	32.10
East	227.35	33	39.37
		6	41.85
		7	19.18
		8	18.54
		9	39.47
		10	56.24
North	187.79	34	38.24
		35	13.83
		2	20.13
		3	34.29
		4	36.66
City Core	221.45	16	50.87
		29	45.84
		17	22.23
		18	15.48
		19	14.53
		24	12.04
		25	11.00
		26	8.14
		27	15.54
		28	9.73
		30	21.13
		12	19.04
		20	17.08
21	23.72		
West	126.18	22	15.10
		23	16.69
		13	35.24
Total	Kathmandu	14	44.03
		15	46.91
			921.82

### 8.2 Waste Collection Rate

Kathmandu Valley municipalities do not have sanitary landfill sites and often dump solid waste into nearby rivers or open fields. Poor management of solid waste poses serious environmental and health risks to the population of the Valley. Since the closure of the Gokarna landfill site in 1999, KMC and Lalitpur Submetropolitan City have been continuously dumping some of their waste in the Bagmati River. Initially, waste was dumped at Teku Dobhan, but it has now reached Sundarighat, triggering protests from local residents and environmentalists. In an attempt to diffuse the protests, KMC and Lalitpur have been shifting their dumping sites from one place to another along the banks of the Bagmati River. In 1996, the Government endorsed a plan to develop a new 41-hectare landfill site in Okharpauwa. Even though the landfill site in Okharpauwa has been in operation since June 2005, residents living around the landfill site and along the access road have been strongly opposed to it. In addition, experts have argued that the site is technically and environmentally unsuitable and is extremely expensive. In response, MOLD has started to explore alternative sites.

Majority of solid wastes generated by households are highly organic and dense, with high moisture content. Its organic nature may be good for composting and could be a large potential market for compost. However, only one composting facility is operating in Kathmandu on an experimental basis at present. Thus, there is a need to examine the possibility of engaging the private sector to operate and manage a large-scale composting plant or plants on a commercial basis. JICA is currently conducting a "Clean Kathmandu Valley Study" to formulate an action plan to improve solid waste management service in the Valley. (<http://www.adb.org/Documents/TARs/NEP/34304-NEP-TAR.pdf>).

Expenditure : USD 2 million, a rate of 38% in the total budget

Fees Within or less than USD 0.7/ household per month

In 2003, the overall collection efficiency was 94 percent. The increase in waste collection was due to the following:

- Involvement of private sectors to waste collection;
- Shutdown of the second transfer station near the airport due to local protest;
- Lack of funding to maintain trucks/ equipment;
- Large increase in plastic waste; and
- Willingness of people to separate their waste into separate bins.

No additional investments were made to the existing development plan to introduce a modern disposal system due to insufficient funding despite a substantial increase in total expenditure. Because of the lack of a proper lining, raw solid waste from the existing dumping site comes in contact with river water directly, causing severe river contamination and deteriorating the quality of the water. (Alam et al., 2006)

Table 8.3 Physical Composition of Solid Waste, 2003

Source: 2003

Waste Composition	(% by weight)
Organic	65.98
Inert	1.01
Metal	0.84
Paper	10.38
Glass	1.38
Plastic	16.31
Textile	3.58
Rubber	0.24
Leather	0.24
Medical	NA
Others	0.04
Total	100

### 8.3 Pollution

#### 8.3.1 Air Pollution

Air pollution is one of the most highlighted environmental problems in Kathmandu. Kathmandu Valley is vulnerable to air pollution because of its bowl-shaped topography which restricts air movement and retains the pollutants in the atmosphere. Unplanned settlements, poor road networks, and conflicting land uses lead to air pollution caused by emissions from vehicle plying along narrow and winding streets. (Pant and Dongol, 2009) Dust emissions of motor vehicles and the release of particulate matters (PM) by small-scale industries such as brick kilns are major sources of air pollution. The number of days with limited visibility in Kathmandu has increased from about 38/year in 1970 to more than 60/year in 1994. Based on energy use, the transport sector was found to have the largest contribution in the total emissions of the selected pollutants followed by the household, industrial, and commercial sectors.

To improve Kathmandu's air quality, the government banned diesel and gasoline-based three-wheelers and closed down a local cement factory. The Ministry of Environment, Science and Technology has prepared a comprehensive draft action plan for air quality management of Kathmandu which aims to meet the National Ambient Air Quality Standards within five years. (ICIMOD, 2007) Better coordination between municipalities and Ministry of Environment needs to be established and conflicting Acts need to be modified to address the issue of air pollution to implement the plan.

#### 8.3.2 Water Pollution

Poor sanitation and drainage in rural and urban areas, where only 15 percent of homes are connected to sewage networks, resulted in the dumping of sewage and garbage into rivers. Around 100 tons of waste generated daily, close to a quarter of the total, remain uncollected

and are left to decay on streets and in rivers. These rivers are key sources of surface water and the main repository for the Valley's untreated sewage, solid waste and industrial effluent. (UNEP ROAP, 2001)

Inadequate and technically unsound drainage system causes water backlogging which is very common in many areas of the city. Some waste water treatment systems in Kathmandu Valley are not functional and as a result, waste water from the drains and sewers are discharged directly into the rivers without treatment. Groundwater, an important alternative to water supply has also been declining with a drop in level from 9 m to 68 m in a matter of years. A report from Teku Hospital in Kathmandu shows that 16.5 percent of all deaths had been due to water-borne diseases. (KVEO, 2007)

#### 8.3.3 Industrial Pollution

The industrial growth of Kathmandu is expected to continue in the coming years; hence, management of industrial environment should be given close attention. However, the growth of small-scale industries such as carpets and garments can be quite unpredictable as they depend upon many factors. For instance, there was a 300 percent growth of carpet industry in the Valley between 1987 and 1991.

Nonetheless, the environmental problems caused by this industry, both small and large scale, may pose problems of unmanageable proportions as they proliferate over the years. To date, there are no guiding principles to monitor these industries in terms of their location, outputs and effluent. There is no effective national environment policy with an intrinsic doctrine for industrial pollution control which has resulted in a total dearth of pollution control and monitoring mechanism. (World Bank, 2001)

#### 8.3.4 Noise Pollution

Noise pollution in Kathmandu is increasing due to aircraft noise, a problem that is related to the

international airport's close proximity to the city core, outdated vehicle engines, and industries located near residential areas. (Thapa et al., 2007)

According to a study on effects of traffic noise, the mean noise levels in KMC were found to be in the range of 79 decibels (dB) and 112 dB, which is higher than the permissible level for road traffic noise of 70 dB. The rate of increase of noise level in the city was found to be 1 dB per year. Putalisadak, New Baneshwore, Kalanki, Narayan Gopal Chowk, Tripureshwor, Kalimati and Koteshwore were listed as hazardous sites in Kathmandu where noise levels were found beyond 80 dB. (The Sunday Post, 2003)

There are no noise control measures in KMC, nor are reinforcing mechanisms in place. In the absence of regulatory mechanisms and controls, noise pollution is expected to remain an environmental hazard in the Kathmandu Valley (World Bank, 2001).

### 8.4. Situational Analysis

The environmental situation in KMC summarizes the following points:

1. Water pollution mainly due to household sewage and wastes, and industrial effluents dumped into the river without treatment;
2. High level of air pollution caused by poor road conditions producing dust and particulates, vehicular emissions, and industrial pollution due to brick kilns;
3. Improper solid waste disposal resulting from temporary dumping along roadsides;
4. Noise pollution due to traffic noise;
5. Flood and erosion of river banks; and
6. Threat of natural hazards such as fire, river erosion/flood, and earthquake.

### 8.5 Challenges and Opportunities

Poor sanitation is also an important problem in KMC. According to the United Nations Environment Program (UNEP), only 15 percent of homes in the city are connected to

a sewerage network. The KVPO reports that 16.5 percent of deaths in the Valley are due to water-borne diseases. Water pollution has become a growing concern in the city. This is mainly due to household sewage and wastes, and industrial effluents dumped into the river without treatment. There is also a high level of air pollution due to poor road conditions producing dust and particulates, vehicular emissions, and industrial pollution. Improper solid waste disposal due to temporary dumping of garbage along roadsides also contributes to urban pollution in the city.

Some of the immediate challenges and opportunities to address the various issues of the physical environment sector of KMC include the following:

- Construction of water supply distribution system;
- Construction of a comprehensive sewerage system for the whole Kathmandu Valley;
- Construction of a waste water treatment plant for industries and household effluents;
- Cleaning up of Bagmati, Dhobikhola and Bishnumati Rivers and their tributaries;
- Construction of retaining walls and the use of bioengineering techniques to prevent erosion; and
- Formulation of specific policies and laws on waste management.

## CHAPTER 9. DEVELOPMENT AND ADMINISTRATION

### 9.1 Organization and Management

#### 9.1.1 Nepal Government Officials

This section provides the list of current government officials with their corresponding designations in the different branches of the Government of Nepal.

#### Executive Branch

As of 23 July 2008, the Executive Branch of the Government of Nepal is headed by the following:

1. Chief of State: President Ram Baran YADAV
2. Vice President: Paramananda JHA
3. Head of government: Prime Minister Pushpa Kamal DAHAL )
4. Deputy Prime Minister: Bamdev GAUTAM

#### Cabinet

After the election, the Cabinet was formed in August 2008 by a majority coalition made up of the Communist Party Nepal (Marxist), Communist Party Nepal-United Marxist-Leninist, and Mahdesi Jana Adhikar Forum.

Elections: President elected by Parliament; term NA;

The last election was held on 21 July 2008. Ram Baran Yadav was elected president by the Constituent Assembly in a second round of voting on 21 July 2008. Yadav received 308 votes as compared to his closest rival, Ram Jaja Prasad Singh, who secured 282 votes.

### Legislative Branch

Nepal's Unicameral Constituent Assembly consist of 601 seats; out of which 240 seats are decided by direct popular vote, 335 seats by proportional representation and 26 appointed by the Cabinet i.e., Council of Ministers. The last elections were held on 10 April 2008. Table 9.1 shows the results in percentage of vote by party:

Table 9.1 Legislative Seats by Party

PARTY	SEATS
CPN-M	220
NC	110
CPN-UML	103
Madhesi Jana Adhikar Forum	52
Terai Madhesi Democratic Party/Nepal Sadbhawana Party	29
other smaller parties	61
seats to be filled by the new Cabinet	26

### Judicial Branch

For the Supreme Court or Sarbochha Adalat, the Chief Justice is appointed by the monarch on recommendation of the Constitutional Council; the other judges are appointed by the monarch on the recommendation of the Judicial Council.\*

### Political Parties and Leaders

The following lists down the political parties and their leaders based on the last elections held on 21 July 2008:



- Chure Bhawar Rastriya Ekata Party [Keshav Prasad MAINALI];
- Communist Party of Nepal (Maoist) [Pushpa Kamal DAHAL, also known as PRACHANDA, chairman; Dr. Baburam BHATTARAI];
- Communist Party of Nepal (ML) [C.P. MAINALI];
- Communist Party of Nepal (Unified) [Raj Singh SHRIS];
- Communist Party of Nepal (United) [Ganesh SHAH];
- Communist Party of Nepal/United Marxist-Leninist or CPN/UML [Amrit Kumar BOHARA];
- Dalit Janajati Party [Vishwendraman PASHWAN];
- Janamorcha Nepal [Amik SHERCHAN]; Madhesi Jana Adhikar Forum [Upendra YADAV];
- National Democratic Party or NDP [Pashupati Shumsher RANA] (also called Rastriya Prajatantra Party or RPP);
- Nepal Loktantrik Samajbadi Dal [Upendra GACHCHHADAR];
- Nepal Pariwar Dal [Vinod DANGI]; Nepal Rastriya Party [Khushilal YADAV];
- Nepal Sadbhavana Party (Anandi Devi) [Shyam Sundar GUPTA];
- Nepal Workers and Peasants Party or NWPP [Narayan Man BIJUKCHHE];
- Nepali Congress Party or NCP [Girija Prasad KOIRALA];
- Nepali Janata Dal [Bharat Prasad MAHATO];
- Rastriya Janamorcha [Chitra BAHADUR K.C.];
- Rastriya Janamukti Party [Malwar Singh THAPA];
- Rastriya Janashakti Party or RJP [Surya Bahadur THAPA] (split from RPP in March 2005); Rastriya Prajatantra Party Nepal [Kamal THAPA];
- Sadbhavana Party (Mahato) [Rajendra MAHATO];
- Samajbadi Prajatantrik Janata Party Nepal [Prem Bahadur SINGH];
- Sanghiya Loktantrik Rastriya Manch [Kamal CHHARAHANG];

- Terai Madhesi Democratic Party [Mahantha THAKUR]

Political pressure groups and leaders: other: several small armed Madhesi groups along the southern border with India; a variety of groups advocating regional autonomy for individual ethnic groups.  
<https://www.cia.gov/library/publications/the-world-factbook/print/np.html>

### 9.1.2 Organizational Structure of KMC

Nepal established an office named Saphai Adda (city sanitation unit) during 1919 AD. In 1931, it was then changed to a Municipality Office. A municipality board consisting of 21 elected members was later formed in 1946.

According to the Municipality Act 1990, the municipality board consists of elected Mayor and Deputy Mayor (five-year term), and 35 Ward committees headed by a chairperson and five ward members (including a woman member). Kathmandu Municipality was upgraded to the status of a metropolitan city on Dec. 15, 1995 and was named as Kathmandu Metropolitan City Municipality or KMC. The present organizational structure of KMC consists of six departments, which is subdivided to 15 divisions and 33 sections. The Mayor of KMC deposes his executive functions to the different departments. He also occupies a vital position in the set-up of the Ministry of Local Development.

The Deputy Mayor and Ward Chairperson assist the mayor in his executive duties. He is also assisted by four ward members, women representatives from each of the 35 wards, and a Secretary. The various department heads also report to the mayor about their activities.

The City Planning Commission provides advisory support in the formulation and implementation process for short- and long-term plans designed to provide urban services and facilities. It monitors the progress achieved by various departments and projects of KMC.

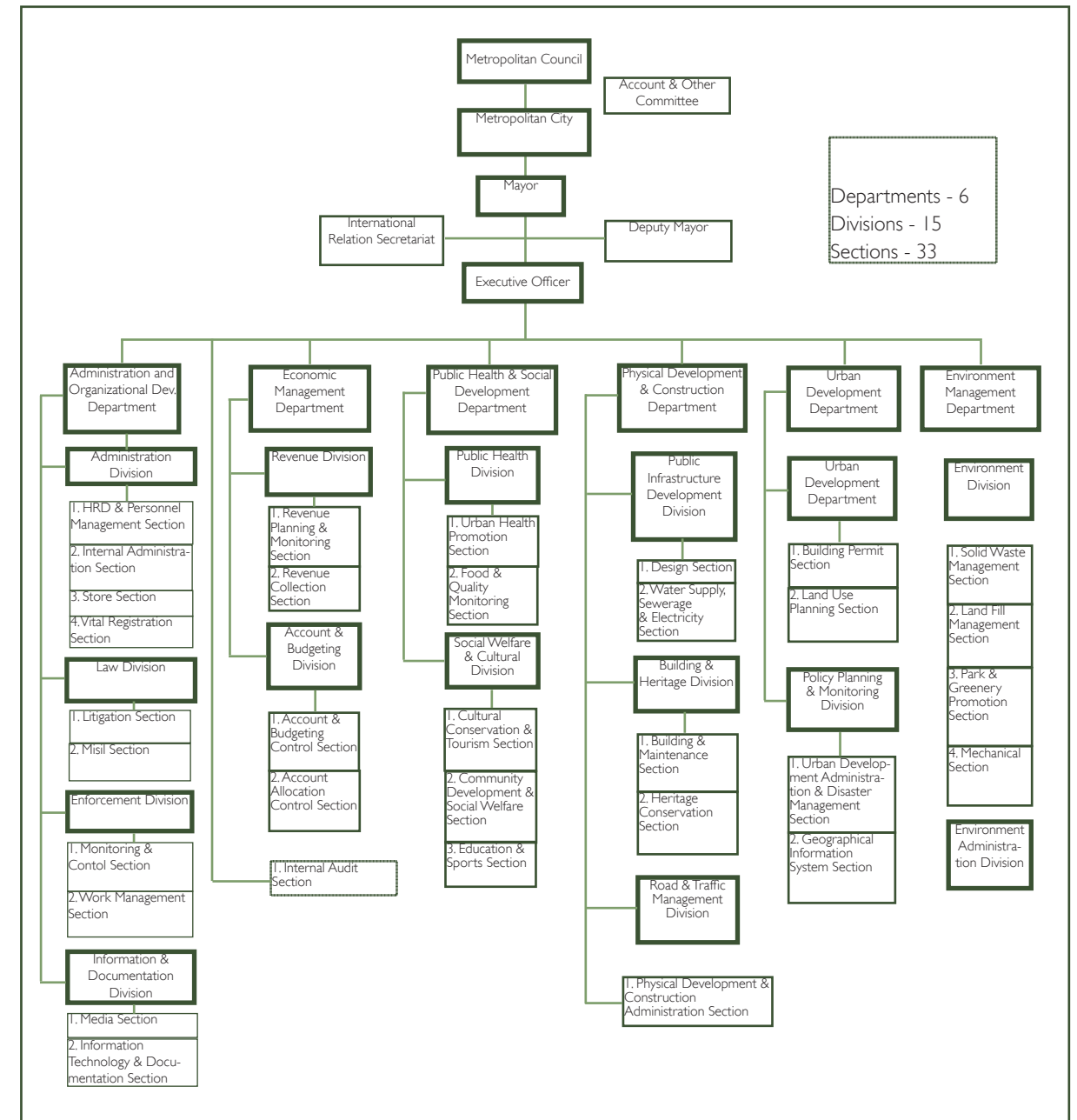


Figure 9.1 Organizational Structure of KMC Government  
 Source: KMC Website

Additional administrative entities include the following:

- Metropolis Council, consisting of 177 elected and 20 nominated members that meets twice a year to review progress, approve the annual budget, and make major policy decisions.
- Metropolis Board, consisting of 39 members that meets at least twice a month.
- The Mayor's, Deputy Mayor's, and Executive Officer's Secretariats.

### 9.2 The Political System

The legal/institutional analysis can only be conducted effectively and reliably with a clear understanding of the country's political system. This consists of the national, regional and local levels of government and the actual operation of their bureaucracy. The political system serves as the overall framework and backdrop of the operation of the entire government, of which land use planning is one of the government's official functions. It influences to a large extent the legal and institutional structure. This brief description of the political system of Nepal

provides the context within which the Legal/ Institutional Sector functions.

### 9.2.1 The National Government

The Nepalese National Government has three branches, namely the executive, the legislative and the judiciary.

1. The Executive Branch is headed by the Chief of State, the President, assisted by a Vice President. The Head of Government is the Prime Minister, assisted by a Deputy Prime Minister. The President is elected by the Parliament who is assisted by his cabinet. The present cabinet was recently formed in August 2008 by a majority coalition of the various political parties
2. The Legislative branch is a unicameral Constituent Assembly with 601 seats, 240 of which are filled up by direct popular vote; 335 seats by proportional representation, and 26 are by appointment of the Cabinet (Council of Ministers). The last elections were held on 10 April 2008.
3. The third branch, which is the Judiciary, is headed by the Supreme Court, whose Chief Justice is appointed by the monarch on recommendation of the Constitutional Council, while the other judges are appointed by the monarch, on recommendation of the Judicial Council.

There is at present a Transition Government which started six years ago in 2003. The new Constitution is currently under review and discussion, and is expected to be in place in another three years. While there seems to be a strong sentiment towards federalization, there are also talks of the return of a monarchy. Since the transition government, MOLD has deployed Chief Executive Officers to all the municipalities and cities of Nepal who also act as OIC Mayors.

### 9.2.2 The Local Government

At the local level, the head of the KMC is the mayor who is assisted by his deputy mayor. Both are directly elected by the people for a term of five years. There are 35 wards in KMC,

headed by the Ward Chairperson and five ward members, who are voted upon by the residents of Kathmandu.

The Mayor, the Deputy Mayor, 35 Ward Chairpersons and two nominated members constitute the body called Metropolitan Board, which meets at least twice a month to transact its business. A senior official in the KMC is deputized by MOLD to serve as Secretary of the Metropolis Board and Chief Executive Officer of the KMC. The Office has about 2,500 staff members. The Executive Officer's Secretariat facilitates the implementation of the Mayor's and the Board's decision, by providing the necessary files and documents for the purpose, The Deputy Mayor's Secretariat handles public relations.

A Metropolis Council also exists, consisting of 177 elected representatives and 20 nominated members. It is responsible for making major policy decisions and for reviewing, processing and approving the annual budget. There is also a City Planning Commission which provides advice to the Mayor and his office. It provides guidance in the formulation and implementation of short and long term plans designed to provide urban services and facilities. It also monitors the progress achieved by various departments and projects of KMC. (KMC Office, 2008 )

### 9.2.3 Institutional Framework for Land Use Planning

Nepal has a unique network of ministries and other government subdivisions that are concerned directly or closely with land use planning, settlements, and regulation of actual development on the ground. In interviews with key informants, it was revealed that despite the persistence of vertical linkages from the national level ministries to departments, down to municipalities, VDCs, and wards, the centralization tendency is still evident, whereby decisions and actions require consent from higher entities.

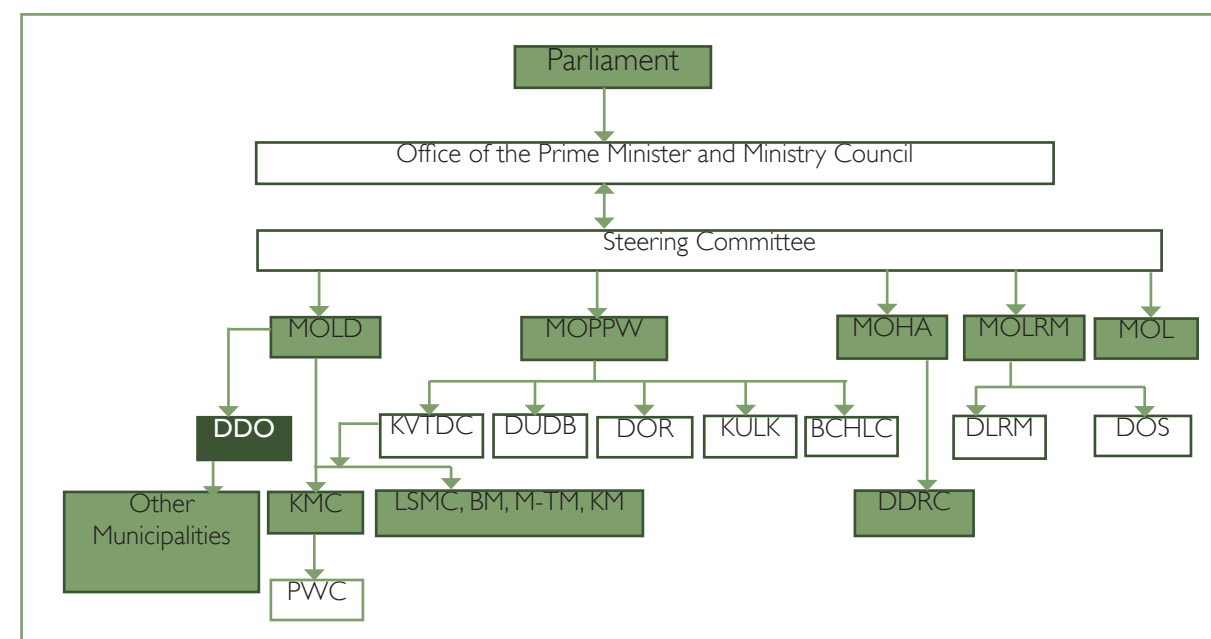


Figure 9.2. Entities Concerned with Land Use/Urban Planning

(Source: EMI, 2008)

There are however, de facto exceptions to the general hierarchy of ministries, and these include politically significant entities such as the KMC, which has already exercised significant autonomy in its development decisions. These decisions are not necessarily aligned beforehand with KVTDC plans. It was evident that closer cooperation between local officials like KMC and the encompassing regional interests of KVTDC should be strengthened. It was also noted by workshop participants that there are two different ministries that are concerned with plan implementation: MoPPW and MoLD, which still need to reconcile overlapping mandates.

Another significant point that will factor into future planning interventions is the apparent lack of horizontal linkages between the various ministries in the form of substantial information exchange, joint development projects, or regular updating of shared databases. This was validated during the LUP workshop held in February 2008, where the need for cooperation beyond simple "informing" was identified by the participants as an important item for action. Horizontal integration of land use plans is very critical since the five municipalities have adjoining boundaries. Moreover, land use issues and urban development do not recognize

political boundaries between municipalities, being cross-territorial in nature. Hence, effective horizontal and vertical coordination is a must if land use planning in KMC is to become a model for DRR in the whole Valley.

In summary, it appeared that many of the planning-related agencies are still highly centralized, traceable to the Nepalese history of hierarchical rule by a single authority. There were other variables uncovered later on that also explained the habitual adherence to the chain of command.

### 9.2.4 Policy Environment for Land Use Planning

There were certain general features of the regulatory environment that were identified, namely:

- Laws and Acts of the State are approved by the parliament, though these may be proposed from the ministry level, where a Ministry of Laws reviews and consolidates such initiatives. After receiving confirmation from the prime minister, the legislation becomes effective, and is implemented by the concerned ministry.
- National legislation gets cascaded



and translated downward through the bureaucracy in the form of by-laws promulgated by the concerned ministry. Once again, the process involves consultation with experts from departments and ministries that will be affected.

There are several key laws that could be relevant to understanding the land use planning and local development of Nepal. These include the following:

- \* 10th National Plan (2002-2005)
- \* 2007 By-Laws for Construction in Kathmandu Valley
- \* 2003 Apartment Ownership Act
- \* 1998 Revised by Laws for Construction
- \* 1996 His Majesty's Government Rules for Allocation of Functions, 2nd Amendment
- \* 1994 Draft Building Council Act
- \* 1991 District Development Committee Act
- \* 1991 Village Development Act
- \* 1991 Municipality Act
- \* 1990 Constitution of the Kingdom of Nepal
- \* 1990 Local Self Governance Act
- \* 1988 Kathmandu Valley Development Authority Act
- \* 1988 Building Act
- \* 1988 Town Development Act
- \* 1982 Natural Calamity Relief Act
- \* 1971 Local Administration Act

- Enforcement of legislation is left to the ministries and their subdivisions. One consistently cited law during planning and local development discussions is the Local Self-Governance Act (LSGA), a landmark policy enabling municipalities and other subdivisions of government to take initiative for local reform and policy action. The LSGA has the following salient features:

- \* Establishes the authority, powers, and duties of the VDC as an autonomous and corporate body, including qualifications and tenure rules for members

- \* Establishes the functions and duties of the municipality and the rules governing its officials (such as the mayor) Establishes the functions and duties of the DDC
- \* Further elaborates on punitive mechanisms, labor regulations, and taxes that can be imposed on the population under the jurisdiction of the concerned local government unit

### 9.2.5 Planning Structures, Practices, and Types of Land Use Plans

Site maps have been produced from the national to local levels by concerned ministries over the past decades. However, many of these documents were simple architectural drawings or listings of guidelines that had never been implemented. Even GIS mapping information has not yet been institutionalized, and is instead outsourced from a private outfit by government entities like KVTDC and KMC.

### 9.3 Fiscal Management

Table 9.3 below shows KMC's revenue sources for the fiscal period, 2000 to 2003. It can be seen that the city's revenue has been managed mainly through the collection of local development charges, taxes, user charges, loans and grants. It also shows that while the revenue from 2000 to 2003 has increased thrice, its expenditures have consistently exceeded its total revenue over the same period.

### 9.4 Urban Development Projects

Below are some of the identified projects within KMC that are related to land use planning.

1. Improvement of intersections and access roads, Construction of parking facilities and promotion of greenery and parks, waste water treatment plant (pilot project), Rehabilitation of monuments and temples along Bishnumati River and planned Housing Project - GTZ / Stuttgart City / CIDA<sup>7</sup>
2. Additional Roads along bank of

**Table 9.2 Policies and Land Use**

Source: EMI, Thematic Report Phase I, 2008

Level of Government	Examples of Types of Plans
National Government	10th National Plan (5-year plan)
Kathmandu Valley Town Development Committee	Vision 2020+ other specialized plans and frameworks
	1988 Urban Development and Conservation Scheme for Greater Kathmandu
	1987 Structural Plan for Kathmandu Valley (UNDP and WorldBank funded)
	1984 Physical Development Concept
Districts (Kathmandu & Kirtipur, Lalitpur, Bhaktapur, and Madhyapur-Thimi)	District Plans
Municipalities (KMC, Bhaktapur, Lalitpur, etc.)	Land Use Zoni (from "As-is" Land Use Maps)
Village Development Committees	Village Plans

**Table 9.3 Sources of Revenue, FY 2000-2003**

Source: KMC, 2001

	Fiscal year			%
	56/57(2000/2001)	57/58 (2001/2002)	58/59(2002/2003)	
Sources of revenue			Rs.	
Total	334,028	547,352	1,097,857	100.00
Local development charge	216,428	235,136	250,000	22.77
Tax	19,285	53,622	271,005	24.68
User charge	43,103	86,130	316,501	28.83
Other own source	3,662	4,261	10,980	1.00
Loan	14,700	0	0	0.00
Grant	12,807	153,082	65,972	6.01
Other income	24,043	15,121	183,399	16.71
Capital and recurrent expenditure per capita				
Population			671,846	
Capital expenditure (Rs.)	23,854	42,302	224,715	
Recurrent expenditure (Rs.)	301,331	427,134	1,163,425	

3. Land pooling projects with contribution from local communities / land owners, KMC and international funding agencies - CIDA (city development initiative for ASIA, GTZ/ADB/SIDA/KFW

- Promotion of planned Housing Projects (focusing low and middle income people) in Kathmandu to discourage prevailing unplanned/haphazard urban expansion - KMC. Preparation of new digital map with all the urban information of Kathmandu Metropolitan City- completed
4. Implementation of parking projects in the city centre of Kathmandu (three sides of Khula-Manch and the area south of existing

Mahankal parking. Other proposed area - Lainchour, Election Commission premise, Social welfare premise - CIDA

- Objective is to eliminate haphazard on street parking in Sundhara, Khichapokhari, Dharmapath, New road, Bishal Bazaar, Bhotahity, Jamal, King's Way, Kamaladi etc
- To improve air and noise pollution, traffic conjunction, and comfortable movement of passerby, maintains aesthetic beauty of commercial and historic centres
- To promote the idea of keeping world heritage sites and Thamel area a vehicle restricted and pedestrian zone in future

5. Bishnumati and Bagmati Environmental Projects - proposal submitted to European Commission
6. Construction of 200 beds Metropolitan Hospital (Tentative Cost Estimate Rs. 60 crore) and Janapath School, Balkhu (Tentative Cost Estimate Rs. 2.5 crore) - Proposal to be sent to Indian Embassy
7. Kamalpokhari, Balaju Environmental Improvement Project (Parks, Greenery and other infrastructure services) KMC / Private Sector
8. Sustainable urban infrastructure projects - UNESCAP
9. Review, analysis/ evaluation of the urban development studies (city development strategy report and others) by CDIA and implementation of urban projects through fund made available from international funding agencies
10. New Cultural Museum
11. Re-development of Old bus terminal at Ratnapark
12. Teen-Kune development project (Park, Greenery, underground parking and commercial shops)

### 9.5 Situational Analysis

The review of KMC's legal and institutional arrangements reveals the following observations:

1. There are laws covering both land use

planning and disaster risk management (and the other legislation mentioned) but they are not interlinked or are not supportive of each other. But there is no law that addresses the specific conditions for risk-sensitive land use planning.

2. There is the persistence of the top-down approach to land use planning for local development.
3. Land pooling project is one of the more common means of plan implementation.
4. Working departments and municipalities are understaffed and are inadequately trained for planning and emergency response.
5. There is little incentive for public involvement which is related to lack of public awareness.
6. In terms of capability building, there is need for new positions for LUP and DRM be created.
7. There is need for alternative implementing tools aside from the land pooling projects
8. There seems to be very limited funding to support the institutional and organizational reforms indicated by the findings and conclusions.

### 9.6 Challenges and Opportunities

In view of KMC's legal and institutional arrangements, the following challenges and opportunities may affect risk-sensitive land use planning:

1. Harmonization of existing laws covering both land use planning and disaster risk management, coupled with the forging of stronger linkages among planners, engineers, builders, architects, disaster managers, different organizations and Local Executives/Mayors in planning and implementing DRR;
2. Strengthening of the system for implementing Bylaws and zoning;
3. Launching of public private partnership towards risk-sensitive Projects Programs and Activities (PPAs);
4. Increase in revenue from existing level to implementation redevelopment PPAs;

5. Implementation of environmental laws for reducing solid waste, noise and water pollution;
6. Availability of grants, soft loans and technical assistants; and
7. Proper legal protection of heritage sites and other tourism centers, as revenue from the tourism sector is proven to be very high.



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1. Surendra Rajkarnik, Section Engineer, UDD, KMC
2. Indra Man Suwal
3. Bijaya Subedi, Section Officer, MOLD
4. Tulasi Sitaula, Director General, Department of Road, MMPW
5. Bal Ram Mishra, Senior Divisional Engineer, Department of Road, MMPW
6. Sunip Poudyal, Senior Divisional Engineer, Department of Road, MMPW
7. Saroj Kumar Pradhan, Unit Chief, Department of Road, MMPW

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