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

# Risk-Sensitive Land Use Plan

## Kathmandu Metropolitan City, Nepal

February 28, 2010

EMI
Earthquakes and Megacities Initiative

NSET

DKKV
Deutsches Komitee Katastrophenvorsorge e.V.
German Committee for Disaster Reduction

Risk-Sensitive Land Use Plan: Kathmandu Metropolitan City, Nepal



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# Preface

The past few years have reminded us that disasters affect anyplace and anyone. Recent tragedies such as the earthquakes that struck Indonesia (2006), China (2007), Haiti (2010), Chile (2010) and the massive flooding that hit the Philippines and Vietnam (2009) have left thousands of people dead and injured, not to mention tremendous losses in livelihoods, properties, and resources and millions of people left homeless.

Acting on the premise that disasters are best avoided through disaster risk reduction (DRR), governments from around the world adopted the Hyogo Framework for Action (HFA) at the 2005 World Conference on Disaster Reduction in Kobe, Japan. The HFA called on national governments to substantially reduce disaster losses by 2015 through concrete actions in five priority areas, to wit:

1. Make DRR a priority by ensuring that it is a national and local priority through efficient legal and institutional mechanisms;
2. Know the risks and take action by identifying, assessing and monitoring risks leading to an effective warning system;
3. Build understanding and awareness through knowledge, innovation and education to build a culture of safety and resilience at all levels;
4. Reduce the underlying risk factors by ensuring that exposure to hazards, vulnerabilities of people and their places and resources are protected and safe, thus resulting in resilient communities; and
5. Be prepared and ready to act by strengthening the disaster preparedness for effective response at all levels.

Since then, land use planning has been identified as one of the most effective ways to take the HFA forward. For highly vulnerable cities like Kathmandu, a land use plan offers an opportunity to incorporate risk reduction into development and spatial plans by engaging the government at various levels, private sector, civil society, international development organizations, and other key stakeholders (e.g. academe, media, private sector, etc.). The land use planning process helps the city address its need to reduce disaster risks as part of its pursuit for sustainable development.

This Risk-Sensitive Land Use Plan (RSLUP) for Kathmandu and the accompanying Sectoral Profile and Preliminary Zone Ordinance are the major outputs under Project Work Output 1.1 (PWO) of the project titled, "Disaster Risk Reduction in Megacities - A Pilot Application in Metro Manila and Kathmandu." The project was a collaborative undertaking between Kathmandu Metropolitan City (KMC), Earthquakes and Megacities Initiative (EMI), and the National Society for Earthquake Technology - Nepal (NSET), with support from the German Federal Foreign Office (FFO) through the Deutsches Komitee Katastrophenvorsorge (DKKV). The project's main goals under PWO 1.1 are two-fold: (a) to develop a rational land use plan for KMC that fully integrates risk reduction parameters into its spatial and physical development strategies and their related tools, bylaws and procedures, and (b) to mobilize political commitment and cooperation for DRR at the local and regional levels. The project demonstrates that land use planning could be an effective tool to lessen the physical, social and economic vulnerabilities of cities to natural hazards.

This RSLUP is a product of activities undertaken in Phase 2 of the project, that is, from June 2008 to January 2010. Reports for Phase 1 (November 2007 - March 2008) were originally submitted by EMI to DKKV and FFO in March 2008; copies of which may be requested from EMI or any of the project's partner organizations.

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## List of Acronyms

| | |
|---|---|
| ADPC | Asian Disaster Preparedness Center |
| ADB | Asian Development Bank |
| BAP | Bagmati Action Plan |
| BASP | Bagmati Authority and Sewerage Plan |
| BCHLC | Bagmati Civilization High Level Committee |
| BM | Bhaktapur Municipality |
| CBD | Central Business District |
| CBOs | Central Business Organizations |
| CDS | City Development Strategy |
| DDC | District Development Committee |
| DDO | District Development Office |
| DDRC | District Disaster Relief Committee |
| DKKV | Deutsches Komitee Katastrophenvorsorge |
| DLRM | Department of Land Reform and Management |
| DOR | Department of Road |
| DOS | Department of Survey |
| DoTM | Department of Transport Management |
| DRA | Disaster Risk Assessment |
| DRM | Disaster Risk Management |
| DRMMP | Disaster Risk Management Master Plan |
| DRR | Disaster Risk Reduction |
| DUDBC | Department of Urban Development and Building Construction |
| EMI | Earthquakes and Megacities Initiative |
| FAR | Floor Area Ratio |
| FFO | German Federal Foreign Affairs Office |
| GIS | Geographical Information System |
| GoN | Government of Nepal |
| GTZ | German Technical Cooperation |
| ICIMOD | International Centre for Integrated Mountain Development |
| IEC | Information and Education Campaign |
| IMP | Integrated Master Plan |
| INGO | International Non-government Organizations |
| IT | Information Technology |
| IWO | Implementation Work Output |
| JICA | Japan International Cooperation Agency |
| KMC | Kathmandu Metropolitan City |
| KUKL | Kathmandu Upatyaka Limited |
| KVERMP | Kathmandu Valley Earthquake Risk Management Project |
| KVTDC | Kathmandu Valley Town Development Committee |
| LSGA | Local Self Governance Act |
| LSMC | Lalitpur Sub-Metropolitan City |

| | |
|---|---|
| MMI | Modified Mercalli Intensity |
| MOC | Memorandum of Cooperation |
| MoEST | Ministry of Environment, Science and Technology |
| MOHA | Ministry of Home Affairs |
| MOLD | Ministry of Local Development |
| MOLRM | Ministry of Land Reform and Management |
| MoPPW | Ministry of Physical Planning and Works |
| MRF | Material Recovery Facility |
| M-TM | Madhyapur Thimi Municipality |
| NGA | Non-Governmental Agency |
| NGO | Non-governmental Organization |
| NSET | National Society for Earthquake Technology |
| NWSC | Nepal Water Supply Corporation |
| PDC | Pacific Disaster Center |
| PEER | Program for Enhancement of Emergency Response |
| PO | People's Organization |
| PWC | Project Working Committee |
| RSLUP | Risk Sensitive Land Use Planning |
| UDD | Urban Development Department |
| UNDP | United Nations Development Programme |
| UNEP | United Nations Environment Programme |
| VDC | Village Development Committee |
| WB | World Bank |

# Extended Summary

This preliminary Risk-sensitive Land Use Plan (RSLUP) for KMC is a product of a two-year cooperative undertaking by a multi-disciplinary team of specialists and practitioners from KMC, NSET, and EMI. It is one of the four components of a larger project aimed at mainstreaming DRR in Kathmandu and Metro Manila. The development of the RSLUP received the backing and support of public officials from within KMC, as well as from other ministries and agencies of the Government of Nepal (GoN). The outcome benefitted from inputs and comments of external peer reviewers, KMC local officials, and representatives of relevant ministries, in particular the Ministry of Local Development (MOLD), Ministry of Home Affairs (MOHA), and the Ministry of Planning and Public Works (MoPPW) through its concerned agencies, namely, the Department of Urban Development and Public Construction (DUDBC) and the Kathmandu Valley Town Development Committee (KVTDC).

The project also received inputs from various development partners in Nepal through a series of consultations and workshops that took place during the course of the project. These include the United Nations Development Programme (UNDP), United Nations-Office for the Coordination of Humanitarian Affairs (UN-OCHA), Asian Development Bank (ADB), German Technical Cooperation (GTZ), Japan International Cooperation Agency (JICA), and City Development Initiative of Asia (CDIA).

The deliverables for this particular project component (i.e. PWO 1.1) are as follows:

1. KMC Sectoral Profile;
2. Risk-Sensitive Land Use Plan 2020 (10 years); and
3. Draft Zoning Ordinance Framework (10 years).

The Sectoral Profile 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 uses. It is available as a separate report.

This RSLUP is a ten-year guide (2010-2020) for realizing KMC's desired spatial pattern of development, with due consideration to the city's seismic risks, emergency response and disaster management capabilities, through different land use policies and urban renewal schemes.

The RSLUP builds on previous and existing land use plans, land use maps and land use-related programs of the government, as well as policies, initiatives and studies in disaster risk management (DRM) that affect Kathmandu, such as the Earthquake Disaster Mitigation in the Kathmandu Valley undertaken by JICA in 2002. The RSLUP explicitly incorporates assessments and projections for transportation and traffic management in the future. It also includes strategies and actions that prescribe reasonable limits and restraints on the use of property through proposed zoning regulations and other local ordinances and control mechanisms for development within the city. It is intended to serve as a guide for engaging

in historical preservation, infrastructure development (e.g. transport, utilities, facilities, etc.), regulating housing settlements and open space, reclassifying agricultural lands into non-agricultural uses, and improving emergency management. It covers the entire territorial jurisdiction of KMC.

The Draft Zoning Ordinance is meant to serve as the principal instrument for enforcing the locational policies and performance standards of the RSLUP. Once the zoning ordinance is enacted, further land development must be aligned with what is stipulated in the RSLUP.

While this preliminary RSLUP provides a clear framework to guide the city's future development, it is constrained by the following limitations: (a) some of the data used has not been fully qualified and may need further verification; (b) the financial implications of proposed programs, projects, and activities (PPAs) have not been evaluated; (c) the process of adoption, implementation and enforcement of the RSLUP has not been engaged; (d) the understanding of the RSLUP by the national and international agencies (beyond KMC and NSET) has been limited; and (e) the awareness campaigns, advocacy, and capacity building efforts have been minimal. These limitations are due to the lack of financial resources and the limited timeframe allocated to the project. The land use plan relied largely on secondary information derived from previous studies by KMC, KVTDC and government ministries. One major difficulty encountered was the necessity of relying on risk assessment results prepared in 2002, which focused on earthquake hazards only. Data on other hazards (e.g., flood, landslides, fire, and others) were sketchy. These shortcomings are proposed to be addressed in a future phase of the project. In addition, the implications of existing or planned projects (e.g. ongoing riverside development, proposed parking, and new roads) by development agencies were less studied and not fully incorporated in this RSLUP.

While the RSLUP includes an initial list of proposed PPAs (Programs, Projects and Activities) in the different development sectors, the information on the financial performance of KMC, as well as the potential sources of funding for various projects, were not fully addressed due to constraints in budget and time. At the end of this document, a set of future activities is outlined to complete and improve this RSLUP. This version of the RSLUP should be considered as a working document and not a comprehensive land use plan.

The structure and summary of this report is provided below. The document covers eight chapters with annexes on document reviews and proceedings of meetings conducted as part of the planning exercise.

**Chapter 1**, Planning Mandates and Approach, provides the rationale for risk-sensitive land use planning and gives an introduction of the planning mandates and key policies and plans that are relevant to land use planning in Nepal. It presents a summary of the mandates of national, regional and municipal planning authorities and directives from the various ministries. The chapter also discusses planning and mainstreaming frameworks and the overall mechanism of integrating elements of DRR in KMC's planning process. It provides contents and limitation of the RSLUP. The chapter ends with the summary of KMC's Sectoral Profile.

**Chapter 2**, The Study Area, provides a summary of the geography, hazards, and socio-economic conditions of the city. It draws information mainly from the Sectoral Profile to provide the initial context of the planning.

**Chapter 3**, Vision, presents the outputs of the visioning exercise held in July 2009 in Kathmandu City. It includes the description and elaboration of the measures of success for various vision elements, as prepared by local stakeholders. In general, the city's vision emphasizes beauty, safety, tourism, health, green living, robust economy, and resilient local governance.

**Chapter 4**, Development Issues and Problems, summarizes the challenges and opportunities that could bring KMC closer to the realization of its vision. Among the pressing development concerns identified include congestion in the city core and sprawling development at the periphery, inadequate housing and urban facilities, unregulated industrial and residential expansion, poor income, and high physical vulnerability. Socio-economic concerns include the loss of cultural heritage, ineffective education policy, decreasing performance of industries, and weak institutional capacities. Further the chapter emphasizes earthquake risk and its impacts, represented by a M8.0 Mid-Nepal Earthquake scenario which could potentially produce a level of intensity of IX as measured by the Modified Mercalli Intensity Scale MMI[1]. Such scenario is expected to heavily damage 53,000 buildings and result in 18,000 deaths and 53,000 injured persons within Kathmandu Valley. However, these estimates are based on census data from 1991. Since then, the population of the Kathmandu Valley has just about doubled and the density has significantly increased, thus increasing the physical and social vulnerability of the city. The actual losses could be several times greater than these projections.

On physical and environment issues, the following are highlighted: shortage of habitable land against an increasing demand for urban land, continuing loss of public open space, conversion of agricultural lands, fragmentation of land parcels arising from inheritance activities, backlogs in infrastructure development, declining water supply against increasing demands, poor wastewater collection and treatment, deterioration of heritage sites and environmental deterioration, air pollution, electrical power shortages, open dumping of solid wastes, traffic congestion with decreasing capacities, and structural risks to old buildings specially those made of brick and mortar. Lack of facilities maintenance similarly contributes to higher estimates of damage in the core and adjoining wards.

In terms of infrastructure, several bridges are likely to be heavily damaged, closing most of the access points in and out of KMC. The same earthquake study in Kathmandu Valley estimated that more than 10 percent of road length will be damaged and more than 50 percent of bridges will be impassable if an earthquake with intensity IX hit Kathmandu Valley. Almost all bridges connecting to the international airport are at risk. As most of them have neither been replaced nor retrofitted, implications for damage and consequent disruption remain substantial. Note that these estimates are based on data that is at least ten years old. In view of the increase in population in the last decade and further degradation of the physical infrastructure, the losses should be expected to be much higher. However, the project did not have the resources and time to improve on existing data.

The public transportation system of KMC is characterized by the dominance of low-occupancy vehicles namely, three-wheelers, microbuses and taxis. Furthermore, the low quality of the existing public transport system drives the increasing ownership and use of private transport, particularly private cars and motorcycles. This situation has contributed to serious traffic congestion, air pollution and low energy efficiency.

Traffic scenarios developed by reducing trips in the Core Area, that is, by transferring part of its population to the eastern or western areas of the city, revealed that such action only transfers the traffic elsewhere within its boundaries. Hence, it is suggested that decongestion may likely be achieved if future population be directed outside of Kathmandu City and towards the Valley boundaries. An identification of possible sites is suggested in this RSLUP, but requires further studies on their availability and suitability, and the resultant traffic between municipalities and VDCs. A Valley-wide transport study was suggested to reveal the dynamics of this movement and identify the needed

1 Modified Mercalli Intensity (MMI) is a conventional empirial measure of the severity of the earthquake shaking at a site based on observed damage. It should not be confused with the magnitude of an earthquake which is a measure of the energy released by the earthquake at its source.

infrastructures and policies, the implications of hazards (e.g. flooding, landslides, ground shaking, and liquefaction) and their related risks on the proposed new development sites, the transport system proposed, and the resulting emergency scenarios that need to be identified and evaluated. The appropriate risk reduction measures should then be integrated into future land use plans or investment projects not just for Kathmandu City but for the entire Valley.

The chapter similarly suggests a list of mutually reinforcing risk reduction and development strategies such as (a) restricting or discouraging new structures in high-risk areas (Core Area); (b) providing economic incentives to discourage development in high-risk areas; (c) use of land pooling experiences by KMC; (d) relocating occupants in high risk-buildings; (e) protection of critical facilities; and (f) encouraging government and private sector to observe building bylaws and zoning regulations. These strategies are further listed in Tables 4.7-4.11.

**Chapter 5**, Towards a Preferred Urban Form, discusses the preferred urban form as the organizing concept for guiding the physical growth of KMC. It indicates the initial bases and considerations for deciding on an alternative strategy. In the absence of an updated inventory on characteristics of residential buildings (i.e. floor area ratio (FAR), percent area occupation of buildings), assumptions were made to check theoretically if future residential areas in each ward having a FAR of 2 and 50 percent occupancy were sufficient to house its future residential population (based on projections). Based on this, results of the projection are as follows:

- In the East sector, the projected population by 2015 or 2020 cannot be accommodated by its own allotted residential areas. Wards 7, 34 and 35 are likely to remain congested, even if the FAR is doubled. Wards 8, 9 and 10 have enough space to accommodate their own populations, but this is likely to be exceeded in 2020.

- In the Central sector, Wards 5 and 31 can accommodate the population projected in 2015 but it is unlikely that they will be able to do so in 2020. Wards 11 and 32 will remain congested, and raising the FAR may be questionable at this time without further information on ground conditions and allowable height restrictions from microzonation studies. Wards 1 and 33 can accommodate a larger population and may be possible for densification.

- In the North, even if a FAR of 2 is maintained, Ward 16 will still have the heaviest concentration of population to be housed. Ward 3 will increase its capacity; while Wards 2, 4 and 29 can accommodate residential population in 2015 but will exceed this capacity in 2020.

- In the Core, available land area will no longer meet the projected population in either year even if the FAR is raised to 2, revealing a truly congested situation.

- In the West, raising the FAR to 2 increases the residential capacity to meet demand in 2015 but not in 2020.

While these are crude assumptions and estimates, augmenting existing residential areas for future population through infilling and densification may be possible but rather difficult to promote at this time without verifying the actual FAR of buildings on the ground, and resolving the transport congestion problem. Hence, special studies on these are required for ascertaining availability and suitability of sites for residential-mixed used areas.

At the same time, it also points to the fact that in some wards, increases in capacity, through densification of residential areas, may no longer be feasible after the planning period. Hence, looking for possible residential sites outside of KMC and towards Kathmandu Valley remain the most plausible options. These findings and conclusions should be further refined by more detailed studies that also integrates an comprehensive analysis of the transport system

in the Valley.

The redevelopment of the core area needs to be prioritized to include measures for (a) relocating part of the existing residential population outside the Core area; (b) reducing building and traffic congestion and deterioration of heritage sites; (c) directing future non-compatible commercial activities outside the city; (d) pursuing redevelopment or preservation with seismic risks in mind; and (e) providing access to open areas and an emergency plan (e.g. considering the possible blockages created by damaged buildings over narrow streets and roads in an earthquake).

In summary, the strategy proposed at this time focuses on protecting assets (specially the core area) through a combination of seismic retrofitting of buildings and infrastructures and relocating existing structures or locating future structures in safer environments and planned areas. The latter strategy may include future planned expansion in safe, available areas in the Valley. The possibility of forming a new risk-sensitive multi-centered development supported by a properly planned transport system may hold the most promising prospect towards the realization of the KMC vision within the Valley. Within Kathmandu City, different development areas and corridors (see Figure on Kathmandu City Land Use) are described briefly:

**The Core**

As the traditional city core, it functions as the nerve center of the social, economic and political life of KMC. The heritage site in the core shall be restored close to its original design and form (Integrated Management Framework, Kathmandu Valley World Heritage Site, 2007). With the cultural and heritage value of the monuments in mind, the structural integrity of the monuments and remaining structures shall be reviewed for possible seismic retrofitting against ground shaking and related hazards. The use and function of the public spaces shall be continued, but will be based on the understanding and appreciation of the heritage values of the site. The RSLUP suggests that the streets and square be restored to allow for their exclusive use by pedestrians. Mercantile operations shall also be regulated; hence, private buildings shall be used only for traditional and compatible activities. Boundaries and buffer zones identified and approved by the World Heritage Committee shall be enforced. Access to emergency vehicles and fire fighting engines should be improved.

Given the varied and special requirements towards the preservation of the heritage site and redevelopment of the Core and its vicinity, this area should be taken as a special zone.

**The Central Sector Growth Area**

The central area being heavily built up, is congested with mixed uses. The circulation network serving the wards in this area is the "Ring Road", which shall be improved by widening its connection with the Madan Bhandari Path. A commercial buffer strip along the Madan Bhandari Path shall provide for the new medium to high density commercial uses proposed to concentrate along this road; while dense mixed residential uses shall continue to dominate the rest of the sector. Strong land use policies will have to be instituted to maintain the buffer as well as densify these areas to its carrying capacity under FAR of 2 to 3.

This central sector will maintain its function as the financial and business district of the city, leaving the traditional role for worship, pilgrimage and other related mercantile functions at the core.

Wards outside the CBD (central business district) will be medium density residential areas, where row houses and townhouses will be encouraged.

**The East Sector Growth Corridors**

Development of the eastern and southeastern sections of the city is influenced by the airport location. Providing the vital link from this airport into inner areas is the same Madan Bhandari Path. The east sector, in general, will

be promoted as a tourism and residential area incorporating into its master plan two major developments: 1) road commercial strips, and 2) apartment housing. These two features will serve as the focal points of this growth corridor. Vegetable markets here will be expanded and modernized in order to cater to the growing population.

In line with the city's aim to further strengthen its role as the premiere center in education and health services, vacant lands still available in the fringes of the East area (near land pooled areas) may be used for setting parks that are conducive to learning and healing.
The North Sector Residential Growth Area
This area shall be maintained as a tourist destination. The highways oriented toward the north can serve as visual corridors leading to the forest areas of the mountains. Therefore, the construction of high rise structures in this area shall be regulated.

The West Sector Growth Corridor
New developments will be identified by urban redevelopment zones (along the Outer Ring Road) within the commercial buffer strips to promote further commerce in the area. The West sector shall remain largely a residential area comprised of "other residential area" categories and land pooled areas. The preferred form will improve the riverside (Bagmati and Bishnumati) in this sector.

**Chapter 6**, Kathmandu City Risk-Sensitive Land Use Plan, presents the land use plan and the different land use policy frameworks for the regulation of future land use activities, consistent with the chosen spatial strategy. This section presents the four major land use policy areas of settlements, production, protection, and infrastructure. These four policy areas cover all possible areas within KMC's territory.

**Chapter 7**, The Zoning Ordinance, presents a framework for the zoning plan. Much of the materials are drawn from the KVTDC Building Bylaws of 2007. Other annexes are also included for completeness.

**Chapter 8**, Conclusions and Future Work, presents a rationale for the extension of the RSLUP to the whole Kathmandu Valley and the completion of the Kathmandu City RSLUP into a Comprehensive RSLUP. It proposes a related work plan for a subsequent three-year phase to undertake the work.

## FUTURE WORK

Moving forward with the adoption, implementation and enforcement of the RSLUP will undoubtedly curb the risk to Kathmandu and build the discipline in development decisions and approaches that has been lacking to date. The RSLUP is a benchmark document in filling an important gap for the direction and control of development within Kathmandu that should be endorsed, adopted, implemented and enforced urgently.

Nonetheless, it must be noted that this version of the RSLUP remains a working document. Some of its underlying data needs to be qualified, completed and refined. Its biggest limitation is that it is limited geographically to KMC. Kathmandu City is physically, socially, politically and economically fully enclosed within the Kathmandu Valley. The link between Kathmandu City and Kathmandu Valley is vital in terms of its demographics, economy, living, and livelihood conditions. The RSLUP for KMC leads to the realization that proposed strategies and approaches for future development are dependent on looking beyond the boundaries of the city proper. Key elements such as transport and housing require a Valley-wide analysis in order to be understood, assessed and incorporated adequately. Further, the hazards and their consequences do not stop at the city boundary; thus, approaches for DRR and for effective emergency management must take a Valley-wide perspective. Other hazards such as floods and landslides but also including the long-term effects of climate change also need to be incorporated. Emergency management approaches must be framed in the context of the Valley in order to organize essential emergency management elements such

as fire fighting, search and rescue, evacuation, shelter, water, health, sanitation, etc. Hence, the comprehensiveness and completeness of a risk-sensitive plan is only possible in the context of the full Valley. At the same time, efforts to extend the RSLUP to the whole of Kathmandu Valley will lend themselves to improving and completing the current Kathmandu City RSLUP, which will serve as a model to other cities.

The proposed scope of future work is structured into six tasks which will have two key deliverables:

1. A Kathmandu Valley Risk-Sensitive Planning Framework (KV-RSPF)
2. A Comprehensive Risk Sensitive Land Use Plan for Kathmandu City

The six tasks are fully detailed in Section 6 of the report together with a corresponding timeline. The proposed work is expected to take three years. However, the work can be phased with Task 1 being given the priority, followed by an effort to complete the Kathmandu City RSLUP. For reference, the six tasks are indicated below:

- Task 1: Adoption, Implementation and Enforcement of Kathmandu City RSLUP. This task includes reviewing, improving, and testing the legal and institutional arrangements for adoption, implementation and enforcement of the RSLUP. Performance indicators will also be included in the task.

- Task 2: Valley-Wide Data Collection and Completion of the Kathmandu City RSLUP. This task includes the development of a Sectoral Profile and related Resource Maps to the whole Valley. It also includes the incorporation of on-going and planned development projects into the RSLUP, as well as its completeness and refinement into a Comprehensive RSLUP.

- Task 3: Valley Wide Multi-Hazard Analysis and Emergency Management. This task includes the extension of the RSLUP to multi-hazards as well as the incorporation of emergency management parameters.

- Task 4: Valley-Wide Risk Sensitive Transport Analysis. This task includes the incorporation of Valley-wide risk sensitive transportation study to serve as a backbone to the Valley-wide risk sensitive development framework.

- Task 5: Special Studies. This task includes the undertaking a several special studies needed to refine the RSLUP (e.g., social housing, historical preservation, building code implementation).

- Task 6: Development of the Kathmandu Valley Risk-Sensitive Planning Framework, This is the final task to integrate the above elements into a Kathmandu Valley Risk Sensitive Development Framework with its companion document Kathmandu-City Comprehensive RSLUP. These elements can then serve as guides and model for other cities to develop their own RSLUP.

It has to be emphasized that the mainstreaming process should continue towards further refining and updating this land use plan up until the implementation stages. Hence, other stages of planning such as local financial planning, project programming and budgeting, monitoring and evaluation programs need to be included in succeeding planning activities.

## CONCLUDING STATEMENTS

The decision to manage the city according to the mandates of the Local Self-Governance Act (LGSA) provides local governments such as KMC and other municipalities the authority to take public control over the direction and pattern of development in their territories. Through a rigorous risk-sensitive planning process, local governments such as KMC can be proactive in prescribing the use of land, with the guidance and support of higher government offices to achieve the following results:

- Hazards such as earthquakes, floods and others are accounted for and their impacts reduced with time;
- Settlement areas are made livable and safe;
- Communities and institutions are prepared, with sufficient understanding of their capabilities, responsibilities and authorities before, during and after a disaster
- Protected areas are respected and preserved for the benefit of all;
- Infrastructure support is adequate and efficient to help a modern city become the model in the management of planned change; and
- Production areas are used sustainably so that the needs of the present and future generations will continue to be adequately met.

Performance indicators of accomplishments in DRM by KMC and other national agencies responsible for land use planning, urban development and DRM should be used to benchmark the current situation and measure future progress. While being a first step, the framework for mainstreaming introduced in this RSLUP could similarly be used to guide development and allocation of land. The replication of the approach towards the Kathmandu Valley can provide lessons in managing risks common to cities and municipalities arising from natural hazards and climate change-related effects in Nepal and beyond.

# About the Project

Many highly urbanized and urbanizing cities fail to consider that risk to disasters is not produced by natural hazards alone, but are similarly man-made. Locating buildings, changing occupancies, increasing building densities without considering the hazards of the place, developing poor infrastructures, and not providing enough open spaces, among others, are among the main ingredients for a disaster. The direct damage on these structures may oftentimes be significant, but non-structural damages and loss of lives may prove to be more costly, derailing development plans and washing out hopes of its people towards recovery.

The major disasters in Yogyakarta, Indonesia (2006) and Port-au-Prince, Haiti (2010) are painful images which can provide similar scenarios of a devastating earthquake hitting Kathmandu Valley in Nepal. Rather than taking the Mid-Nepal Earthquake scenario (KVTDC/JICA earthquake study in 2002) as one of fate, this potential disaster can be avoided.

Essentially, RSLUP came about as an offshoot of a previous study undertaken by EMI, KMC, NSET and other local and international partners to develop a disaster risk management master plan (DRMMP) for Kathmandu during the period 2005-2006. This RSLUP integrates elements (i.e. disaster risk assessment and mitigation) into local land use planning by: (a) using available seismic hazard and risk information; (b) including emergency management parameters (e.g., evacuation roads), (c) prescribing a series of disaster risk reduction strategies and actions in the land use planning practice; and (d) delivering a rational risk-sensitive land use plan to guide the future development of Kathmandu.

A collaborative approach was selected to ensure full ownership of the project by KMC and other local partners and build the capacity within local professionals. The engagement of the partners in the project and their integration in a single team was instrumental to the success of the project. To initiate the process, EMI organized a series of consultation meetings within KMC, leading to the creation of a Project Working Committee (PWC) comprising of different units from KMC, KVTDC, the various Ministries (e.g., MoPPW, MOLD, and MOHA), NSET and EMI. Each member of the team had specific roles and responsibilities and contributed to the project according to his/her own expertise. Leadership in the project was shared between partners, with EMI filling the technical and managerial gap, while local partners undertook most of the data collection, consultations, coordination and validation. The mobilization of all the resources among the partners enabled a significant scaling up of the outcome of the project as well as the possibility to overcome many hurdles during its implementation. The PWC served as the technical, managerial, logistical and administrative unit of the project, as well as the consultation and coordination agent for the different activities needed for the RSLUP formulation.

During the initial meetings by the PWC, several key points were identified as crucial in ensuring the crafting of the plan: (a) incorporation of existing land use maps and other available land use information (e.g., development and master plans, the risk maps resulting from the JICA-funded study in 2002, and the findings and results of Phase 1 of this study); (b) developing protocols to improve inter-institutional coordination, complementing strengths and

weaknesses of the PWC members; (c) providing for a framework for mainstreaming DRR in land use plan formulation; (d) identifying and defining programs aimed at reducing physical and social vulnerability; and (e) promoting awareness and gaining support on the importance of practicing risk sensitive land use planning. These initial series of activities provided for the project scope and framework for mainstreaming DRR in KMC.

The elements of the RSLUP and its driving parameters were prepared through a series of workshops and investigations by the members of the PWC, relying mainly on secondary information and subsequently reviewed and updated by the PWC members through validation exercises. In terms of data processing and mapping for the RSLUP, substantive efforts and resources were committed by KMC and NSET to collect the appropriate information, analyze and formulate it in a way that is required by the RSLUP. The project drew particularly on information in the geographic information systems (GIS) in place in each of the KMC departments as well as at NSET. Coming up with new data and updated information proved to take much time and resource, especially for purposes of understanding and establishing trends on demographic, social and economic growth, and spatial distribution in Kathmandu. The EMI technical team provided the guidance in terms of the type and format of the data and lead the analysis and integration of the data within the PWC. However, while some of the data was in satisfactory quality, others were either unreliable, could not be located, or did not exist. In addition, the PWC did not have the resources or time to locate and collect all the data that may be in the hands of the various national institutions and international development partners. Furthermore, the same limitations in time and resources made the project rely mostly on available information. The project did not have the possibility to update existing information or generate new data (e.g., hazard and risk information, inventories on buildings, traffic demands, among others) through further inspections and studies. Thus, some elements of this RSLUP need to be further qualified and its accompanying zone plan accordingly modified.

At this time, the current zoning scheme's main functionality is to frame possible urban zoning. In spite of these limitations, the RSLUP provides a rational framework to guide future development within Kathmandu in a process that will undeniably produce a safer and more sustainable development than the ad-hoc and haphazard manner under which the city has developed in the last several years.

Similar project-related outputs were prepared by KMC complementing this RSLUP, namely, the creation of Disaster Risk Management and Citizen Safety (DRMCS) Unit and the formulation of a related Emergency Operations Plan, both as part of PWO 1.2 of the larger FFO project. These are meant to institutionalize disaster preparedness and management and preparedness units within KMC and further strengthen the ownership process by local institutions.

Several follow-on activities need to be undertaken in order for the RSLUP to become an effective document in guiding the city's future development. First and foremost, implementation and enforcement mechanisms need to be developed through appropriate regulation, empowerment, training and awareness. Without enforcement, the RSLUP will remain just a "plan." Secondly, Kathmandu City is geographically and politically integrated with the rest of the Kathmandu Valley. Its land-use strategy and requirements cannot be undertaken in isolation from the adjoining municipalities and localities within the Valley. Thus, the RSLUP must be completed to include the full Kathmandu Valley. Thirdly, the RSLUP needs to be completed by integrating all development projects undertaken by national and international development agencies and by completing and qualifying uncertain or incomplete data. Fourthly, refinements of the plan are needed to include other hazards (e.g. flood). There is also a required activity to improve the technical capacity of planners and other professionals at KMC, KVTDC and at national level institutions (Ministry) which are similarly envisioned to take the lead in mainstreaming risk reduction in the land use and development processes

in the Kathmandu Valley and the rest of the county.

The Kathmandu RSLUP is undertaken as a pilot study to provide an example for Nepal and other cities in the developing world as to how DRR and emergency management considerations can be explicitly integrated with land use planning and urban developmental planning. By completing this project, Kathmandu City will be one of the very few cities in the developing world that has completed a risk-sensitive land use plan. Thus, this project could have significant value to the implementation of urban DRR if this pilot study is completed, duplicated and refined in other cities.

# Chapter 1. Planning Mandates and Approach

### 1.1. Rationale for Risk-Sensitive Land Use Planning for Kathmandu City

Historically, Nepal has experienced several destructive earthquakes with more than 11,000 people killed in four major earthquakes just in the past century. The recently developed and published "Three-Year Interim Plan (2007 - 2010)" of Nepal recognizes disasters as one of the major impediments to its national development. A review of the seismicity and damages in Nepal reveal that damage intensities (see NSET website, http://www.nset.org.np ) greater than or having same intensity (MMI) VI may recur every 21 years, damage intensities greater than or having intensities greater than (MMI) VIII may recur every 38 years, and the more extensive damage under (MMI) intensity IX may recur every 75 years. 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>= 7 have affected Kathmandu. Recent damaging earthquakes in Nepal were recorded in 1980 and M8.3 in1934, with the first documented earthquake in 1255.

A risk assessment by JICA and MOHA in a 2002 study titled, "Earthquake Disaster Mitigation in the Kathmandu Valley," illustrated the implications of a Mid-Nepal Earthquake scenario on Kathmandu Valley as follows: (a) number of heavily damaged buildings: 53,000 or 21 percent of all buildings; (b) death toll: 18,000 or 1.3 percent of the total population in the Valley; and (c) number of seriously injured people: 53,000 or 3.8 percent of the total population in the Valley.

KMC is facing a number of problems related to its growing population. One major issue of the city is congestion due to high population density. Population density in the city had crossed over 1,000 persons per hectare in some wards particularly at the city core. This has resulted in several related concerns such as increased traffic, high level of waste generation, and increased demand for urban services and facilities. In relation to seismic hazards, most structures are old and made of stone, brick and mud whose structural elements are unlikely to withstand strong shaking leading to their damage or structural collapse. Some buildings stand closely near rivers (Bagmati, Bishnumati and Dobikhola) and are prone to collapse from liquefaction. Previous studies have identified possibilities of strategic roads and bridges likely to suffer damages under strong ground shaking. Other visual indications that damage and collapse are likely to result in deaths and various degrees of injury are revealed from high density of structures and their high occupancy adjacent to narrow streets; heavy foot and vehicular traffic in old sections of the city, and lack of strategic fire stations to contain building fire. The visual images of mass casualties and injuries, poor access to the damage site and egress to evacuation sites and to medical facilities provide impetus in planning the city against seismic risks.

In general, these existing conditions contribute to increased vulnerability of communities, compounding the possible disruption of various functions and destruction of physical assets. Added to this problem is the limited supply of lands and resources to serve the needs of the future population for infrastructure related to housing, transportation and other urban services.

One way of addressing development problems in the face of seismic risks is to deal with identified risks and their management in the planning process. This approach was taken in the land use planning exercise for KMC.

This RSLUP is the municipal counterpart of Valley-wide physical framework plans prepared by KVTDC. It is a ten-year guide (2010-2020) for more detailed development planning of Kathmandu City. The land use plan provides a long-term view of how land can be best utilized to provide the platform for various development activities, as well as serve as a key component (e.g. soil) for producing various goods. As such, land can serve a multitude of uses such as for settlements, production, infrastructures and maintaining lifelines (e.g. food from forests and water from aquifers).

It also adopts or seeks to strengthen the role identified for the city in the higher-level plans and aligns its infrastructure projects along those plans (e.g. KVTDC, Ministry). Regional plans or Valley-wide projects that will be located in KMC shall be chosen with the participation of affected local residents and in consideration of the inherent natural hazards of the place. These sites will be committed lands forming part of the Kathmandu City land use plan. It shall confine or divert settlement, production areas, and infrastructures outside of areas that are protected from human activities and shall identify and prescribe the necessary adjustments in case of unavoidable threats from natural hazards.

Natural hazards that pose significant threats to these land uses, to the elements below and above them, and to corresponding land use activities, shall be reduced, if not eliminated. Hence, land use planning offers a way of integrating these concerns as well as their possible solutions. As a first step, the integration of seismic risk assessment and the subsequent risk reduction measures in this plan may result in:

- A better knowledge and understanding of the seismic risks and the vulnerabilities of exposed communities, their social and economic susceptibilities, and their ability to cope with or recover in times of disaster.

- Identification of hazard-prone areas where future settlements may be discouraged or restricted, or where possible structural adjustments may be implemented. These constraints to development become part of the development goals and issues.

- Improved preparedness and realistic emergency operation plans to prepare for effective response and to develop the capability to deal with emergency and reduce loss of life.

- Increased awareness of decision-makers and stakeholders to ensure reduced loss to life and property from seismic risks.

- Inclusion of appropriate risk reduction measures in priority programs and projects and eventually provided with budgetary resources and implemented in periodic plans, duly monitored and evaluated.

- Appropriate identification of zones for various land uses, with relevant resolutions and legislations promulgated to support them. Clear directions to Building Bylaws of KMC are crafted following the prevention and mitigation policies and measures identified in this plan.

These elements constitute the foundations of a risk-sensitive land use plan. Once translated and enacted into a zoning ordinance, the policies in this RSLUP become mandatory and enforceable. Enforcement is the key to its implementation, and concerns regarding this area remain to be addressed.

This document was developed to serve as a source of information for the important elements, approaches, methodologies for mainstreaming seismic risks and their management in the land use planning exercise at the local (e.g. city or municipal planning) level. It is hoped that it can be adopted, completed, improved, implemented

and enforced by KMC and other relevant government agencies in Nepal. It is also hoped that it will serve as a model to other cities in Nepal and other countries on how to integrate DRR in land use planning and urban development.

### 1.2. Legal Mandate for Plan Formulation

In coordination with local municipalities and Village Development Committees (VDCs), the KVTDC is responsible for the overall planning and regulation of urban development at the Valley level. Its work includes the formulation and updating of Valley development plans and land use plan for the region. These plans serve to guide the municipalities within the Kathmandu Valley, including KMC, in developing their own detailed land use plan.

KVTDC exercises land redevelopment through land pooling and guides land development projects in KMC and other municipalities and cities within the Valley. Land pooling is a powerful tool that KVTDC is already using, which may be used to integrate DRR in the urban development and land use planning processes of KMC.

At the national level, laws and acts of the State are being approved by the Parliament. These legal frameworks and policies may come from various ministries while the Ministry of Laws reviews and consolidates such initiatives. After receiving confirmation from the Cabinet, the legislation enters into force and is implemented by concerned ministries. These national legislations are cascaded down through the bureaucracy in the form of bylaws promulgated by the concerned ministries and other governmental institutions.

Below are highlights from several key policies and development action plans that are relevant to understanding land use planning and local development in Nepal:

**1. The Interim Constitution of Nepal 2063 (2007)**

Under this Interim Constitution, provinces are granted autonomy and full authority to plan for their territories. Article 140(1) stipulates the mobilization and allocation of responsibilities and revenues between the Government of Nepal and local authorities as provided by law, in order to make the latter accountable for the identification, formulation and implementation of local level plans, while maintaining equality in the mobilization, appropriation of means and resources, and distribution of development.

**2. Three-Year Interim National Plan (2064-2067) (2007 - 2010)**

This plan was prepared with federalism in mind in order to provide a certain level of autonomy to the local government, under the supervision of a Regional/Provincial body. The regional body and the local government units that compose the regional body shall be responsible for the development of the region in accordance with the specific needs of the constituents in order to uplift the present standard of living. Hence, the restructuring process results in a multi-tier government with the national government being called the Federal Government and the regional government as Federal States. The local government is to be given autonomy, but supervised by the State.

**3. Tenth National Plan (2002-2005)**

Significant issues addressed in this document include *Unit 21-Residential Building and Town Development Planning*, which covers, inter alia:

- Regulating haphazard construction with proper development controls in town development planning;
- Establishing good partnerships with villages;
- Providing incentives to private sector developers to ensure safe and affordable

housing (i.e., with considerations of earthquake safety and promoting local and affordable construction materials);
- Providing guidelines for managing environmental degradation and for orienting people about DRR before the implementation of any project; and
- Preparing and implementing town development policies and regulating city development by local governments. The program and policies will be developed, taking into account the disaster risks in the cities.

**4. Local Self Governance Act of 1999**

Section 96 of the Local Self Governance Act (LSGA) of 1999 stipulates the functions, duties, and responsibilities of municipalities, including Kathmandu City, to wit:

*"Section 96. Functions, Duties and Power of Municipality: In addition to executing or causing to be executed, the decisions and directions of the Municipal Council, the functions and duties to be performed by the Municipality mandatorily in the municipal area shall be as follows:*

*(a) Finance:*

*(1) Prepare annual budget, plans and programmes of the Municipality and submit them to the Municipal Council.*

*(b) Physical Development:*

*(1) Frame land-use map of the Municipality area and specify and implement or cause to be implemented, the industrial, residential, agricultural, recreational areas, etc.*

*(2) Prepare housing plan in the area of Municipality and implement or cause to be implemented the same.*

*(4) Develop, or cause to be developed, green zones, parks and recreational areas in various places in the Municipality area.*

*(c) Water resources, Environment, and Sanitation:*

*(1) Conserve rivers, streams, ponds, deep water, wells, lakes, stone water-taps etc. and utilize or cause to be utilized them properly.*

*(4) Assist or cause to be assisted, in environment protection acts by controlling water, air and noise pollution to be generated in the Municipality area.*

*(5) Protect or cause to be protected the forests, vegetation and other natural resources within the Municipality area.*

*(7)Carry out and manage or cause to be carried out and managed the acts of collection, transportation and disposal of garbage and solid wastes.*

*(d) Education and Sports Development:*

*(1) Establish, operate and manage pre-primary schools with own source in the Municipality area and give permission to establish the same.*

*(6) Open, operate and manage or caused to be opened, operated and managed, libraries and reading halls in the Municipality area.*

*(7) Prepare and implement or cause to be implemented, sports development programmes.*

*(e) Culture:*

*(1) Prepare an inventory of culturally and religiously important places within the Municipality area and maintain, repair, protect and promote, or cause to be maintained, repaired, protected and promoted the same.*

*(f) Works and Transport:*

*(1) Prepare plans of unpitched and pitched roads, bridges and culverts as needed within the Municipality area, except those roads which are under the responsibility and control of the Government of Nepal (GoN), and construct, maintain and repair or cause to be constructed, maintained and repaired the same.*

*(2) Arrange or cause to be arranged for bus*

*parks and parking places of rickshaws (three-wheelers), horse-carts, trucks etc. within the Municipality area.*

*(g) Health Services:*

*(2) Open, operate and manage or cause to be operated and managed health posts and sub-health posts within the Municipality area.*

*(h) Industry and Tourism*

*(1) Act or cause to act as a motivation to the promotion of cottage, small and medium industries in the Municipality area.*

*(2) Protect, promote, expand and utilize or cause to be protected, promoted, expanded and utilized, natural, cultural, and tourists heritage within the Municipality area.*

*(i) Miscellaneous:*

*(1) Determine and manage places for keeping pinfolds and animal slaughter house.*

*(2) Protect barren and government-owned unregistered (Ailani) land in the Municipality area.*

*(6) Frame by-laws of the Municipality and submit it to the Municipal council.*

*(7) Carry out necessary functions in managing and responding to natural disasters.*

*(8) Maintain inventory of population, houses, and land within the Municipality area.*

*(13) Update the block numbers of the houses in the Municipality area.*

*(14) Arrange for animal slaughter houses.*

*(17) Grant approval to open cinema halls in the Municipality area.*

*(21) Carry out or cause to be carried out other acts relating to the development of the Municipality area.*

*(26)Carry-out such other functions as are prescribed under the prevailing law."*

In addition to the functions and duties referred to in sub-sections, the Municipality may also perform the following optional functions:

*a. Control unplanned settlement within the Municipality area;*

*b. Make the structure and development of the town well-planned through the functions such as guided land development and land use;*

*c. Launch programmes to control river pollution; and*

*d. Carry out preventive and relief works to lessen the loss of life and property caused by natural disasters.*

Further, Section 111 of the LSGA provides the following instructions in the formulation and implementation of municipal plans:

*(1) Each Municipality shall have to formulate periodical and annual development plans for the development of the Municipal area.*

*(2) In formulating the plans, the Municipality shall, as per necessity, have to launch plans such as land-use, land-pooling, and guided land development for making the development of the Municipal areas balanced and planned."*

**5. Town Development Act of 1988**

Section 3 indicates the role of the local government in developing the plan and the role of Town Development Committee to approve the plan for implementation.

**6. Kathmandu Valley Development Authority Act of 1988**

Section 6 pertains to the development of Kathmandu Valley by improving existing town development and identifying new areas for urban expansion. It also highlights the development and implementation of land

pooling program and building construction in identified areas.

Section 7 explicitly highlights the need to stop land fragmentation in the identified land use plan area. Land fragmentation is the result of dividing a parcel of land into smaller sizes by the head of the family and distributing the pieces of land to his heir or members of his family. In many cases, the resulting lots become inadequate in size and shape for the construction of a comfortable house or that the building is built higher in order to accommodate the expanding family occupants. However, whenever the original lots are pooled or consolidated into bigger lots or parcels, the resulting area would yield a building structure with adequate amenities and open spaces for air to flow through.

**7. Building Act of 1999**

The Preamble of this Act provides for disaster-resistant building design and construction standards to make buildings safe from natural disasters like earthquake, fire, floods, among others. Section 4 calls for the formulation and adoption of a building code and implementation of the same with the end in view of improving the quality and safety of each building. Section 8 mandates the categorization of buildings into different classes and the issuance of a building permit prior to construction in the municipal areas.

**8. Local Administration Act of 1971**

The Act designates the Chief District Officer to make an inventory of local, unregistered, open government land and protect the government land from private illegal acquisition. If public lands such as parks, ponds, grass field and others are unlawfully registered, this registration will be cancelled.

**9. 2003 Apartment Ownership Act 1998 Revised Bylaws for Construction**

This Act is issued to facilitate apartment ownership by making house ownership affordable to citizens through joint partnerships with housing and land developers. As provided for in the law, housing companies or developers and land owners may enter into agreements regarding development and ownership of apartments. Approval and permits are obtained from the local government. Ownership cannot be transferred without permission from the joint committee.

**10. 2007 Bylaws for Construction in Kathmandu Valley**

With the enactment of Kathmandu Valley Town Development Act of 1976, a building construction bylaws was formulated and implemented to safeguard life, health and public welfare. It was a framework containing minimum standards and requirements to regulate and control the construction of new buildings in the Valley. The building bylaws was updated in 1993 and in 2007.

The current building construction bylaws cover the rules and regulations on building construction in the following cities, municipalities and VDCs:

- KMC,
- Lalitpur Sub-Metropolitan City,
- Bhaktapur Municipality,
- Madhyapur Thimi Municipality,
- Kirtipur Municipality, and
- adjoining VDCs

According to the Building Bylaws of 2007, KMC is divided into nine zones, listed as follows:

A. Old City zone
   a) Protected Monument sub-zone
   b) Protected sub-zone
   c) Mixed Old Residential sub-zone

B. Residential zone
   a) Business sub-zone
   b) Dense Mixed Residence sub-zone
   c) Other Residential sub-zone
   d) Planned Residential sub-zone

C. Institutional zone
D. Industrial zone
E. Protected zone (park, forest, greenery, open space, historical, cultural and religious areas, etc.)
F. City expansion zone
G. Plane transport zone
H. Airport zone
I. Sports zone

Development controls to regulate the areas include the following:

- maximum ground coverage,
- maximum floor area ratio,
- maximum height of the building,
- maximum number of stories, and
- setback to adjacent plot as well as widths to road approach,

Provision of basement is classified for different zones. Similarly, types of road within the city are classified as circumferential (ring road), highways, arterial road, connector road, feeder road, special road, link road, river corridor, etc. Right of ways and setback for different roads are classified accordingly.

With the enactment of apartment laws, the Building Bylaws had included the rules and regulations to construct apartment buildings as well as group housing units.

**11. Local Self-Governance Regulation of 2001**

The Local Self-Governance Regulation (LSGR) 2001 Municipal planning process highlights the following:

A. Each Municipality should prepare a fiscal year plan for development.

B. While preparing the plan, there should be balanced city development strategy; to regulate urban development, it should be based on land use plan, land pooling, and guided land development programs.
C. Municipalities can take in consultants for the preparation of the plan.
D. Municipalities should concentrate on priority areas while taking into consideration the following :
a) Productive and results-oriented;
b) Improvement in citizens' standard of living;
c) Low-cost and engaging people's participation
d) The use of local resources;
e) Technology-oriented
f) Women and children
g) Environmental sustainability

E. Additionally, plan preparation should consider the following elements:
a) City's geophysical situation, economic activities, and state of natural resources
b) Different sectors balanced estimate and feasibility analysis
c) Indigenous or ethnic groups
d) Plans should be prepared by local people and should concentrate on local resources

F. Each municipality should prepare a base map with city level statistics.
G. Each municipality should prepare feasibility study for the project on the basis of:
1. Project objective;
2. Project beneficiaries and type;
3. Type of project and alternatives;
4. Cost of project;
5. Participation and contribution by users;
6. Environmental considerations;
7. Peoples participation coordination with government and non government organization.

H. City Level Planning can make use of various fund sources such as:
a) Cities own resources
b) Grant from district development committee
c) Grant from the national government
d) Grant/loan from different nongovernment organizations and international development organizations.

**12. Disaster Risk Reduction Mandate**

Upon completion of the proposed risk-sensitive land use plan, KMC shall continue to review and evaluate the risks from natural calamities, as provided for in Section 96(2)(m) of LSGA which mandates local governments to "carry out preventive and relief works to lessen the loss of life and property caused by natural calamity." A hazard assessment is initiated during the preparation of the Resource Map, which according to Section 112 of the LSGA, reflects the situation of the municipal area. Resource Maps include geologic maps, seismic and geotechnical hazard maps, soils map, geomorphologic maps, natural drainage map and soil cover map, among others. These maps, when used together, would indicate the protected areas, areas of high risk, areas fit for building structures, and the city's gross carrying capacity for development.

On the other hand, project feasibility studies, when done in accordance with Section 113 of the LSGA, could help reveal vulnerability of projects, of its environment and of the community it serves to emergencies and disasters, susceptibility to hazards, and the community's capacity to cope with hazards.

The post-completion risk assessment of the proposed land use plan is important "for making the development of the Municipal area balanced and planned" (Section 111(2)), and for making sure, that the projects identified are environmentally sustainable (Section 111(4)(f), LSGA).

The identification of risk could then serve as basis for the preparation of appropriate development and land use policies to help prevent, prepare for or mitigate the impacts of disasters, as mandated in the LSGA.

### 1.3. Institutional Framework for 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. As shown in Fig. 1.1, national ministries have a strong influence on decisions and actions at lower levels. Additional plans and programs direct the development thrust on the ground, such as the Bagmati Authority and Sewerage Plan (BASP) (a high-level authority for Bagmati and Sewerage plan), Bagmati Action Plan (BAP), Integrated Master Plan (IMP) of World Heritage Sites, Bishnumati Corridor Development Plan, Dobikhola Corridor Plan, and Land Development Programme of KVTDC.

This RSLUP for KMC is a product of a series of consultations with several concerned ministries and other national and international institutions involved in urban development and land use planning. The RSLUP also builds on previous and existing plans and programs of the government in DRM as well as outputs of Phase 1 of the KMC RSLUP (e.g. Institutional Framework for Planning in Figure 1.1).

The planning process for the current RSLUP follows the existing planning structures and functions i.e., RSLUP endorsement through the municipal council and consultation with the related ministries and Valley authorities simultaneously. KMC, being a leader of the municipalities, shares this plan, lessons learned and good practices with other municipalities and VDCs in their planning, and as an input to the different existing plans and the programs in their jurisdiction. Thus, the current RSLUP can be considered by other local government units in their development and physical planning processes. Hence, this allows KMC to align RSLUP with national and local-level development thrusts.

There are, however, exceptions to the general hierarchy of ministries and these include politically significant entities such as the KMC, which had already exercised significant autonomy in its development decisions and plan formulation. These plans and decisions may not necessarily be aligned beforehand with KVTDC and a closer cooperation between

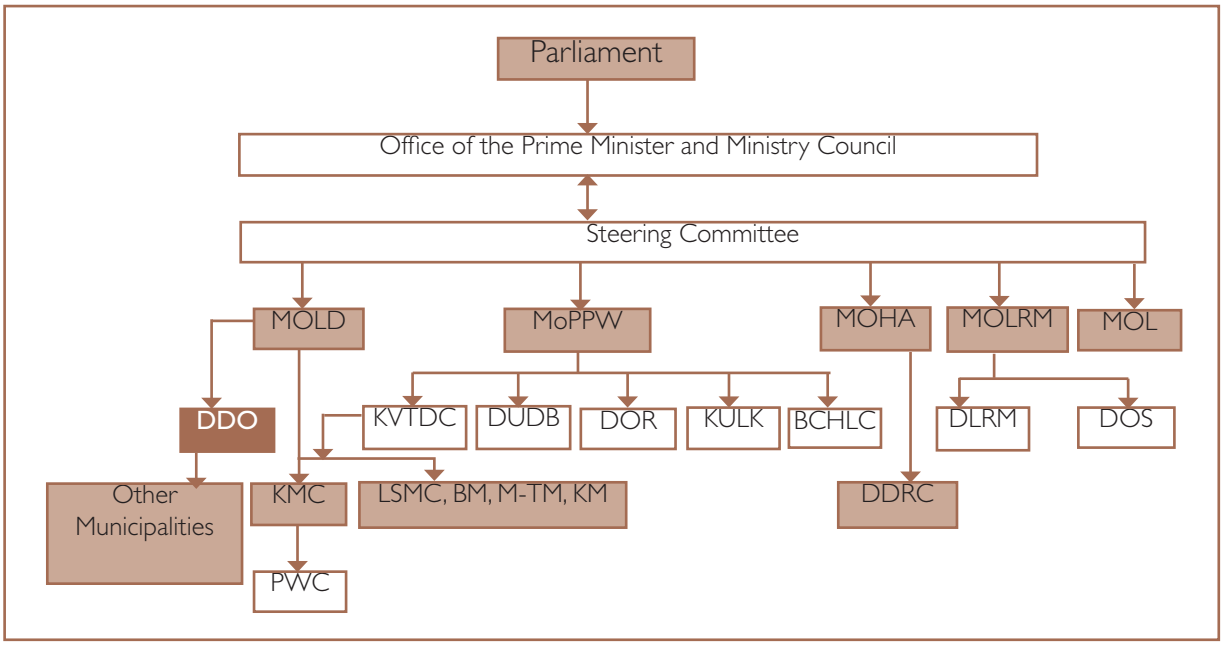



**Figure 1.1 Institutional Framework for Planning, Nepal**
Modified from Source: EMI, 2008

local officials like KMC and KVTDC need to be encouraged and strengthened.

Future planning interventions should consider the current weak horizontal linkages between various ministries, which had previously resulted in uncoordinated and poorly implemented information exchanges and joint development projects; hence, engaging them early on in any project is an important lesson to share.

Horizontal integration of land use plans were found to be very critical since the five municipalities had adjoining boundaries. Moreover, land use issues and urban development did not recognize political boundaries between municipalities, albeit being cross-territorial in nature. Hence, effective horizontal and vertical coordination is a must should land use planning in KMC is to become a model for risk-sensitive land use planning in the whole Valley.

In summary, 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. Institutions involved with settlement development may be seen in Table 1.1. On the other hand Sec. III, subsections 1 and 2 of LSGA provide guidelines in formulating periodic (5-years) and annual (1-year) development plans for the municipal area. Likewise, Section 111 provides the "list of projects that shall be given priority, such as projects that can generate income for the municipality, poverty alleviation projects at the field such as livelihood improvement projects which can be operated with low cost and with people's participation; projects to be operated though local means, resources and skills; projects providing direct benefits to the disadvantaged as well as indigenous groups and children; and projects that can contribute to protect and promote the environment." (Section. 111(4) (a-f))

The above-mentioned priority projects are mirrored in the proposed programs and projects developed during the workshop on Development Thrust and Strategic Planning held on 17-20 September 2009. Unfortunately, the sources of funds to implement them have not been identified. In the preparation and formulation of its annual development plans for the development of municipal area, Section 111 (5) of the LSGA requires the municipality "to obtain guidance and prior estimation of the

resources and means from the GoN, District Development Committee, and other concerned bodies for the coming Fiscal year until the month of March of each year."

The same section of the LSGA provides that "even the Municipality itself shall have to provide guidance on selection of projects and formulation of plans to the different Ward Committees for the formulation of service and development programmes for the forth-coming fiscal year." This requirement is consistent with Section 111 (5) (b) which states that "projects have to be invited from the Ward Committees, consumers' committees, and non-governmental organizations in the Municipal area, and plans have to be formulated on the basis thereof."

Additionally, the LSGA in Section 111 (7) states and reiterates that in formulating annual plans, the following matters have to be taken into account:

1. Directives received from the National Planning Commission and the District Development Committee (which in the case of KMC is represented by KVDTC, establish in 1988) on national development policy;
2. Overall necessities indicated by periodic plans; and
3. Suggestions received from the Ward Committees.

Detailed land use planning is an inherent duty and responsibility of municipalities. However, municipal land use plans should be congruent with the general or regional land use plan prepared by the GoN or through the KVTDC in the case of KMC. This is the "top-down" aspect of the planning process. Moreover, KMC, as the municipality, is required to receive and consider suggestions about projects in the municipal area from the Ward Committees. This is the "bottom-up" component of the planning process.

In order to support the formulation of municipal plans, Section 112 of the LSGA requires the preparation of a resource map, to wit: "Each Municipality shall, for the development of the Municipal area, collect municipal-level objective data and prepare a resource map reflecting the situation of the Municipal Area." This is what KMC has done upon the completion of its Existing Land Use Maps for 2001 and 2006. Several thematic maps were also prepared.

Additionally, the LSGA requires the conduct of project feasibility studies. Section 113 stipulates that "in the course of implementation of municipal projects, the Municipality shall have to undertake or cause to be undertaken feasibility study of the project." The same section enumerated the matters to be set out in a feasibility study.

Table 1.1 Policies and Plans on Land Use
Source: Topical Report 1, EMI, 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<br>• 1988 Urban Development and Conservation Scheme for Greater Kathmandu<br>• 1987 Structural Plan for Kathmandu Valley (UNDP and World Bank funded)<br>• 1984 Physical Development Plan and Programs |
| Districts (Kathmandu, Lalitpur, Bhaktapur,) | Periodic Plans |
| Municipalities (KMC, Bhaktapur, Lalitpur, etc.) | Land Use Zoning (from "As-is" Land Use Maps) |
| Village Development Committees | Village Plans |

## 1.4. Planning Structures, Practices, and Types of Land Use Plans

Several plans had been prepared at the national and the local levels by concerned ministries and KMC over the past decades. However, many of these documents were only incrementally implemented, if at all. Within the last decade,

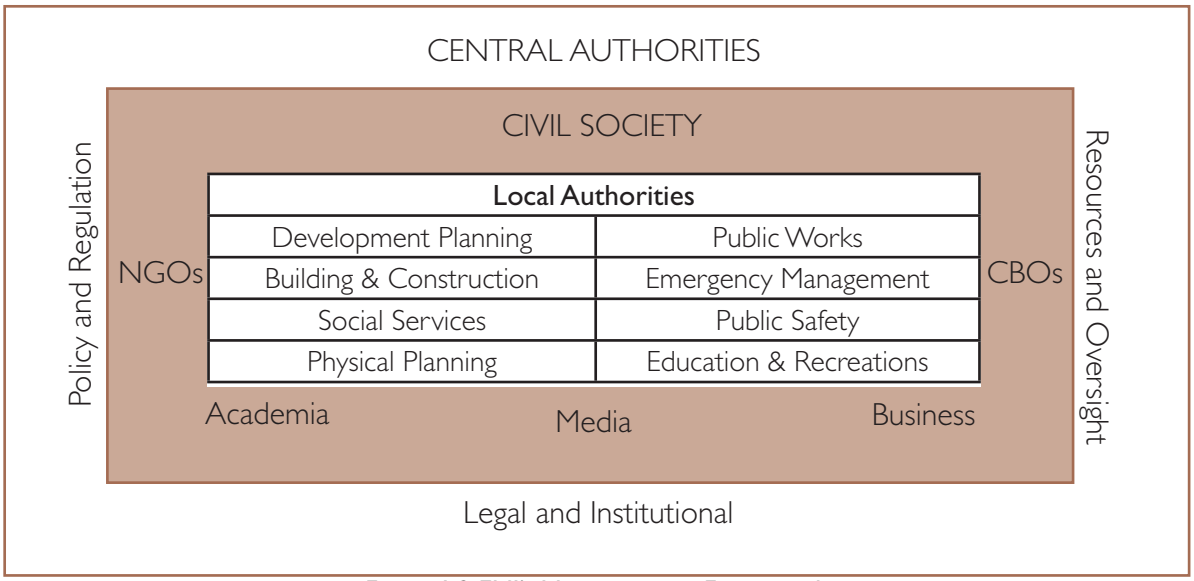



Figure 1.2 EMI's Mainstreaming Framework

GIS mapping had been developed in KMC, making the visual planning easier; however, the data had not been updated and most information were dated in 2001.

## 1.5. Planning Frameworks

This section discusses the different planning frameworks and processes involved in drafting the risk-sensitive land use plan.

### *1.5.1 Mainstreaming DRR in Land Use Planning*

Two important frameworks were used to guide the preparation of risk-sensitive land use plans, namely: the DRR mainstreaming Framework discussed below and the Risk-Sensitive Land Use Planning Framework for KMC described in the next section.

Fig. 1.2 shows the DRR mainstreaming concept developed by EMI to promote the integration of risk reduction measures in local governance, in a way that significant risk reduction occurs at the local level (Buika et. al., 2006). The mainstreaming framework can be highly effective when local authorities, engaged in the normal conduct of their functions, responsibilities, and practices, integrate DRR measures and objectives in various aspects of local governance such as urban planning.

This framework also suggests that DRR can be mainstreamed in local governance by harnessing existing mechanisms, processes, and systems that are already in place and making use of such resources.

In the context of KMC, EMI organized a series of consultation meetings with different units from KMC (the Urban Development Division, Physical Development and Construction Department, Law and Enforcement Divisions of Administration and Organizational Development, Public Health and Social Development Department); the KVTDC, various national-level Ministries (i.e. MoPPW, MOLD and MOHA), and local partners such as NSET. Towards the latter stages, print and broadcast media were also engaged to widen the awareness about the risk-sensitive land use planning project in KMC.

The consensus of the initial investigative work undertaken by EMI in 2005 revealed the need to integrate natural hazard risk information in physical planning. A series of discussions and workshops revealed the following conditions:

- A need to understand and identify, describe implications of natural hazard (i.e. earthquake) risks in Kathmandu City and reduce them through strategies (e.g. road development) and land use approaches (e.g.,

bring to safer places, use of open spaces).

- A need to protect people, public and private property (e.g. heritage sites, institutional and residential buildings), and maintain functions of critical facilities (e.g. hospitals, water systems, public buildings, roads) from earthquake damages and losses. This was highlighted by the 2002 earthquake study for the Valley where estimates of damages and losses under different scenarios were made for the Kathmandu Valley and later evaluated for Kathmandu City-being the center for various functions of the Valley.

- A need to pursue urban renewal strategies and transport strategies to address congestion at the city core and central areas, preserve public structures, squares, and rehabilitate old, deteriorating buildings, redevelop areas as well as to control or delay sprawl towards the periphery with the implementation of building by-laws.

- A need to address the observed fragmentation of land parcels and partitioning of building floor areas in residential areas and the lack of implementation of building codes and by-laws that will help in allocating spaces to improve access, provide easements and maintain a good mix of built up and open areas.

- A need to integrate the needed changes under a risk sensitive planning approach which addresses the risks (natural hazard risks) and their management as an approach for sustainable development of Kathmandu City.

These considerations were further confirmed in Phase 1 of the project (EMI, 2008). However, with the information obtained, an approach was needed on how mainstreaming seismic risk parameters in plans may be done at a metro-wide or city-scale planning level (i.e. KMC) considering the planning limitations and arrangements with higher institutions in Nepal.

The above requirement to incorporate risk assessment in land use plans resulted in identifying the following planning objectives:

a. to identify, describe and understand the hazards and its impacts;
b. to understand the implications of the selected natural hazard risks;
c. to incorporate emergency management improvements;
d. to incorporate/integrate the assessments as development issues and concerns and translate it to planning goals, objectives and targets; and
e. to address the identified risk concerns through available and possible strategies and land use practices to achieve the identified development goals and objectives

The first three objectives were answered by revealing information about the hazards and their impacts. In Phase 1, earthquake concerns were highlighted and these became the basis for preparing the RSLUP. This was not to say that other hazards were any less important, but studies were readily available to reveal the seismic risk information and became logical to integrate them as a first step in the mainstreaming approach. The fourth and fifth objectives were achieved by translating the seismic risk and their management as development concerns and evaluating their implications as part of the land use planning exercise.

Figure 1.3 presents the risk-sensitive land use planning framework for KMC. The components of the framework are explained in the next section.

### *1.5.2 Risk-Sensitive Land Use Planning Framework*

This section explains the components of the Risk-Sensitive Land Use Planning framework shown in Figure 1.3. The framework describes disaster risk assessment, the process of integration in planning, and the plan

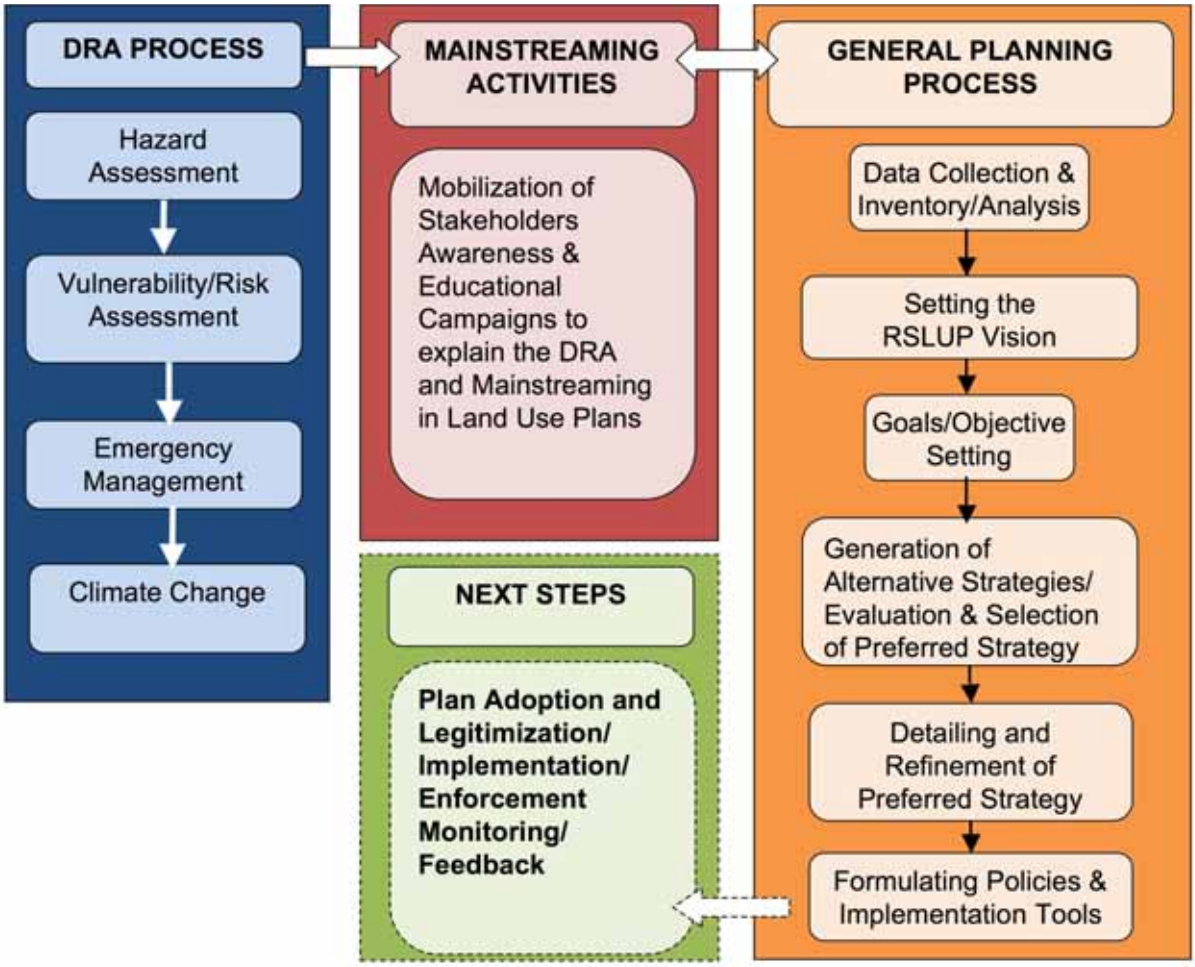



Figure 1.3 Risk Sensitive Land Use Planning Framework for KMC

formulation phases and the implementation stages.

### *1.5.2.1 The Disaster Risk Assessment Process*

The Disaster Risk Assessment (DRA) process entails several steps prior to the integration (or mainstreaming) of risk information in the planning process. It involves an assessment of the following: (a) seismic hazard, (b) the vulnerabilities and risks of different elements (e.g. people, buildings, facilities, activities, etc.) in the city and the (c) requirements for emergency management (e.g. open spaces, open access, access routes, etc.)

*A. Obtaining the Risk Information*

Information on seismic hazards, vulnerabilities and risk estimates were obtained from an earlier study entitled "Earthquake Disaster Mitigation in the Kathmandu Valley" in 2002. The parameters considered are shown and briefly described in Table 1.2. In Phase 1 of the project, vulnerability and risk maps specific for Kathmandu City were prepared. These sets of information formed the bases for determining the implications on the future development and land use of KMC.

The risk assessment relies on the following parameters shown in Table 1.2 as provided in the 2002 earthquake study by JICA.

It may be possible to include in the risk assessment different types of vulnerability analysis such as socio-economic vulnerability and risk analysis related to other consequences (e.g. indirect damages and losses, i.e. monetary loss, loss of function of specific sectors), effects

**Table 1.2 Risk Information Used in the Study**
Items Parameter description Use of Assessment in Plan

| Items | Parameter description | Use of Assessment in Plan |
|---|---|---|
| hazard | Earthquake ground shaking | Exposure of the city to different degrees of possible damage using MMI intensities |
| | Earthquake potential lique-faction | Exposure of structures are high if located above these areas and are tagged as moderate or high risk to these structures |
| | Earthquake fault lines | Nearness to a fault would contribute to greater risk to damage, depending on vulnerabilities of the building and site conditions |
| Vulnerabilities | Number/ density of popula-tion | Indicative of the persons affected, or potential for injury and potential for loss of human lives<br><br>Also indicative of intensity of use in an area or the volume of traffic possibly to be affected by the hazard. |
| | Building materials pre-dominantly in use during the earthquake study. | The estimated damage and collapse of buildings are very much related to the capacity of the building to resist strong ground shaking. Using risk scales and color scales. |
| | Lifelines such as roads and bridges in hazard prone areas | Indicated the breaks in these links and crossings which would indicate road closures, non-operation of utilities which may impact emergency or response. |
| | Exposure of critical infra-structures | This indicates threat to hospitals and schools which may require further evaluation with new inventory. |
| | Density of structures based on building foot prints and closeness to each other | Provides intensity of use of built up areas. The lack of proper spaces for easements, foot and vehicular access and access to open areas may provide indication of dangerous areas arising from structural collapse; hence, reviews and studies need to be made |
| | Exposure in terms of num-ber of establishments in high risk areas | Indicative of the concentration and specialization of the city being threatened. |
| Risk estimates | Injury and loss of life | The loss of life is highly correlated to severe building damage and collapse. The building collapse is also highly correlated to the materials used and structural make-up of the building.<br><br>Where greater number of affected population result, the injury and loss of life may similarly increase. |

from climate change and climate variability. Understanding the implications of the risk assessment to development requires the collective experiences and expertise of the planners, scientific experts and stakeholders in different sectors to address these threats. To treat them as significant or not, or whether they are impediments to development and progress, will require further evaluation.

*B. Emergency Management*

In view of the spatial requirements for emergencies, information on possible escape routes at the Core area, temporary sites for evacuation, and locations of critical infrastructures (e.g. hospitals, water sources) were mapped and provided. The basic information on critical infrastructures, routes, temporary sites were obtained from the JICA study (2002) and remapped using the aerial images of Nepal from Google Earth. This revealed indicative movements and possible evacuation locations. However, the information will still require further validation as to suitability in ground conditions.

### *1.5.2.2 The Mainstreaming Activities*

Mainstreaming activities pertain to the various activities in the general planning process which aim to build on existing capabilities to initiate land use planning and integrate risk information in the plan and in the decision processes leading to the adoption of the land use plan. These activities generally involved the mobilization of stakeholders and promotion of educational campaigns about the following: disaster risks, role of land use planning in sustainable development, and the activities for mainstreaming. Theoretically, the mainstreaming activities may be taken as being embedded within the planning process, assuming that an organization is available and capable of preparing a land use plan. The main difficulties, which are addressed by the mainstreaming activities, lie in explaining the elements of the disaster risks, how to use the information for planning, determining its implications to development and spatial plans and taking the necessary strategies for risk reduction. These apparently are the difficult areas, which traditional planning may need to be enhanced by said mainstreaming activities. It is worth mentioning that it was through these mainstreaming activities that significant work was made towards the finalization of the document.

*A. Mobilization of stakeholders*

The first step includes the involvement, and mobilization of different organizations representing various sectoral task groups, (e.g. from MOLD, MoPPW, KMC, NSET and EMI) and defining and allocating their respective tasks and functions. This step also included the conduct of orientation seminars. The orientation was attended by officials and representatives of KMC, KVTDC, concerned national ministries, hazard agency and civil society. The objective was to familiarize the constituents with the objectives, processes, and importance of the planning project to the city, as well as to seek their support and involvement. Participation and ownership building were stressed as part of the goals of the project.

A collaborative approach was selected to ensure full ownership of the project by KMC and other local partners and build the capacity within local professionals. The engagement of the partners in the project and their integration in a single team was key to the success of the project. This unified Project Working Committee had the following Terms of Reference:

- To initiate the land use planning process, EMI organized a series of consultation meetings within KMC, leading to the creation of a Project Working Committee (PWC) comprising of different units of KMC, KVTDC, the various Ministries (i.e. MoPPW, MOLD, and MOHA), NSET and EMI. The PWC served as the technical, managerial, logistical and administrative unit of the project, as well as the consultation and coordination agent for the different activities needed for the RSLUP formulation. See figure 1.4

- Each member of the team had specific roles and responsibilities and contributed to the project according to his/her own expertise. Leadership in the project was shared between partners, with EMI filling the technical and managerial gap, while local partners undertook most of the data collection, consultations, coordination and validation.

- The mobilization of all the resources among the partners enabled a significant scaling up of the outcome of the project as well as the possibility to overcome many hurdles during its execution

Through the PWC, several key points were identified as crucial in crafting the plan, namely:

a. incorporation of existing land use maps and other available land use information (e.g., development and master plans, the risk maps resulting from the JICA funded study in 2002, and the findings and results of Phase 1);
b. development of protocols to improve

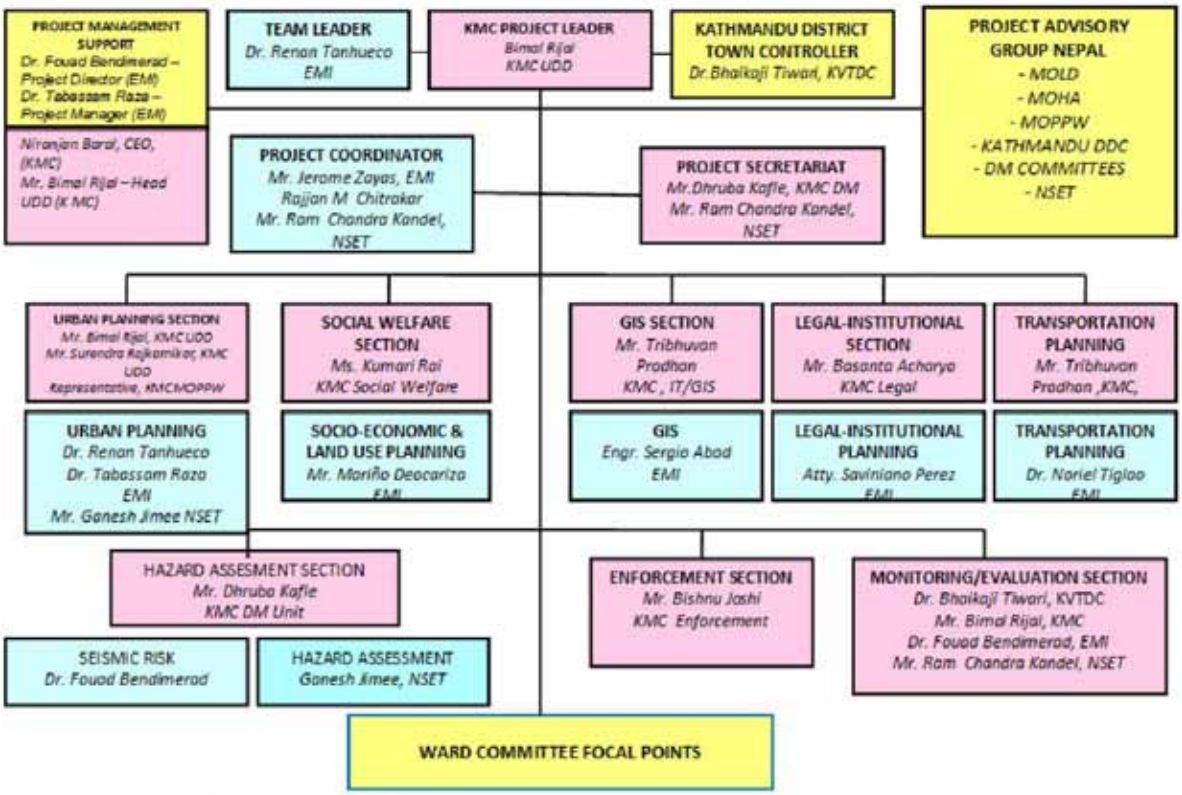



Figure 1.4 Organization of the Project Working Committee

inter-institutional coordination, complementing strengths and weaknesses of the PWC members;

c. provision of a framework for mainstreaming DRR in land use plan formulation;
d. identification and definition of programs aimed at reducing physical and social vulnerability; and
e. promotion of awareness and gaining support on the importance of practicing risk sensitive land use planning. These initial series of activities provided for the project scope and framework for mainstreaming DRR in KMC.

Similar project-related outputs were prepared by KMC through the PWC, complementing this RSLUP, such as the creation of the Disaster Risk Management and Citizen Safety (DRMCS) Unit and related Emergency Operations Plan developed under Project Output 1.2 of this project, which provide for the institutionalization of the emergency management and preparedness units in KMC and further strengthen the ownership process by local institutions.

*B. Awareness and educational campaigns and explaining the risk information*

Previous and current awareness campaigns undertaken by KMC, NSET and the Ministry of Education, together with the series of stakeholder workshops conducted by EMI from 2005 to 2007 to develop the local DRMMP and its corresponding IWOs, were also helpful in explaining the earthquake hazards and their threats among various stakeholders. Though the educational campaigns had limited coverage, they helped in contextualizing these risks as possible impediments to individual and collective goals and objectives of different sectors.

The planning activities and field investigations conducted by EMI have highlighted the importance of including seismic hazard assessment, vulnerability assessment, information on damage to infrastructure and utilities, and loss of life and property information in planning Kathmandu City in order to initiate risk reduction through the existing processes. To provide the initial

inputs, risk assessment results from JICA's Valley-wide earthquake study were used. The spatial information of earthquake risks in the Kathmandu Valley was remapped and reviewed in this planning exercise through a series of workshops, with NSET providing support and validations as well as providing updates related to their earthquake risk reduction activities in Kathmandu City (e.g., the community-based and institutional-based preparedness and mitigation programs such as ward-level preparedness, school safety awareness, retrofit programs, mason training programs, and the multinational PEER program, among others). Risk mapping appeared as a good starting activity for the spatial screening of environmental constraints and for guiding land use to achieve sustainable development.

The implications of these assessments such as the disaster management issues and concerns identified were given possible and preferred solutions, while taking into account the limited information and uncertainties involved. Strategies were formulated in order to address these coupled problems of environmental constraints and infrastructure and land development, among others. Workshops were held for KMC officials to validate and evaluate the risk maps and the information provided in previous studies.

In workshop meetings in Manila with KMC officials in late September 2009, the risk maps were used as among the parameters to develop scenarios and implications to current development concerns. One important activity which EMI accomplished with KMC was to form the linkages and relationships between the planning environment (social, economic, physical and environmental) and the causes and effects of current development and land use problems in Kathmandu City. Hazard, vulnerability, risk information and emergency management concerns which were previously prepared in Phase 1 (DRA information, Table 1.2) were similarly presented in the form of texts, graphs, tables and maps to facilitate the discussion, that is, its significance, its implications to present problems and concerns and future decisions. This mainly formed the content for mainstreaming activities in the land use plan shown in Figure 1.5. The implications to development thrusts, existing and future land use, as well as their management through different strategies of urban renewal and development control were discussed and documented.

Towards the latter stages of the land use planning exercise, an awareness campaign structure was developed by PWC to sensitize the population and relevant institutions on RSLUP, and encourage participation of communities. The structure identified the key audiences and corresponding communication objectives, message to be reached, medium of communication, strategies and expected output of the campaign. The focus persons for each audience were chosen and expected outputs defined by the PWC members. Table 1.3 shows the details of the awareness campaign structure.

The two last field investigations in KMC were conducted by the Land Use Planning (LUP) Team from EMI to implement the strategies and achieve the objectives of the awareness campaign. A series of consultations, meetings, interviews and workshops were carried out from the beginning of the project to the latest in December, 2009.

Highlights of the consultations and interviews conducted during the first field investigation on 1-3 November 2009 are shown below:

1. *Mr. Reshmi Raj Pandey, Undersecretary, and Mr. Dinesh Thapaliya, Joint Secretary, MoLD.* Mr. Pandey appreciated the presentation and said that it is really a good initiation and if we get the realities of Land use planning in KMC it would be easy to replicate later in other municipalities as well. The involvement of KMC alone is not enough for the conversion of the document to become "doable" and hence, EMI needs other representatives as well for support and effective implementation of RSLUP.
2. *Mr. Shambhu K.C., Member Secretary, Dr. Bhaikaji Tiwari, Town Controller, Mr. Dan*

Table 1.3 Awareness Campaign Structure

| Key Audience | Communication objective | Message | Channels/medium of communication | Strategy | Focus Person | Expected output |
|---|---|---|---|---|---|---|
| 1.Ministries and related agencies i.e., MoLD, MoHA, MoPPW , KVDTC, DUDBC | To secure buy-in | "We would like to partner with you" | Progress report/update from the PWC; Consultation with the Individual ministries and related agencies I, Distribute IEC material , re-visit EM website on DKKV-FFO project to highlight KMC ownership of project | Advocacy through ministry of MoPPW Hold half day workshop for MoPPW personnel Consultation meeting with KVTDC may be they have their alternatives - getting their inputs Consultation meeting with ministries and related agencies to get their inputs in RSLUP | Bimal Rijal, KMC | Buy-in |
| CEO, KMC | To act as Coordinator and build support to the plan (advocacy champion) | "This is our plan" | Progress report/update from the PWC; re-visit EMI website on DKKV-FFO project to highlight KMC ownership of project | Request CEO to provide link to EMI website on the KMC website, and in other channels | Bimal Rijal, KMC | Get commitment from the CEO to advocate and support the Plan. |
| Metro Council i.e., Ward chairpersons, ward members and nominated members, Metro Board i.e., Ward Chairpersons and nominated members. | To Get the social acceptability and communicate KMC Vision with board and Council | "KMC is preparing 10 year RSLUP" | Tarpaulin/flex print (KMC), Small pamphlets, Stakeholder consultation meeting/ social acceptance of the plan. | Consultation meetings | Rai, Chitrakar, Kafle, Rajkarnikar, NSET and Jerome Zayas | Get social acceptability |
| City Planning Commission; Department heads i.e., UDD, Legislators (metropolitan council), Ward Chairpersons and two nominated members | To Increase participation in the RSLUP process and Develop ownership of project | "This is our plan" | Presentation and distribution of Pamphlets | Periodic meeting | Kafle, Chitrakar | |
| International Donors/ Development Partners | To secure future funding for RSLUP implementation | "We would like to partner with you" | Present the RSLUP to get their inputs and see if it match with other ongoing or proposed projects | Consultation meetings and Include them in mailing list of EMI's regular newsletters | CEO's of KMC and EMI with the support of NSET | Get financial support to Implement next Phase of the project |
| General Public/ Communities | Awareness campaign regarding KMC RSLUP | "Safe Kathmandu City" | T.V Channel Hamro Kathmandu and Nepal mandal, and Radio Programme Metro FM 96.4 and through the Website | Interview of PCW Team by media personnel | Kafle and Rai | To achieve the objective. |

*Bahadur Malla, Mr. Ram Prasad Shrestha, and Mr. Kamal Prasad Bhattarai, KVTDC.* Mr. Shambhu K.C. reminded the PWC about KVTDC's overall policy framework that aims at strengthening all three major cities within Kathmandu Valley. In such a way, according to Mr. K.C., KVTDC is concerned with the overall development of the valley and not only KMC. In appreciation of the fact the KMC has proposed to shift the core population to periphery, he adds that KVTDC has also done similar study.

3. *Mr. Suresh P. Acharya,Joint Secretary, MoPPW.* Mr. Acharya said that the presentation provided very important message and he wished to be in further contact with KMC, NSET and EMI. Also he suggested for organizing a half day workshop on DRR which as he hopes would bring a fruitful result.
4. *Dr. Mahendra Subba, Deputy Director General, DUDBC.* Showing more concern on zoning, he also suggested coming up with the environmental threshold. Disagreeing with strict separation of land use and zones, he said the very purpose of zoning should be not to have undesired use of the land with environmental threshold values. He then asked, "If zoning did not worked in 1960 why should we work for it in 2010?"

Moreover, to raise community awareness and support to the RSLUP, a local TV channel, Hamro Kathmandu, was tapped. A channel representative interviewed members of the PWC who highlighted salient features of the project, and stressed the significance of the project to a safe and sustainable development of Kathmandu.

Key personnel of development partners, namely, Dr. Horst Matthaus, Coordinator, Governance and Civil Society from GTZ; Mr. Sourab Rana, Program Officer from JICA; and Mr. Nogendra Sapkota, Social and Environment Officer and Mr. David Irwin, Consultant for the Kathmandu Valley Sustainable Urban Transport Project from ADB were briefed about the project.

A follow-up field investigation was undertaken by EMI on 13-18 December 2009 with the following objectives: (1) to secure commitment of stakeholders for the RSLUP and build partnerships, (2) to take part in ongoing awareness campaign, and (3) to explore possible funding for future RSLUP implementation. The following consultations and meetings were conducted by the PWC during the mission:

1. On 13 December, the EMI team participated in a Ward-level Workshop to generate awareness on the project. KMC Officials and NSET staff conducted much of the meeting in Nepali.
2. On 14 December, a meeting with Mr. Devendra Dongol, newly appointed head of KMC's UDD, was held. Mr. Dongol assured his full support in implementing the RSLUP.
3. On 14 December, a meeting with key stakeholders from KMC, Tribhuvan University of Nepal, United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA), District Disaster Response Team (DDRT) of the Nepal Red Cross Society, District Development Committee of Kathmandu, EMI-KMC and NSET was held to get inputs and comments on the first draft of the RSLUP and Emergency Operations Plan (EOP). It was concluded that the RSLUP and EOP process be extended to the Valley and to resolve shared problems with other municipalities such as those relating to traffic congestion and seismic risks.
4. On 15 December, PWC members including Mr. Jim Buika, EMI, met with Mr. Ganesh Rai, newly appointed Chief Executive Officer of KMC to discuss the next steps to be taken towards endorsement of RSLUP to higher authorities. Mr. Rai guaranteed that on behalf of KMC, he is ready to take any step for implementing the RSLUP and EOP.
5. On 15 December, a meeting with German Embassy Counsellor (Development), Mr. Udo Weber was held. The possibilities of GTZ providing technical assistance and/or continuation of the project by the German

government were suggested in the meeting.

6. On 15 December, a meeting with Mr. George Murray, Disaster Readiness and Response Advisor and Mr. Ram Prasad Luetel, National Disaster Response Advisor from UNOCHA was held. Mr Murray expressed concern about strategically locating new fire stations within KMC to reinforce the existing facilities
7. On 16 December, a meeting with Dr. Horst Matthäus, Coordinator, Governance and Civil Society from the German Technical Cooperation (GTZ) was held. Dr. Matth‰us agreed that the work was very relevant to Kathmandu City, He expressed interest in extending the work to the Valley level.

### *1.5.3.3 The General Planning Process*

*A. Data Collection, Inventory and Analysis*

Characterization of the city involved gathering, collating, and processing information necessary to provide a clear picture of the city. The information generated was presented in the form of statistics as well as thematic maps. This collective effort of the PWC culminated in the drafting of the KMC Sectoral Profile.

The Sectoral Profile was used as a major reference for the analysis of the current situation in KMC. This activity was done by the PWC through a series of consultation meetings and workshops among its members.

During these meetings, it was realized that some necessary information was still needed to complete the Sectoral Profile in order to analyze and to assess the gaps between what is desired in the vision and what is happening in Kathmandu City. Through carefully designed workshops and by engaging KMC in each of the step of the general planning process, many planning assumptions and data gaps were filled towards the completion of the Sectoral Profile.

Limited field inspections as to the conditions of buildings, intensity of land use, and appropriateness of open spaces were made by NSET and KMC, in order to validate impressions that the vulnerabilities continue to exist, and possibly, have increased in the absence or as a result of piecemeal interventions. Due to resource constraints for conducting a full study, seismic risk analysis and risk analysis of other hazards relied on previous assessments. Hence, future updated assessments will help inform decision-makers, planners and affected communities to take specific measures to reduce these risks.

The outputs of these analyses were discussed among the PWC, other KMC officials, and later with other agencies and organizations such as KVTDC and MOLD.
The principal output of the sectoral and land use analysis workshops was the development of spatial and alternative development scenarios (or options), which provided the bases for development thrusts, land use strategies and policy options.

*B. Setting the RSLUP Vision*

Crafting the RSLUP vision statement for KMC made use of the vision outputs developed for the KMC in 2001. The RSLUP vision statement was crafted with the consideration of disaster risk and their management through a visioning workshop held in July 2009 and was then broken down into its component elements; each element was given a set of descriptors (i.e. words and phrases that signify the desired quality of the future) city population, the local economy, the natural and built environment, and the local leadership (See Chapter 2)

*C. Formulation of Goals, Objectives and Strategies*

The descriptors guided the formulation of goals and objectives developed from the analysis of the development problems, issues and concerns. The goals, objectives provide for the long to medium term requirements to achieve sustainable development of Kathmandu City. The strategies provide for the approaches to

achieve the desired goals and objectives.

*D. Generation and evaluation of alternative strategies*

Generation of alternative spatial strategies is a major activity in the crafting of RSLUP. The spatial strategy is the form or pattern of physical development of the city that will contribute to the realization of the long-term vision. Each form that is generated is envisioned to establish a sustainable balance between the built and natural environment with considerations of natural hazards, risks and their possible management. This is to ensure the following: a) that areas ought to be preserved in their open character, are not built over; b) that the built environment is directed into those areas that are relatively free from hazards; and (c) that the type, size and intensity of development are consistent with the capability of environmental resources. (Serote, 2004)

Evaluation of the alternative spatial strategies to determine the advantages and disadvantages of each strategy was done by the PWC. To support the land use strategies, the development sectors represented in the PWC prepared their initial sectoral strategies and programs following a few sequential steps described briefly below.

1. Sectoral development issues and concerns. The sectoral profile, thematic maps, earthquake hazard risks and other data outputs were used to describe the development issues and concerns. Previous issues, problems and concerns that resurfaced and documented in studies prepared by KMC, were reviewed, validated, prioritized and formed the various sectoral issues and concerns in the RSLUP. Their implications and their possible solutions were then discussed in workshops.

2. Sectoral development objectives and targets. These were also derived from the vision statement. The development goals and targets are framed for ten years only(i.e., 2010-2020). A useful input to this activity was the result of the problem-objective tree analysis earlier undertaken in July 2009.

3. Sectoral strategies and policies. These comprise the principles and values that guide the formulation and implementation of proposed sectoral programs and projects. They were derived from various sources, mainly from previous development literature, from higher level plans, and from the KMC PWC analysis and interpretation of the following: i) the spatial trends of settlement expansion, ii) economic concentration and specialization and iii) environmental concerns. Spatial content or implications of the different development thrusts were included in the RSLUP and into the zoning policies, ordinance and other proposed local legislation.

4. Sectoral Programs and Projects. Programs and projects necessary to realize the objectives and achieve the targets of the sectors and subsectors were identified and listed in the RSLUP.

The outputs of this stage, however, are still subject to public consultation. It is expected that the public consultation will result in a consensus on the final vision statement and the preferred spatial strategy.

*E. Detailing of preferred risk-sensitive land use plan*

The preferred spatial strategy served as a takeoff point for the preparation of the draft RSLUP. The main activities included identifying and mapping the general land use policy areas, namely: settlements, protection, production and infrastructure. The preferred urban form is also reflected in the land use plan.

In drafting the RSLUP, the existing plans of the Valley and the Building Bylaws of 2007, the river development plans, and road development plans provided the bases for the inclusion of higher level plans and projects in the Kathmandu City land use plan. Reviews and recommendations were made to determine whether there remain useful features that can be

retained, modified or improved upon. Similarly, based on the available quality of information, a draft zoning framework was reviewed and accordingly, some parts were amended or retained.

*F. Formulating policies and implementation tools*

The other major activities consisted of reviewing existing relevant national laws, identifying needed land use policies, and drafting the initial zoning policies and ordinances.

New local legislation. Some sectoral policies and programs cannot be fully implemented by means of development projects alone. They may require enactment of possible regulatory measures by the legislative council or by the provision of certain incentives to attract private investments or partnerships.

Drafting the Zoning Ordinance, which basically translates the risk-sensitive land use plan into a implementing tool, was based on the preferred land use plan and initial land use policy frameworks. However, the zoning provided here does not yet contain detailed information on zone boundaries needed for the creation of a zoning map.

*G. Adoption and plan implementation activities*

Towards the finalization of the plan, the PWC identified several follow-on activities (Adoption, implementation, enforcement, monitoring, feedback) in order for the RSLUP to become an effective document in guiding future development in the city.

a. Legal and Institutional Framework. For the RSLUP to be useful at this point, KMC needs to endorse and formally introduce it to relevant agencies of the government for adoption and implementation. KMC can initiate actions that will seek endorsement from GoN through the various agencies (i.e. KVTDC, MOLD, MOHA and MoPPW). This task can be structured around a special inter-governmental committee that involved these and other relevant agencies with support from the PWC. While various programs, projects and activities are implemented by different agencies, the role of KMC, KVTDC, MOHA and MoPPW in the project development, implementation and enforcement would be explicitly clarified along with the roles of donors and development partners
b. Advocacy Campaign. KMC with the support of national agencies and other relevant stakeholders should continue with its advocacy (e.g. IEC) on acceptance, support and implementation of the strategies and provisions of the RSLUP
c. Capacity Building. through training of professionals, including planners, engineers, architects, developers and others should be undertaken to build the skilled resources for ownership and competent implementation of the RSLUP, and for future refinements and updates.
d. Development of Performance Indicators. To benchmark current status and measure performance in implementation of RSLUP, performance indicators will be developed and tested with pilot application in KMC.

### 1.6. Tasks and Activities

Based on the foregoing, the following tasks were identified to develop the RSLUP:

a. Incorporate existing land use maps of 2007 developed by KVDTC and the results of the earthquake scenario risk maps developed by the JICA-funded study of 2002, and its related DRR recommendations into a comprehensive set of land use maps that incorporate social and physical vulnerability and risk parameters. This implies that the RSLUP should explicitly address DRR goals and improvements in emergency management in the land use plan;
b. Draft a zoning ordinance based on the

RSLUP that would enable KMC to control future development in a risk-adverse and sustainable way. Zoning ordinance is a key legal instrument for controlling land use in an urban setting;

c. Develop protocols to improve inter-institutional coordination among concerned national agencies, KMC authorities and KVTDC;
d. Strengthen of local institutions through the creation of an ad-hoc structure and protocol between KMC as well as through legal instruments necessary to support such interventions. This also includes inter-institutional coordination between national and local levels of government;
e. Expand the capacity of PWC through related workshops in Manila and Kathmandu. This activity ensures that in the long run, PWC will have technical capacity to develop and revise the RSLUP with minimum assistance from external experts;
f. Provide social and economic actions aimed at reducing social vulnerability of the most vulnerable population within Kathmandu; and
g. Structure an awareness campaign to sensitize population and institutions on the importance of practicing risk sensitive land use planning in order to protect resources and the environment.

### 1.7. Peer Review

This RSLUP was later subjected to an external peer review to evaluate and provide recommendations. The objectives of the review were as follows:

a. Review the conceptual framework for risk-sensitive land use planning and provide comments to operationalize the framework in the context of KMC based on the situational analysis done by the PWC;
b. Review the KMC updated Sectoral Profile in order to identify the gaps in the data that may have significant impact on the land use planning of the KMC;
c. Review the goals and objectives of the RSLUP vis-‡-vis alternative spatial strategies to check if the strategies are aligned with goals and objectives of the planning;
d. Review the evaluation and selection process in determining the preferred spatial strategy; and
e. Review the draft KMC RSLUP and its corresponding model zoning ordinance to review and evaluate the:
    i. Overall relevance of the data used, methodology applied, and conceptual framework implemented;
    ii. Applicability in term of the document's ease of use by KMC planners; and
    iii. Overall content to insure that it is in line acceptable land use planning practice.
    iv. The report from the external peer reviewer is attached as Annex A of this document.

### 1.8. Outputs

The deliverables under PWO 1.1 of the FFO project are as follows:

- Sectoral Profile of KMC;
- Risk-Sensitive Land Use Plan 2020 (10 years); and
- Draft Zoning Ordinance Framework (10 years)

Sectoral Profile. The Sectoral Profile is a comprehensive set of information about Kathmandu City organized under five development sectors, namely, social, economic, infrastructure, institutional and environmental. It contains the latest data available presented with minimum of analysis so that the data can serve as a general reference and can be utilized by a wide range of readers for various purposes. To the extent possible, the data are presented in historical sequence and are aggregated or disaggregated in different spatial scales or geo-political units. This three-dimensional display

of information will allow readers to form a more concrete picture of the city. The Profile served as the principal data base for all the plans that were produced in this project. Section 1.11 provides a summary of the Sectoral Profile.

Risk-Sensitive Land Use Plan. The RSLUP serve as the basis for prescribing reasonable limits and restraints on the use of property within the city jurisdiction, for regulating subdivision developments, and for reclassifying agricultural lands into non-agricultural uses. The RSLUP covers the entire territorial jurisdiction of the city. The authority to plan and manage these latter areas is shared between KMC and the national government.

Zoning Ordinance. The principal instrument for enforcing the locational policies and performance standards of the RSLUP is the zoning ordinance. Currently, the RSLUP remains an indicative plan with only persuasive force and effect and people can afford to ignore it. Once the zoning ordinance is enacted, however, the right of property owners to develop their property is transferred from the individual to society and everyone who wants to develop his/her land must seek permission or clearance from the local government.

### 1.9. Limitations of the Plan

The preparation of this RSLUP has been limited by a number of factors. First, the plan relied largely on secondary information from previous studies by KMC, KVTDC and government ministries. Updating the socio-economic and physical information and related field verification were limited by the few resources and limited funding. One major difficulty was to rely on risk assessment results prepared in 2002, which focused on earthquakes. Data on other hazards (e.g., flood, fire), were minimal. Second, the implications of on-going projects (e.g. ongoing riverside development, proposed parking, new roads) by development agencies were less studied and written about in this RSLUP. Third, while the report has come up with an initial list of proposed programs, projects and activities (PPAs) in the different development sectors; the information on the financial performance of KMC, as well as, the potential sources of funding for various projects were barely discussed and reviewed due to limitations of budget and time. Lastly, the engagement of national and international agencies (beyond KMC and NSET), as well as the awareness campaigns, advocacy, and capacity building efforts, have also been limited. Given these, this RSLUP should be treated as a working document subject to further refinements in future planning activities.

Towards the preparation of the plan, the risk assessment in the Kathmandu Valley earthquake study of 2002 was used to come up with discussion points on hazard assessment, building vulnerabilities and in evaluating their implications to the spatial plans.

The identification, description, and analysis of various development issues, and the corresponding goals, objectives, targets, and strategies to be achieved in the next decade were then prepared. However, sectoral development plans were not prepared at the outset as these required further discussions and participatory processes, which the current land use planning cannot accommodate. However, emphasis was given to the most pressing concerns of each sector, described briefly below.

Social development. Issues and concerns on the state of well-being of the local population and social services such as health, education, welfare, housing and the like were identified. Questions of equity and social justice and gender sensitivity were partly discussed in this sector. Programs and projects in this sector are "soft" non-infrastructure type.

Economic development. The economic development concerns embody KMC's intentions to create a favorable climate for private investments through a combination of policies and public investments, necessary to enable private investments to flourish and, ultimately, assure the residents of steady supply of goods and services and of jobs and

household income.

Physical and land use. This component deals with the hazard and risk sensitive infrastructure building program and the land development, acquisition required as right-of-way for easements of public facilities. It contains the physical development strategies such as urban renewal or redevelopment schemes for inner city areas, opening up new urban expansion areas in the urban fringe, or development of new growth centers in conformity with the chosen spatial strategy.

Environmental management. This embodies the strategies, programs for maintaining cleanliness of air, water and land resources and rehabilitating or preserving the quality of natural resources to enable them to support the requirements of economic development and ecological balance across generations.

Institutional development. This focuses on strengthening the capability of the local government bureaucracy as well as elected officials to plan and manage their territory and serve their constituency.

### 1.10. Contents of the RSLUP

This RSLUP consists of five chapters arranged logically as follows:

**Chapter 1** provides a brief introduction to the RSLUP and other related plans prepared at different levels including KMC, as mandated under the LSGA. The chapter also focuses on the approach and methodology applied in the planning of KMC.

**Chapter 2** provides a summary of the geography, the hazards of the place, the socio-economic character of Kathmandu City. It draws information mainly from the KMC Sectoral Profile to provide the initial context of the planning.

**Chapter 3** presents the outputs of various stakeholders in the RSLUP visioning exercise held in July 2009 in Kathmandu City.

**Chapter 4** summarizes the sectoral and spatial constraints that must be overcome and opportunities that could be taken advantage of in order to bring KMC closer to the realization of its vision. Further, the chapter also presents the information on earthquake risk and its impacts, represented by a potential M8.0 Mid-Nepal Earthquake which would produce MMI[2] VII and greater damages in Kathmandu Valley.

**Chapter 5** discusses the preferred urban form as the organizing concept for guiding the physical growth of the city.

**Chapter 6** presents the land use plan and the policy framework for the regulation of future land use activities consistent with the chosen spatial strategy pursuant to national and other higher level policies and in accordance with the residents' vision for their city.

**Chapter 7** details the framework of the zoning ordinance to accompany the RSLUP. Much of the material is drawn from the KVTDC Building Bylaws of 2007. Other annexes are also included for completeness.

**Chapter 8** provides conclusion and recommendations for the extension of the RSLUP to include the whole Kathmandu Valley and the completion of this preliminary RSLUP into a Comprehensive RSLUP.

### 1.11 Sectoral Profile of Kathmandu City

The KMC Sectoral Profile 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 uses. It gives 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 summary of the Sectoral Profile is provided in Table 1.4 below. The detail study of the sectoral profile is available as a separate report titled, "Sectoral Profile Kathmandu Metropolitan City, Nepal."

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 Kathmandu. 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 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, KVTDC, MoHA, MoLD, MoPPW, Department of Roads, Department of Transport and Traffic Management, and NSET, as well as international organizations such as JICA, GTZ, UDLE and CDIA, among others. The list of data collected and their corresponding sources is provided in Annex B.

Table 1.4 Summary of KMC Sectoral Profile

| CHAPTER | CONTENTS |
|---|---|
| Chapter 1. Introduction and Background<br>Provides a brief introduction about the document and a short narrative of Kathmandu City, its geography and history. | • Geography of the area<br>• Historical background of the city |
| Chapter 2. Physical Environment<br>Presents information on the natural physical environment or Physical determinants of the city to be considered in risk sensitive land use planning.<br><br>Highlights: Kathmandu has suffered damage due to earthquake several times. There are several faults in the 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. | • Location<br>• Land area<br>• Topography<br>• Climate<br>• Geology<br>• Natural hazards Identification |
| Chapter 3. Population<br>Discusses the people of Kathmandu and the key features and trends of the city's growing population.<br><br>Highlights: 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 and reduce their capacity to respond, cope with the disruption of various functions and the destruction of physical assets. | • Population size and annual growth<br>• Population distribution and density<br>• Household population and size<br>• Population by age and sex<br>• Population by caste/ethnicity<br>• Migration<br>• Women-headed household<br>• People with disability<br>• Situational analysis<br>• Challenges and opportunities |

| CHAPTER | CONTENT |
|---|---|
| Chapter 4. Social Sector<br>Tackles the general condition of Kathmandu's social sector including the city's education, health and protective services<br><br>Highlights: KMC is experiencing a number of pressing social issues. These includes the high rate of migration in the city, increasing crime rate primarily child trafficking, rising incidence of child labor and the poor quality of public education. The high rate of migration to Kathmandu was attributed to ineffective development policies in Nepal which includes the lack of services, facilities and opportunities outside Kathmandu. The ongoing political conflicts, poverty and disasters in the countryside also contributed to the increased influx of migrants to the city. The increase in crime rate is caused by the severe urban congestion and ineffective crime protection system in the city. The poor quality of public education is attributed to inadequate funds, services and facilities for education and the ineffective monitoring of the quality of the public school system. | • Education<br>» Literacy rate<br>» Number and type of schools<br>• Health, nutrition and family planning<br>» Health<br>» Heath Facilities<br>• Social welfare<br>• Housing<br>» Floor area per person<br>» Occupancy status<br>» Informal housing<br>• Peace and order<br>» Police protection<br>» Crime rate<br>» Fire protection<br>» Traffic management<br>» Disaster management<br>• Situational analysis<br>• Challenges and opportunities |
| Chapter 5. Economic Sector<br>Presents an overview of the city's economy.<br><br>Highlights: Tourism sector dominates the industries, but there are signs of growth in Kathmandu's economy which are mostly fueled by trade, manufacturing and tourism. 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. Power shortage and frequent power outages These include, among others, political instability which affects economic activities in the city such as tourism, high rate of unemployment, growing informal sector, improper management of heritage sites, and land fragmentation | • Per capita income<br>• Households below poverty<br>• Labor force<br>» Employment by major economic activities<br>» Child Labor by major economic activities<br>• Trade and commerce<br>• Agriculture<br>• Tourism<br>» World heritage sites<br>» Tourist facilities<br>• Situational analysis<br>• Challenges and opportunities |
| Chapter 6. Land Use<br>Talks about the city's built environment.<br><br>Highlights: 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). | • Existing land use<br>» Trends of building construction<br>» Land pooling<br>» Urban housing development<br>» Cultural and heritage sites<br>• Land use trends<br>• Situational analysis<br>• Challenges and opportunities |
| Chapter 7. Infrastructure and Utilities<br>Focuses on the land use pattern in the city<br>Highlights: 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. The combined storm water and sewer system is about 50-70 years old that services 17 percent of KMC households. | • Transportation<br>» Road network<br>» The Bishnumati Link Road<br>• Drainage and sewerage<br>• Water supply<br>• Power supply<br>• Telecommunications<br>• Situational analysis<br>• Challenges and opportunities |

| CHAPTER | CONTENT |
|---|---|
| Chapter 8. Environment<br>Describes the infrastructure and utilities sector in Kathmandu<br>Highlights: Poor sanitation is also an important problem in KMC. 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, Improper solid waste disposal due to temporary dumping of garbage along roadsides also contributes to urban pollution in the city. | • Waste generation rate<br>» Waste collection rate<br>» Pollution<br>» Air pollution<br>» Water pollution<br>» Industrial pollution<br>» Noise pollution<br>• Situational analysis<br>• Challenges and opportunities |
| Chapter 9. Development Administration<br>Discusses the development administration of KMC, including its legal and institutional arrangements.<br><br>Highlights: 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. Many of the planning-related agencies are still highly centralized, despite the existence of vertical linkages; the centralization tendency is evident, whereby decisions and actions require consent from higher authorities. There seems to be very limited funding to support the institutional and organizational reforms indicated by the findings and conclusions. | • Organization and management<br>» Nepal government officials<br>» Organizational structure of KMC<br>• The political system<br>» The national government<br>» The local government<br>» Institutional framework for land use planning<br>» Policy environment for land use planning<br>» Planning structure, practices and types of land use plans<br>• Some relevant findings and conclusions from earlier investigations<br>• Fiscal management<br>• Urban development projects<br>• Situational analysis<br>• Challenges and opportunities |

# Chapter 2. Study Area

## 2.1. Location and Land Area

KMC is located in the Kathmandu District, Bagmati Zone, Central Develoment Region of Nepal. It is situated in the northwestern part of Kathmandu Valley. KMC is bounded by 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. General Hazards and Associated Risks

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

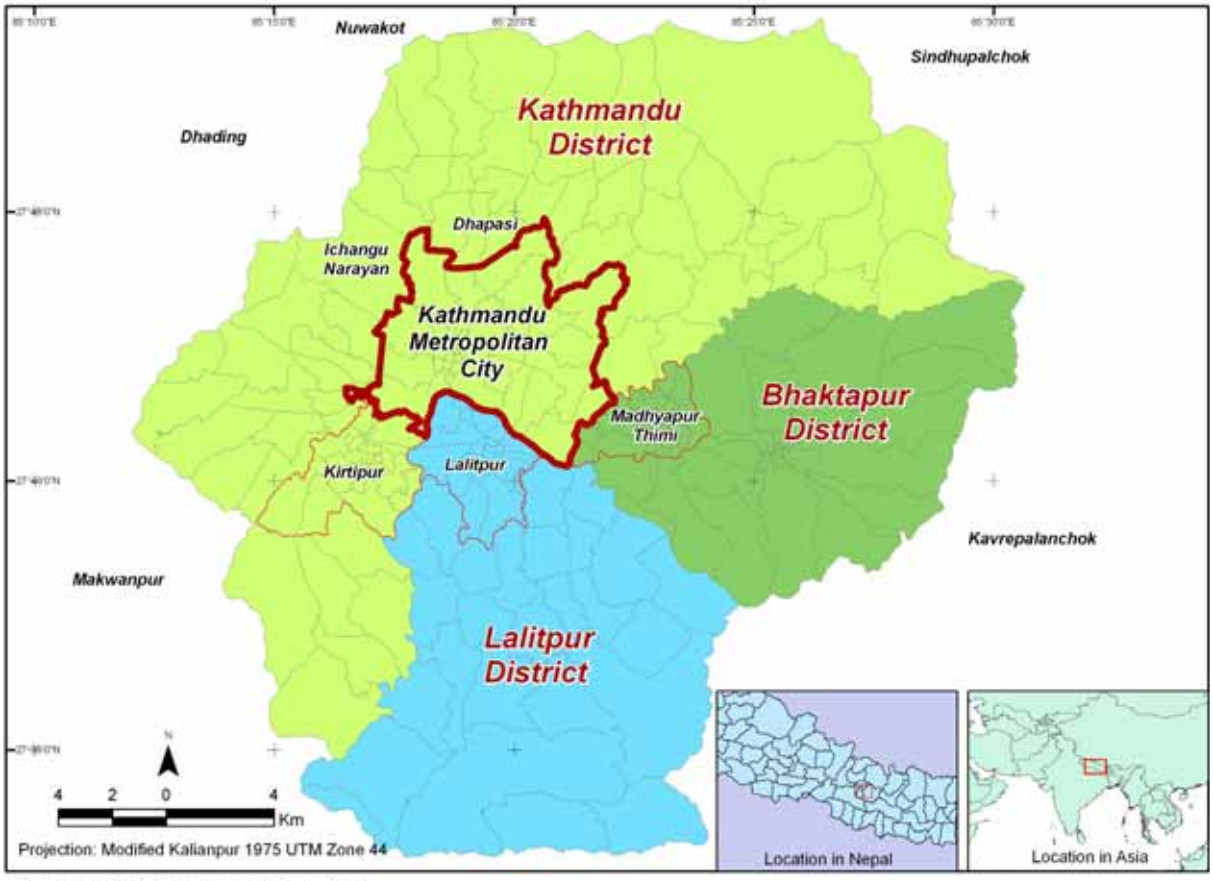



Figure 2.1 Location Map

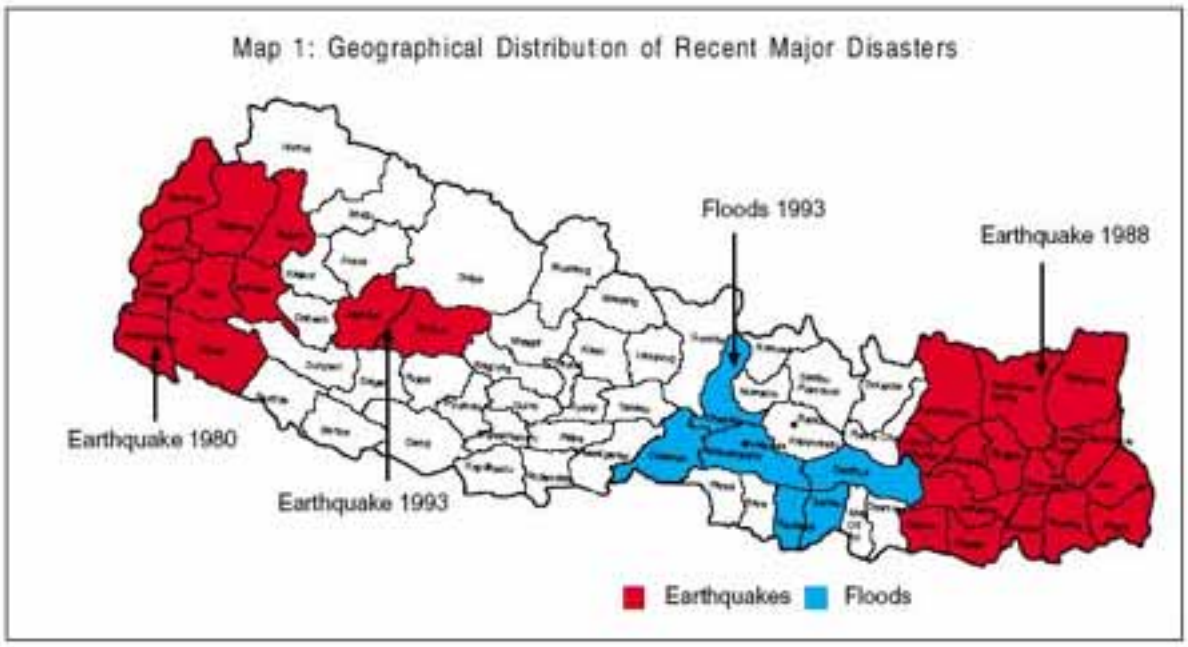



Figure 2.2 Geographic Distribution of Recent Major Disasters
Source: UN Nepal 's Inter-Agency Disaster Response Preparedness Plan, 2001

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 different chapters pertaining to other development sectors.

Table 2.1 Lives Lost Due to Different Disasters
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 |

### *2.2.1. Earthquake*

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>= 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 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.

| EARTHQUAKE INTENSITY | AVERAGE RETURN TIME |
|---|---|
| Intensity >= 6 | 21 years |
| Intensity >=8 | 36 years |
| Intensity >=9 | 75 years |
| Last Significant Quake | 1980 |
| Large Likelihood of I>=8 by 2020 | |

| KATHMANDU |
|---|
| 5 Events of M>=7 since 1800 with one event of M=8.3 (1934) |

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

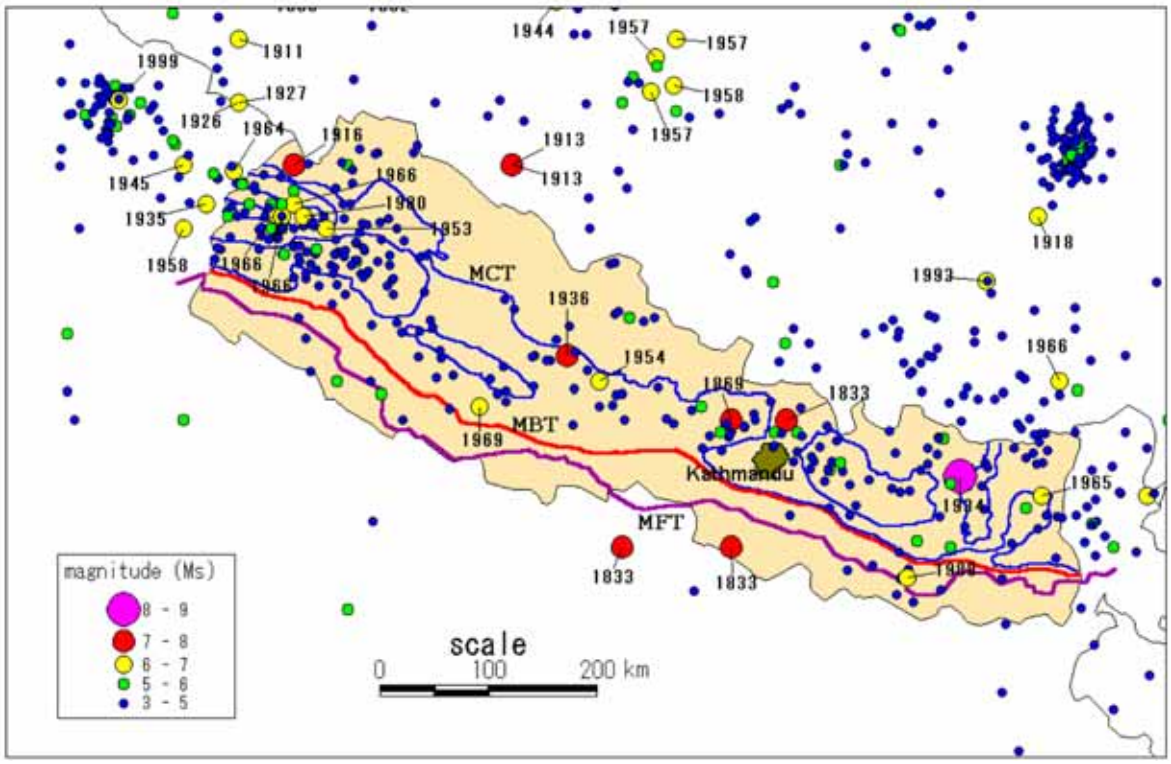



Figure 2.3 Epicentral Distribution around Nepal, 1255 to 2001
Source: Earthquake Disaster Mitigation in the Kathmandu Valley, March 2002

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.

A study by JICA and MOHA in 2002 covered seismic risk assessment for the whole Kathmandu Valley. It was, however, conducted within a short duration of time under limited resources. At that time, there was no official building in-

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

ventory 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 the 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.

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.

### *2.2.2. Flood, Landslide and Debris Flood*

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, 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.

### *2.2.3. 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 lives 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.

# Chapter 3. Vision

## 3.1. Vision Statement

The vision statement for Kathmandu City serves as the ideal scenario upon which all major plans and programs are anchored. The city's 2001was crafted as follows: *"Beautiful, well-managed and full of life city where citizens are proud of their natural and cultural heritage and look forward to a bright future."*

To put more emphasis on safety and disaster resilience, this earlier vision was refined in a Strategic Planning Seminar-Workshop held in July 2009. The new vision aspires for KMC to be *"a tourism center based on heritage and culture with healthy, responsible and economically active citizens, living in a clean, safe, and disaster-resilient environment."*

While the RSLUP is prepared for a ten year period, the conditions envisioned can inspire KMC well beyond the plan's 10-year time horizon, as it may probably take more time to attain.

## 3.2. Vision Elements, Descriptors and Success Indicators

A vision statement is meant to capture the desired qualities of the city according to five major elements namely, the quality of the people as individuals and as society, the nature of the local economy, the state of the natural environment, the condition of the built environment and the capability of the local leadership. (Serote, 2004)

### *3.2.1. Role of KMC*

KMC shall continue to be the capital city of Nepal serving as the administrative center, cradle of heritage and culture, and a world-class tourist destination.

### *3.2.2. Qualities of the people as individuals and as a society*

KMC residents are responsible. This trait is said to have been attained if they have reached a state where most of its current social and economic problems had been addressed, and may be further described as follows:

- A low number of crime cases, having negligible incidence of theft, pilferage, including insignificant cases of drug abuse, and destruction to property, less number of broken families and juvenile delinquents;
- A genuine concern for the environment such as garbage being properly disposed, cleaner and greener environment;
- The city being child-friendly would connote no cases of child abuse or labor and minimal number of out-of-school youth.
- The citizens are transformed into a disaster-prepared citizenry where the government, private sector and civil society resources are immediately mobilized in time of crisis and emergency.
- Public consultation/people participation has been made an integral part of the government's decision-making process and that non-government organizations including people's organizations and cooperatives, regularly participate in the physical and development planning, implementation, monitoring and evaluation of government programs and projects.

KMC inhabitants are healthy physically, mentally and emotionally. Being in good shape would mean longer life expectancy i.e. at least 65 years, zero malnutrition, low morbidity, sports-oriented, and possessing healthy mind and body.

KMC towns-people are economically productive having been able to provide the basic needs of their respective families and that there is an insignificant number of families below poverty level.

KMC residents are hospitable, as bearers of goodwill in a Valley which continue to serve as a cradle of religious and cultural heritage for the world to see, and for its visitors to experience the hospitality of the people of Kathmandu.

### *3.2.3. Nature of the local economy*

KMC wants to be known not only nationally but also worldwide as the "tourism destination of the world," known for its competitive and environmentally sustainable tourism industry.

Second, KMC's economy is envisioned to be sustainable and progressive. This can be attained by creating an economic climate that will encourage inflow of investments. Progressive means KMC shall implement sustainable development programs and projects in the different sectors of the economy. The city must be able to use its land and water resources sustainably to support its functions and industries, while at the same time create a space (e.g. parks, open space) for good quality living. Future human and physical developments will not be allowed to contribute to the degradation of the environment and will be sensitive to natural and technological hazard risks.

Third, in maintaining its dominance as the region's center for distribution of goods and services, Kathmandu City shall continue to develop its tourism and handicrafts industry, and diversify its economy in "specialty" areas of education, health services, and in trade.

The educational institutions located in KMC, which offer formal education and training, should be able to provide a quality of education and training in disciplines that cater to businesses in the 21st century such as information technology, and handicrafts to increase the city's level of competitiveness.

### *3.2.4. State of the built and natural environment*

Pollution (e.g.; solid waste; effluent; air pollution, whether toxic or hazardous or coming from households, hospitals, industries or institutions) is one of the major problems in Kathmandu City. However, its residents envision living in an environment that is **clean, green and safe.** A clean environment would translate to a city where all types of wastes are properly disposed of, and where air and water quality supports a livable and healthy urban environment.

In line with KMC's desire to live in a "green" city, urban core/development clusters shall flourish with flower-bearing trees along the city entrances, highways and even minor roads. The city will also become more attractive without illegal settlements encroaching on critical and hazard-prone areas (e.g. river side, public land, etc.).

This condition is said to have been attained when urban blight is considerably reduced, when the greenery becomes a dominant feature of the city; when sidewalks along rivers, along main thoroughfares are continuous and integrated with street lights, parks and open spaces; when rivers and creeks are cleared and cleaned and become part of the network of parks and open spaces; and when public squares, monuments and buildings which serve as landmarks of the city (e.g. city hall, the public market, the heritage sites) are transformed anew and restored to their original, distinct architectural character.

### *3.2.5. Condition of the built environment*

Creating a **planned** community supported by adequate and appropriate transport and infra-

structure will enable every citizen to meet the demands of daily work and recreation between workplace and home. To attain this desired condition is to identify and develop suitable areas for urban expansion in the form of mixed-use growth nodes. Other requirements include:

1. Increased efficiency of the circulation network with new roads and bridges constructed, existing ones rehabilitated, the public transport system rationalized, and decentralized multi-modal transport terminals provided;
2. Improved mobility of pedestrians through the provision of pedestrian-oriented facilities such as overpasses, waiting sheds, etc.;
3. Improved quality and quantity, and increased affordability of water supply, power supply, telecommunications and internet services, etc.,
4. Adequate and effective drainage, sewerage and flood control systems; and
5. Buildings and infrastructures are engineered with natural hazard risks in mind.

Taking into consideration the natural limits and constraints inherent to the land resource of the city, a desired condition of the built environment is the development of **safe forms and patterns of settlements** away from identified environmentally critical areas and the protection of resource reserves such as urban forests, and remaining agricultural lands. As for existing built-up areas, appropriate measures will be adopted to reduce building and infrastructure vulnerability and social risks.

A **planned and safe city** results in a balanced relationship between the built and the unbuilt environments. This condition is said to have been attained when the built environment is integrated into the city's unbuilt space consisting of parks and open spaces, rivers, creeks. Safe areas and safe forms (e.g. buildings and sites) and patterns of urban space mean existing and future locations are decided with the inherent natural hazard risks in mind, and managing them all throughout the land use planning stages and in succeeding project development stages.

When urban forests are delineated and protected, and when standards on open space requirements such as those pertaining to subdivision development, housing, road planning and river easements, and utility lines/facilities are strictly complied with, the desired condition of a safe built environment is said to be met.

### *3.2.6. Capability and quality of the local governance*

The people of KMC desire to have local leaders **who are visionary, dynamic and people oriented.** These desired qualities of local governance are anchored on shared values committed to promoting the public interest. This means that local leaders whether from the KMC leadership, nongovernment organizations or people's organizations are determined to put the interest or welfare of the people above their self-serving interests. In concrete terms, the people of KMC would like to experience the following effects of visionary, dynamic and people-oriented local governance:

**Strict enforcement of laws**

Laws are rules of conduct established and enforced by authorities supported by the people. Through a process of decentralization (i.e. LSGA), the KMC was allowed by the State to perform functions and responsibilities as well as exercise powers and authority at their mandated territorial and political jurisdiction. This entails an unwavering commitment to enforce laws at all times.

**Self-sustaining KMC**

The people of KMC are empowered to become self-reliant communities and to act as effective partners in the attainment of national development goals. KMC has the capacity to maximize its income through progressive means that are practical and equitable and thus, reduce the city's reliance on the national government. Apart from maintaining financial stability through a sustained positive balance in its financial statement, the KMC must also adopt a progressive

fiscal policy in terms of local revenue e.g., taxes and other revenues, grant from the central government and donation from local and international donor agencies.

**Effective, efficient and responsive city government**

The people hope to have an effective, efficient and responsive KMC government. Effectiveness means that KMC is able to deliver appropriate services if and when needed. Efficiency relates to the cost-effective delivery of public services. Responsiveness refers to the relevance and timeliness of the local government's responses to problems as they arise. In this view, areas of local governance shall be strengthened such as the technical capability of its human resources and system capability of its organizational structures.

**Disaster-prepared and resilient government and citizenry**

KMC is known to be located in an environmentally-critical area. However, the occurrence, frequency and magnitude of natural disasters are unpredictable. Therefore, there is an imperative for the KMC and citizenry of Kathmandu to be prepared for disasters at all times.

With a common vision, under a dynamic and people-oriented governance, KMC remains and continues to be resilient, in spite of the political turmoil, and possible natural and technological disasters that may hit them. The government and its citizens will rise above these situations, as empowered citizens and not mere victims.

KMC shall continue to work with the nongovernmental organizations and other institutions that are recognized as active partners of the KMC in the pursuit of local autonomy and good governance.

# Chapter 4. Issues, Problems and Development Directions

This chapter discusses the development and spatial planning concerns of KMC. An analysis of the different sectoral issues, problems and concerns, including relevant strategies to address them, is presented.

## 4.1. City Context

KMC is the capital city of Nepal. It 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 within Kathmandu Valley, ranks among the oldest human settlements in the central Himalayas. The summary of information about Kathmandu is provided in Table 4.1.

Table 4.1 Kathmandu City 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 |

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.

## 4.2. Development Issues, Problems and Constraints

The following discussions on the factors that hamper urban development in KMC are derived mainly from the KMC Sectoral Profile and other relevant documents, as wells as from the series of workshops conducted over the course of the project. Development constraints are generally classified into two: inherent and derived. Inherent constraints pertain to the limitations due to an area's geophysical features and natural environment. Derived constraints, on the other hand, are the issues that arise out of the effort of man and society to adapt to or modify the environment to further their individual interest and collective wellbeing (Serote, 2005).

The process of mainstreaming DRR in the local planning process is shown in Figure 4.1 (the same figure is also available as Figure 1.5 in chapter 1)and provides inputs to the profile which may be used to guide planning. The objectives of including the DRA is to inform the

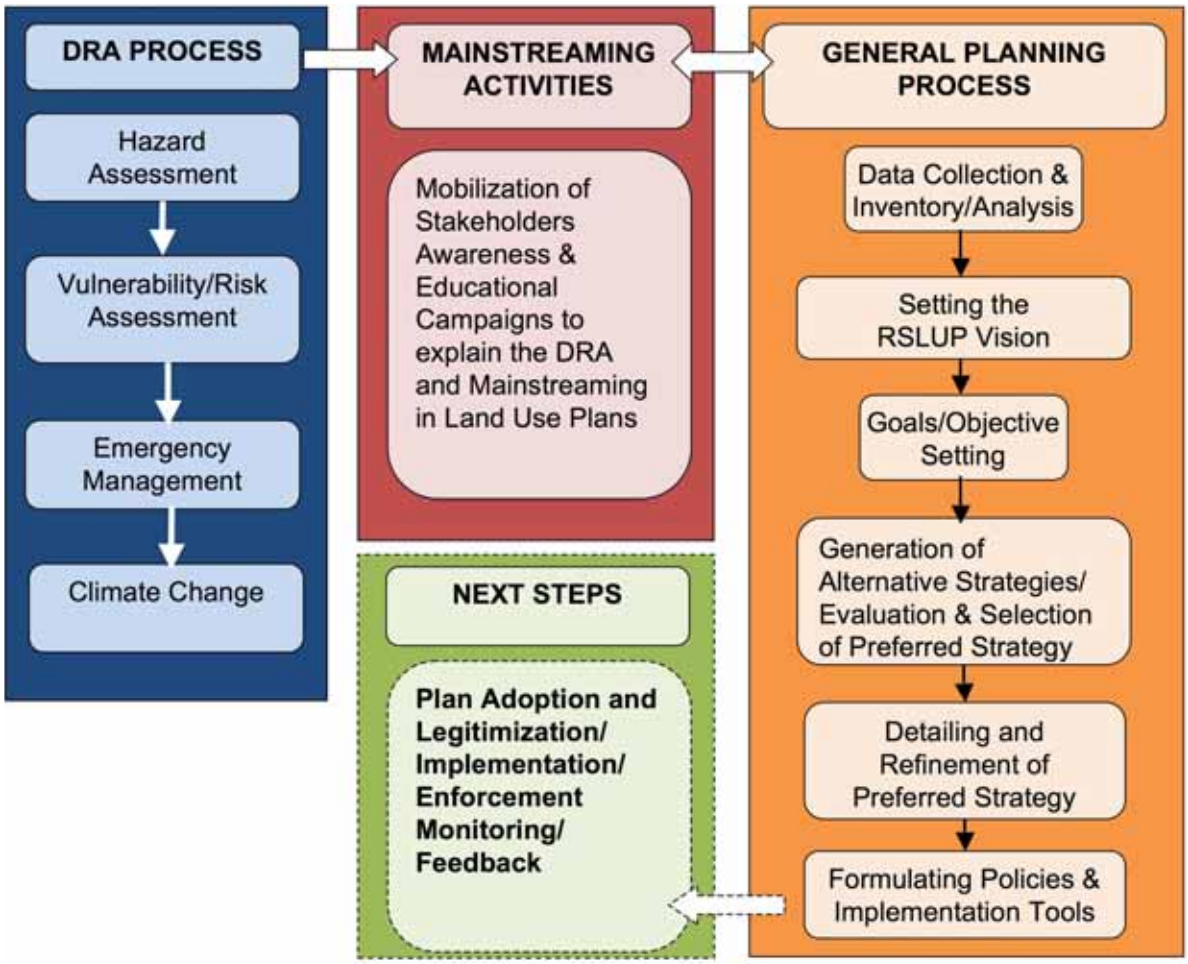



Figure 4.1 Risk-Sensitive Land Use Planning Framework for KMC

planner on the attendant risks, interpret its implications to development, and guide the physical framework and succeeding land uses to avoid, prevent, or mitigate risks as well as prepare the population or settlements through the plans.

## 4.3. Disaster Risk Assessment

### *4.3.1. Seismic Hazard Information*

Hazard information includes the inventory, description and preparation of the hazard maps in Kathmandu Valley. The maps described in this section pertain to earthquakes (i.e., nature and magnitude of the hazard, susceptibility of the area, and extent of the intensities of damage or impacts over the affected areas.) as described in the study, "Earthquake Disaster Mitigation in the Kathmandu Valley" in 2002.

Three fault models were selected based on the seismic, seismo-tectonic and geological condition around Kathmandu Valley, and the fault model of 1934 Bihar-Nepal Earthquake. Among the three, the Mid-Nepal earthquake was selected. Figure 4.2 shows the distribution seismic Intensity in KMC.

The liquefaction potential map is based on information on soil properties and seismic motion from JICA's "Study on Earthquake Disaster Mitigation in the Kathmandu Valle" in 2002. The liquefaction potential map shown in Figure 4.3 indicates that the liquefaction is moderate in areas along the Bagmati River. A closer look into the moderate liquefaction-prone areas reveals several buildings standing over these areas, among them hospitals (Figure 4.4).

Scenario projections indicate that a repeat of the 1934 Bihar-Nepal earthquake would pro-

duce a death toll between 22,000 and 40,000, while about 60 percent of all buildings in the Kathmandu Valley will be heavily damaged, many beyond repair. Ninety percent of the water pipes would be seriously damaged and about half of the bridges would be closed due to damage. Note the loss estimates of the JICA study are based on 1991 Census. Since then, the population in the Valley has just about doubled and density has increased also. Thus, based on current conditions the actual losses could be several times greater than the JICA study projections, should the earthquake happen today.

For Kathmandu Valley, as well as for Kathmandu City, the worst-case scenario earthquake has been identified as the Mid-Nepal Earthquake with Ms=8.0 (see Figure 4.5). Comparing it to the 16 July 2001 Gorkha earthquake of Ms=5.1, the energy of a probable Mid-Nepal earthquake would be about 30,000 times greater.

The VDCs were adopted as the basic units for the administration boundary. Also, in studying the ground earthquake motion and ground condition, the 2002 JICA study made use of grid system having a mesh of 500m square. The meshed areas covering KMC were taken from the same study and were used in overlaying process.

The following maps from the 2002 JICA study provide a spatial description of the potential damage and losses that Kathmandu Valley would probably sustain in the event of this scenario (Figure 4.5).

### *4.3.2. Assessment of Vulnerability*

Vulnerability analysis defines the possible areas or elements exposed to the hazard. The elements at risk may include population, settlements, property, land cover features or their values. When overlaid with the hazard maps, they provide information about the potential affected areas. The consequences typically analyzed are risks to life, risks to property and possible loss of certain functions such as communication, transportation, power supply, and water supply, among others.

On the socio-economic side, political instability, high mortality rate, illiteracy and extended poverty are the main components of vulnerability. Weak emergency preparedness and response capacity, limited hospital and health resources, and inadequate land use controls have been identified as the most significant components that contribute to low-coping capacity and disaster resilience. High structural vulnerability of existing buildings were due to inappropriate construction practices, unregulated urban development that allows settlements in landslide prone areas found in the hilly fringes, and increasing number of informal settlements that significantly contribute to accumulation of risk.

The components of direct damage in urban areas considered in the 2002 report include buildings for housing, commerce, industries, tourism, hospital, roads and bridges and other economic or social infrastructure. It also covered utilities which include transport, communication facilities, energy sources, water facilities and sewerage facilities. The damages are expressed as percentage of building or number of breakage points.

There were no official building inventory data for the Kathmandu Valley in the 2002 study, and so the building vulnerability was estimated from the population and household distribution by the 1991 census. Similarly, the total number of buildings was based on estimates of these buildings in 1991. In assessing building vulnerability, the building material was used but the age and height of buildings were not taken into consideration. Among other elements considered were the damage on road network and utilities. Detailed and updated data need to be prepared in future seismic vulnerability studies for a more accurate risk estimates.

For this RSLUP, vulnerability of KMC was also interpreted from the concentration of major establishments in various wards. The location of these different types of establishments (specialization or sector) on the hazard maps would indicate the potentially affected sectors (e.g. tourism, commercial). In addition, the common areas between the different land uses of the 2001 and 2006 land use maps and the seismic

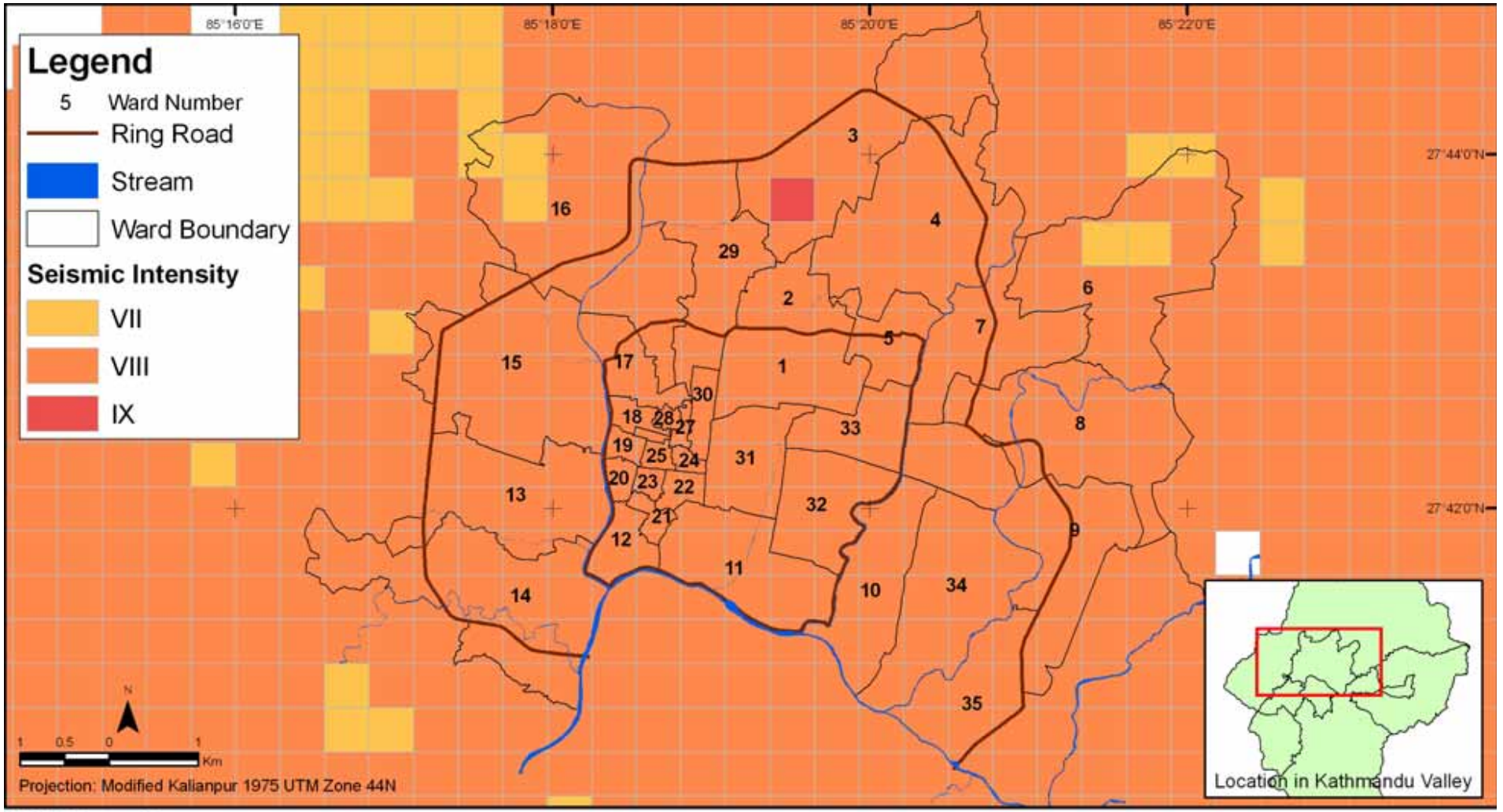
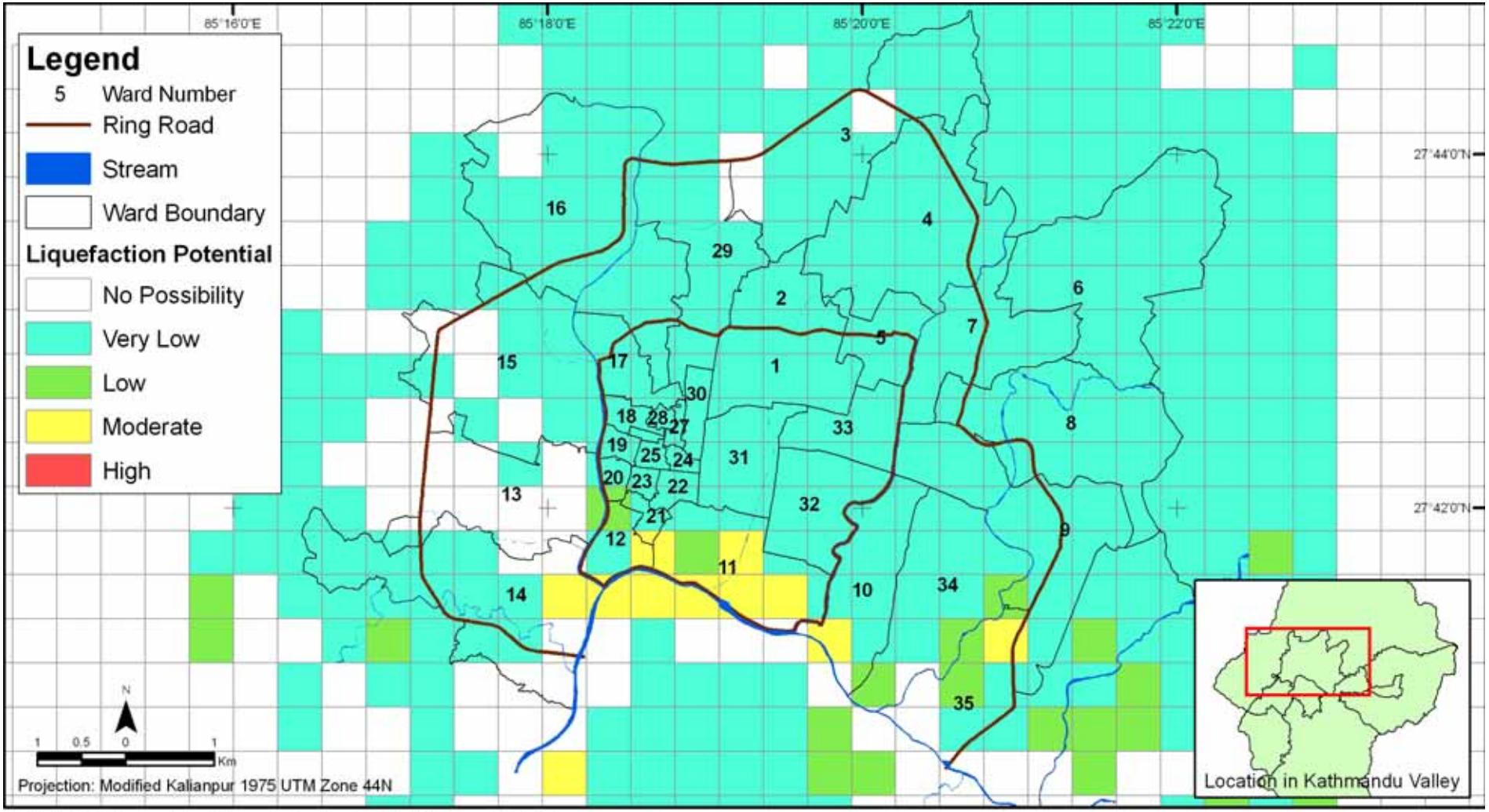



Figure 4.2 Seismic Intensity Map




**KMC Liquefaction Potential Map, 2006**

Sources: Kathmandu Metropolitan City Government, JICA

Map and projection modified by EMI-GIS, 2010

Figure 4.3 Liquefaction Potential Map

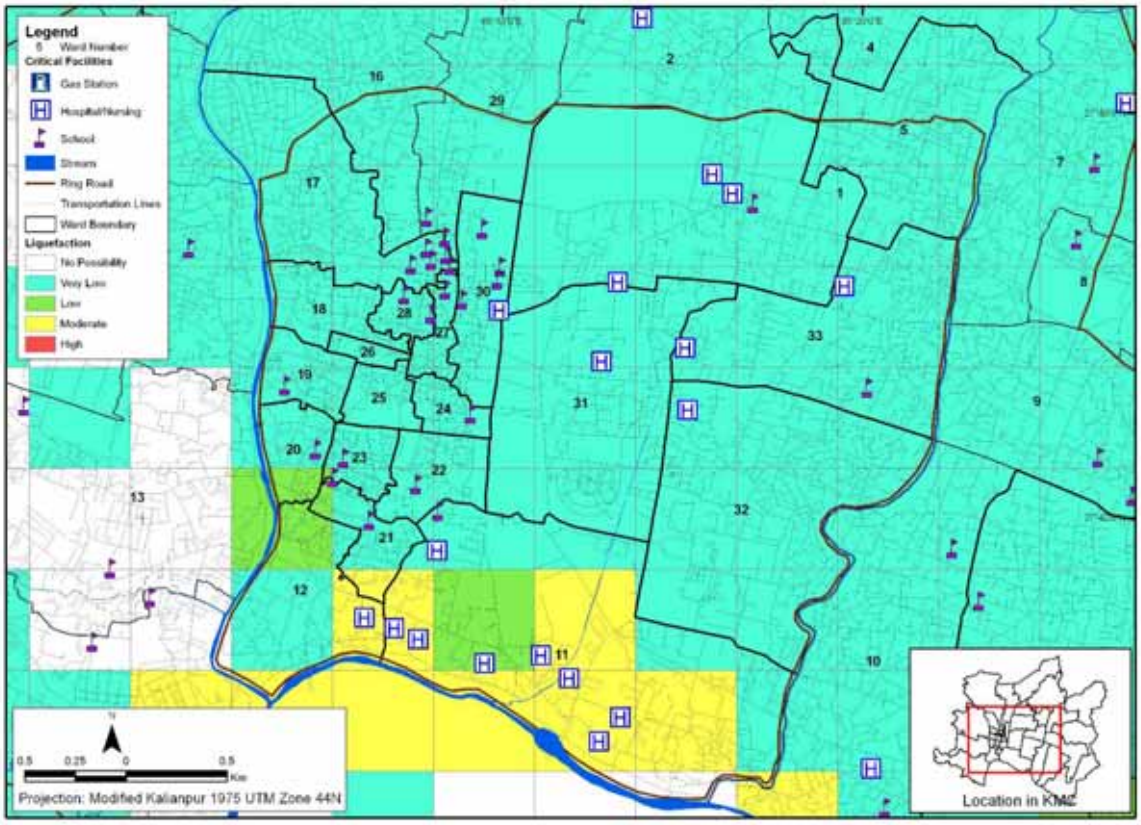



Figure 4.4 Zoom-in of Liquefaction-Prone Areas along Bagmati

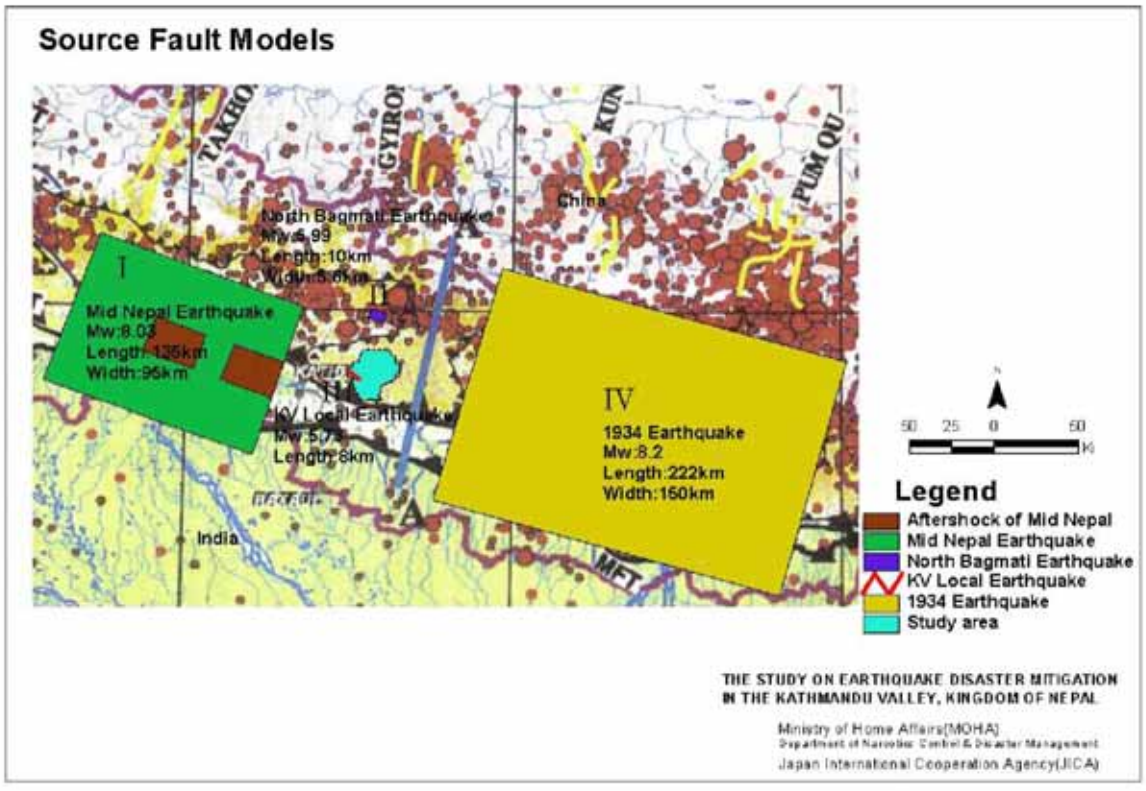



Figure 4.5 Scenario Earthquake Fault Mode

intensity map were overlaid and their exposure qualitatively described.

In the following sections, the existing situation of the different sectors of the planned environment is described. The implications of the seismic hazard and risks are discussed as well.

### *4.3.3. Settlements and Population*

Initially, the basic demographic characteristics and settlement patterns of the city are described in so that trends may be known, and later verified if these trends are proceeding towards unsafe areas, making it a development concern. Trends therefore are reviewed in this section.

Based on the KVTDC Earthquake Study of 2002, Kathmandu Valley has three main sectors which can be recognized as urban core, urban fringe and rural hinterland. According to KVTDC, the Valley may be divided into locality categories as follows (Figure 4.6).

a. Urban area: urbanized area corresponding to the five municipalities; population density is mostly over 100 persons/ha.
b. Sub-urban area: relatively urbanized and adjacent to the municipalities.
c. Rural area: non-urbanized area consists of VDCs other than the sub-urban VDCs.

Figure 4.7 provides a map of the various wards in Kathmandu City, dividing the area into five sectors, namely, Core, Central, North, East and West.

The core built-up area is comprised of central areas of Kathmandu, Kirtipur and Lalitpur. For Kathmandu City, sprawl had already spilled over toward the outer ring road, an urban fringe immediately outside of the Ring Road. The rural sector comprising the rural hinterland showed signs of urban influences such as the presence of economic activities directed at servicing the urban market. This trend is illustrated in Figure 4.8.

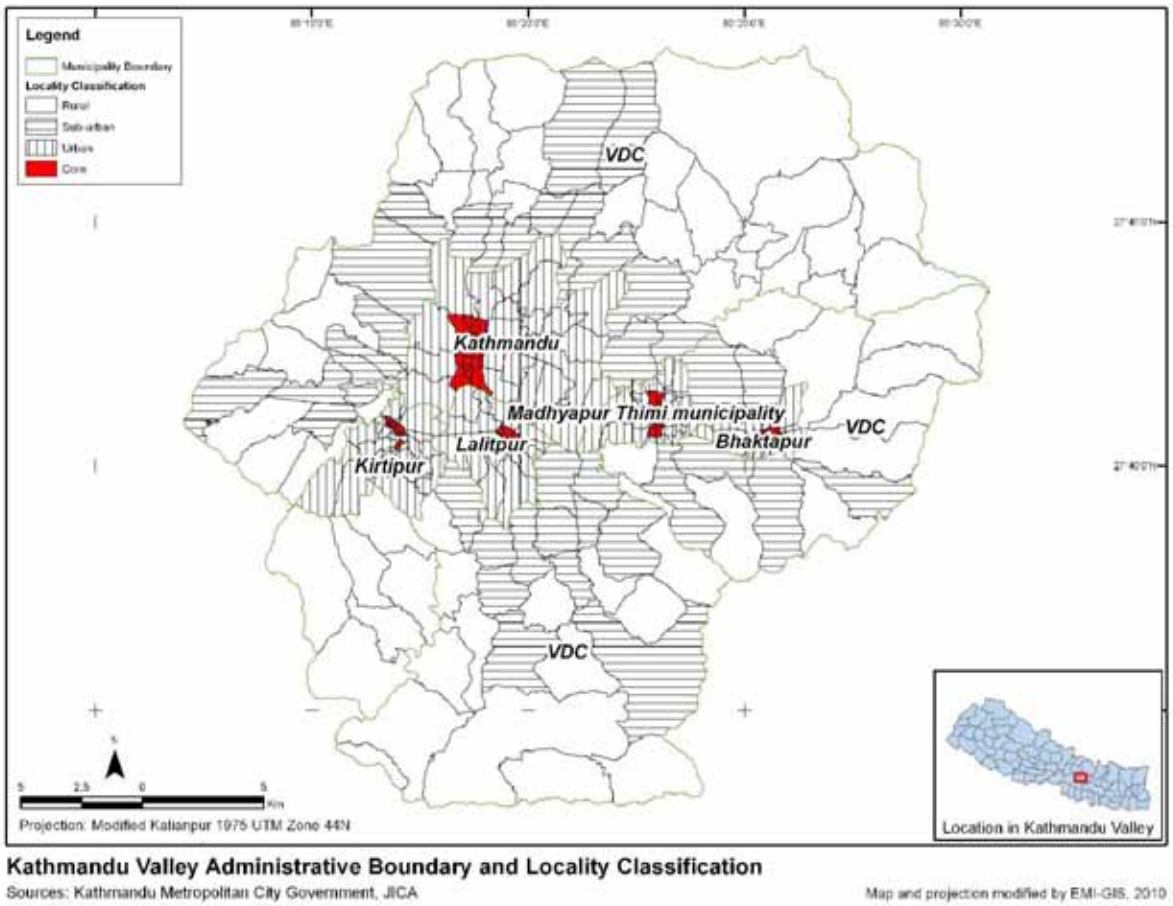



Figure 4.6 Administrative Boundaries and Locality Classification

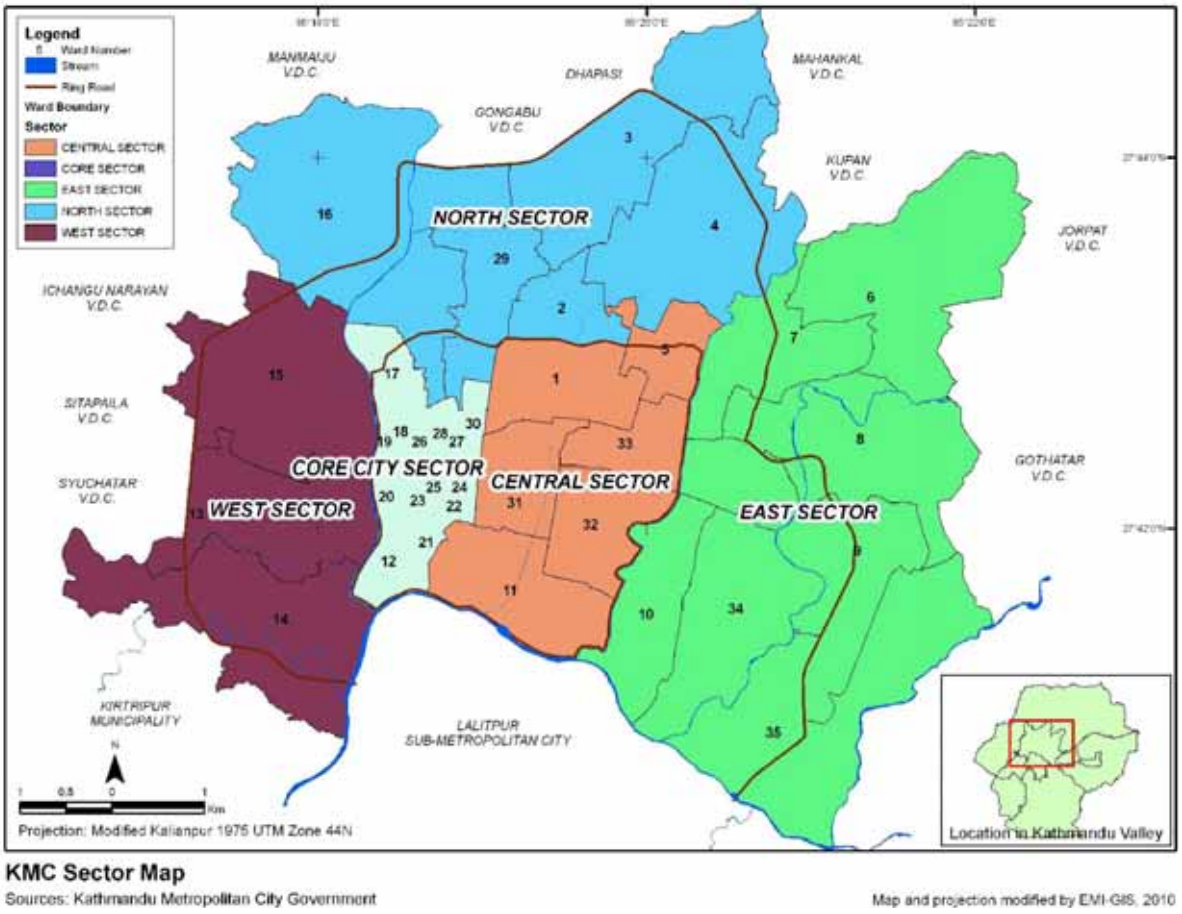



Figure 4.7 The Five Sectors of Kathmandu City

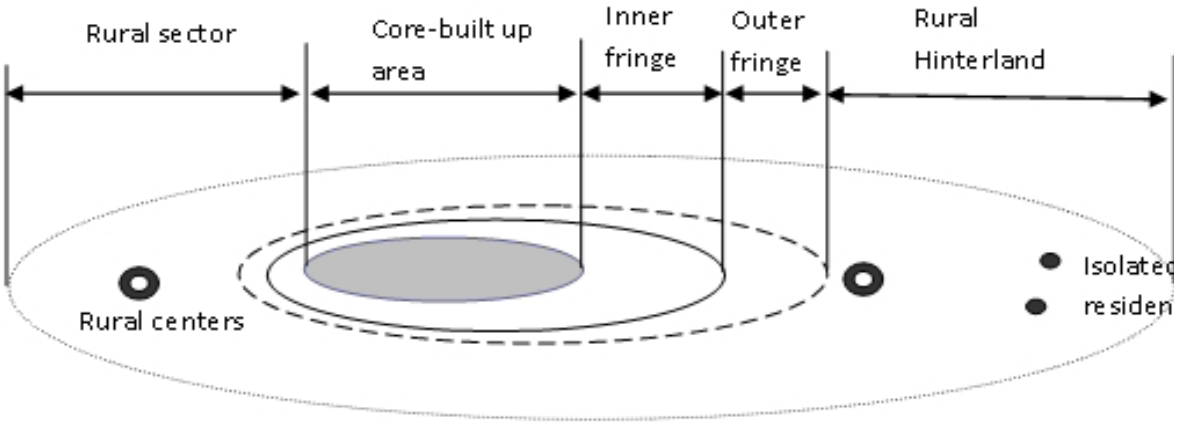



Figure 4.8 Urban Place - The General Urban and Rural Settings
Adapted from Source: Serote, 2004

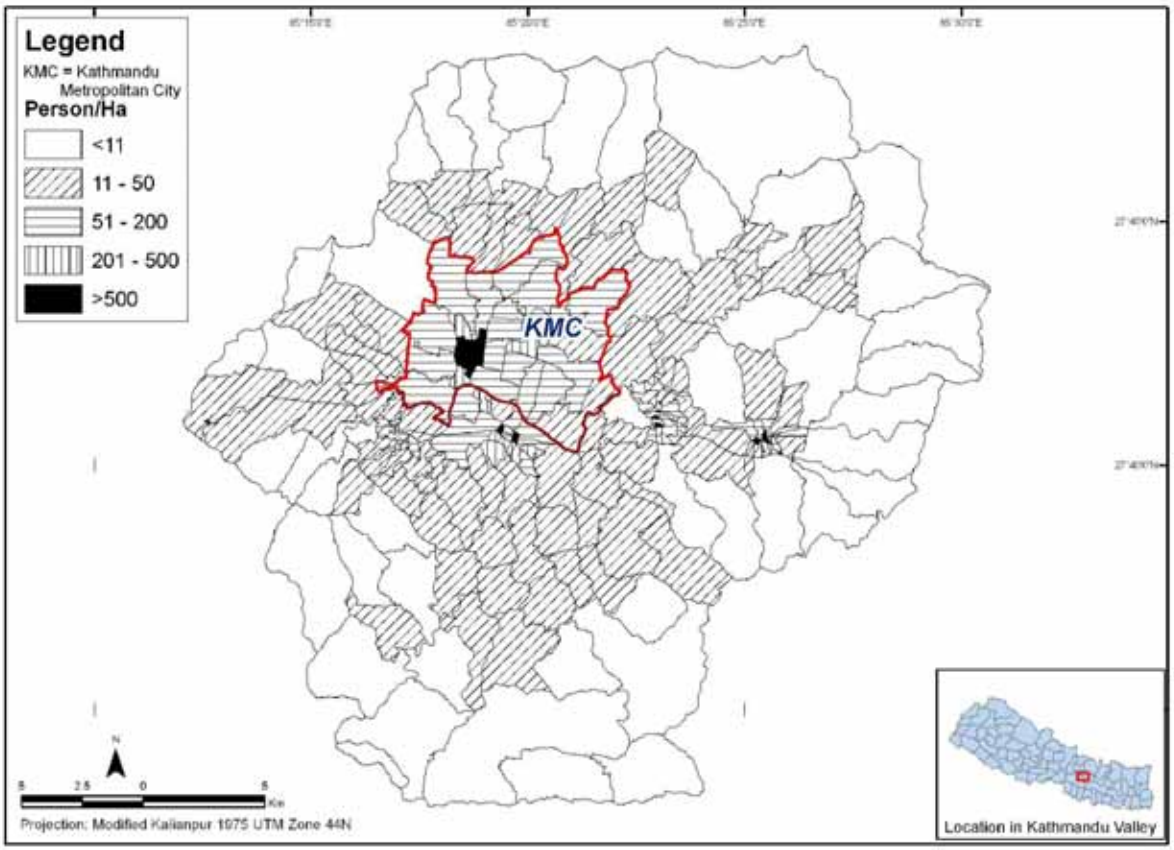
To date, KMC's City Core still maintains its function for worship and tourism. It has, however, deteriorated over the years. Its form has similarly changed and other sections of the city have since grown into urban centers in their own right. The expansion has gone beyond the core area (Durbar square) towards the once rural hinterland and farther outside its territory resulting into a metropolitan area.

Population density of Kathmandu City at the core area was about 427 persons/ha in 2001, while those around immediately east and west of the core, it ranged from 800 to1070 persons/ha, with Wards 21, 26, 27 and 28 having the highest densities. Close to the Ring Road, some ward densities are pegged at around 50-100 person/ha. (See Table 3.2 of Sectoral Profile) Much of the agricultural land had been converted into urban built-up areas, although estimates using digital maps reveal about 900 hectares remained agricultural in 2006. This conversion has sprawled across agricultural lands and towards more fertile areas along the river flood plains (Figure 4.9).

Summarized below are the issues and concerns identified during Strategic Planning Workshops. The problems are organized in a cause-effect relationship with the lower boxes representing the causes ("roots") and the upper boxes indicating the effects ("foliage"). All problems and issues are presented from the perspective of the municipal or city government (institutional sector), which forms the basis for the identification of appropriate intervention measures or strategies. (Serote, 2005)
Contemporary urban development in Kathmandu City is observed to be driven by the following factors: (PWC, 2009)

- Influx of population (people pushed out/in by political instability and disasters)

- The influx of the population is bound to grow faster than settlements of smaller size.




**Kathmandu Valley Population Density, 1999**

Sources: Kathmandu Metropolitan City Government, JICA

Map and projection modified by EMI-GIS, 2010

Figure 4.9 Population Densities in Ward and VDC, 1999

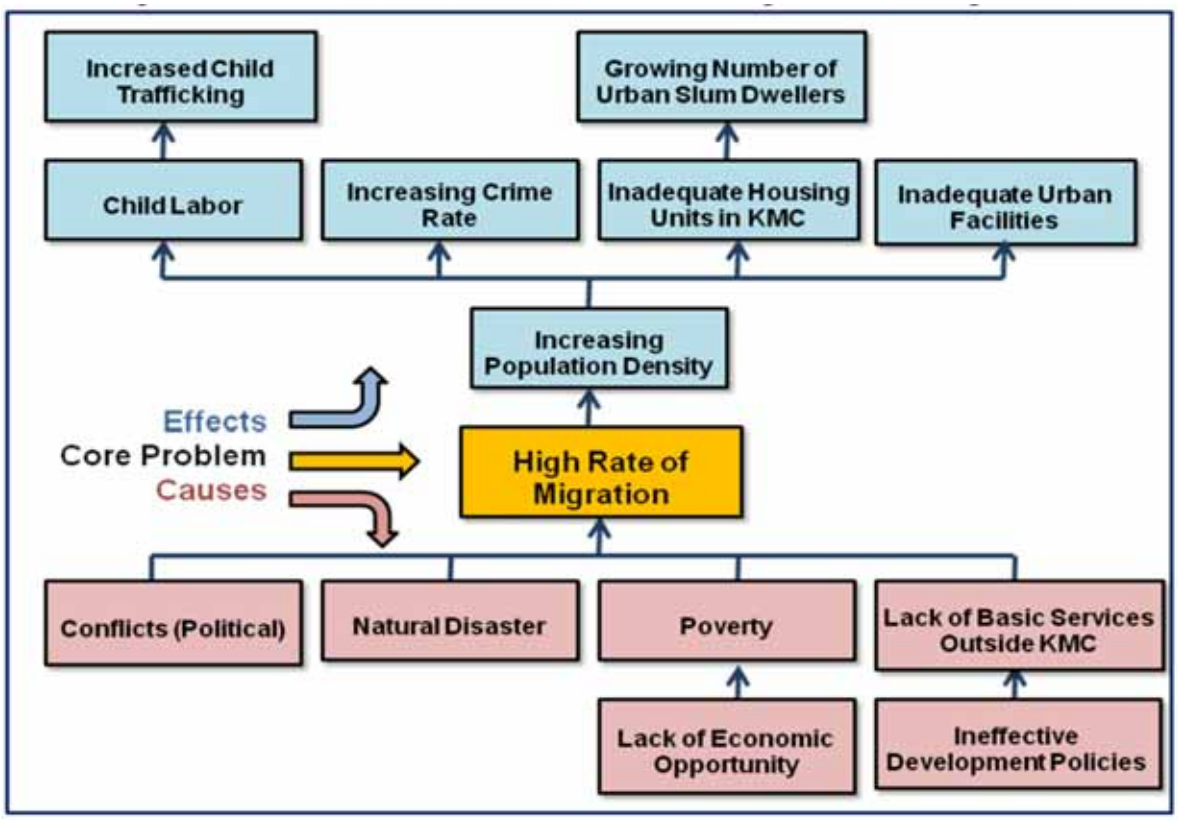



Figure 4.10 Social Issues and Concerns: High Rate of Migration

The main reason may be due to the economic attractiveness of Kathmandu City as well as being the receiver of people pushed out of certain areas by natural and human-induced disasters (i.e. natural hazards, insurgency and armed conflict, relocation of squatters) (See Figure 4.10).

- Increased income in the city (tourism, remittances, and institutions/centers)

The economy of Kathmandu City may be attributed to the net capital inflow from the incomes of households, and investments of institutions and government especially in the Central area. Major contributors to the net inflow include tourist influx, manpower export (remittances from deployed labor), and presence of major institutions and regional and national government centers.

- Ethnicity (ethnic groups outside KMC who are seeking jobs in the city used to live with the same ethnic groups in Kathmandu City)

Migrant workers/laborers in Kathmandu City would normally locate themselves among similar ethnic groups or castes. Some of them may obtain their housing and urban services from the informal market and whatever facilities the host locality can offer. This rural-to-urban migration results in the build-up and increase of informal settlers, putting greater pressure on the city's scarce basic services (water, sanitation, power, etc.).

These combinations and ineffective development policies had resulted in the following: Unplanned use of land. Partly due to the shortage of buildable land and due to the absence of a clear zoning plan, some house builders were found to have constructed their houses in places that ought not to be built over or in areas that should not have been encroached upon (e.g. riverbanks, river easements and road rights-of-way).

Due to inadequate information about possible damages from ground shaking and liquefaction in certain areas, many builders located their

structures without the benefit of thorough geo-technical investigations thereby exposing dwellers to risks. At present there are many buildings with compromised structural quality due to this lack of information and lesser concern about the soundness of their houses/structures against the risks from natural hazards inherent to the place. Inadequate housing and urban facilities. There is a high concentration of activities in the traditional core (heritage area) and central areas.

This owes much to KMC's role as Nepal's main place for worship (e.g. pilgrimage), commerce and trading. Kathmandu City and its adjacent municipalities also serve as the regional center for higher education and health services. In addition to the need for more lands for the expansion of these urban services and facilities, the city is severely constrained by old and non-framed buildings (e.g. brick, mortar-based) in the core area. The problem is compounded by fragmentation of land parcels and partitioning of old buildings, many extended vertically and horizontally with the same amount of footprint and possibly without the guidance of trained masons and/or engineers.

A great number of the transient population also exists. The transient population is distributed in the core and in the central areas determined by the services offered (e.g. work, education, social functions). The main reasons for coming to the Valley (especially in Kathmandu City) are work, higher education, medical check-ups, pilgrimages, bureaucratic formalities, visiting relatives, internal tourism, and official visits. In the last five years, people seeking jobs overseas have constituted a large proportion of the transient population. The nature and flow of population depends upon the time of year and festivals. Industrial and residential expansion. Urban growth through industrial location or expansion may have been due to new industries just outside of the ring road to the north. Agricultural areas are preferred sites in the urban fringes over low-lying vacant lots in city centers and inner cities. This contributes to the conversion of agricultural lands.

Private-led development (malls and residences). Similarly, new residential areas prefer agricultural or open sites essentially because of lesser problems in consolidating fragmented inner land parcels. Demand for urban land is concentrated in areas where new industrial sites or service centers are located. This further puts pressure to the remaining agricultural lands.

More suitable lands are owned by large private developers and wealthy residents who may have banked sizeable quantities of agricultural lands so they could resell their better located properties or develop them for high-end markets. This leaves low-income groups to locate themselves in less suitable and high-risk areas.

### *4.3.4. Settlement Risks to Natural Hazards*

The Great Gujarat Earthquake that hit India in January 2001 revealed the vulnerability of "non-earthquake-resistant" cities and villages. The earthquake killed approximately 20,000 people and destroyed over 300,000 houses. An even closer comparison is the 2010 Haiti Earthquake which killed in excess of 250,000 people and left more than 2 million homeless. The physical vulnerability of Kathmandu is not any better than Port-au-Prince in Haiti; to some extent it is even worse because of the types of buildings and the very high concentration of construction. Compared to the Gujarat region, Nepal lies closer to the subduction zone where the Indian plate passes under the Tibetan plate, and may actually be susceptible to even larger earthquakes. In 1934, an earthquake of magnitude 8.4 caused serious damage to 60 percent of the buildings in Kathmandu Valley (Figure. 4.11), killing about 4,300 people. Probability studies suggest that the next great earthquake may occur at any time after around 70 years of silence. As population, buildings and facilities have increased many times more since1934, so does KMC's overall exposure to seismic risk.

The earthquake scenario that is expected to create significant destruction and disruption in the Valley is the Mid-Nepal Earthquake (Magnitude 8). This earthquake scenario has been set based on the seismic gap in the middle of Nepal. Except in mountainous areas, an MMI VIII is

expected to be experienced in the Valley under this scenario. If an aftershock of magnitude 7 occurred at a position nearest to the main rupture zone, Kathmandu Valley would experience MMI VII. Moderate liquefaction potential was identified in some areas along the Bagmathi River. The anticipated impact of the Mid-Nepal Earthquake scenario is as follows:

- Number of heavily damaged buildings: 53,000 or 21 percent of all buildings;
- Death toll: 18,000 or 1.3 percent of the total Valley population in the Valley; and
- Number of seriously injured people: 53,000 or 3.8 percent of the total Valley population.

Should the earthquake happen today, the losses will undoubtedly be several times higher because of the population in the Valley has doubled since 1991 (the date for the data of the JICA study) and the concentration of construction is much greater now.

According to an earthquake vulnerability assessment carried out by NSET, more than 643 school buildings or 66 percent of public schools in three administrative districts of Kathmandu Valley - Bhaktapur, Kathmandu and Lalitpur - could collapse given an MM IX earthquake. Figures 4.11 and 4.12 reveal the distribution of damages to buildings under different scenarios of ground shaking. Based on prior surveys conducted in the Valley by NSET, use of traditional building materials, such as adobe, stone rubble in mud mortar, or brick in mud mortar, is the leading cause of building school vulnerability, followed by lack of structural maintenance. Of the inspected buildings, 10-15 percent was found to be in very poor condition, many with roofs on the verge of collapse or walls that could crumble at any time (Table 4.2).

This is an alarming observation given that schools could play a significant role in the aftermath of an earthquake as they are typically well-distributed throughout the communities and could be used as temporary shelters. Initiatives by NSET to reduce the vulnerability of schools included (a) training of masons on issues related to building earthquake-resistant structures, and (b) training of teachers, parents, and children on earthquake preparedness. (EMI, 2005)

Buildings constructed with brick and mortar and without competently designed frames that tie the brick walls together are typically more vulnerable than buildings made of reinforced concrete. Many of the buildings in the core area are made of brick and mortar. Age, lack of maintenance and structural transformations have further weakened these buildings and made them extremely vulnerable. These are the reasons for the higher estimates of damage in the core and adjoining wards. Most reinforced concrete buildings in Kathmandu also exhibit high vulnerability because they were designed and build without any consideration to earthquake loads. They will not be able to sustain prolonged shaking and swaying induced by strong earthquakes, but to a lesser degree than the old brick buildings. Among concrete frame buildings, older ones (20 yearsand more) will tend to be more vulnerable, in general because of advances in concrete technology and effects of age.

Figure 4.13 shows the distribution of buildings based on the type of materials, as classified in the 2002 study.

Figure 4.11 provides a damage distribution map of the 1934 earthquake. The figure shows that majority of the building damage are concentrated in the Core area and the wards immediately surrounding it, particularly the Central areas.

The Mid-Nepal Scenario, similarly points to the same Core area of Kathmandu City as a very high risk area. Note the cluster of red grids in Figure 4.12. The Central areas, as well as the wards around the core are similarly at high risk. Based on the distribution of buildings, following the dominant type of material in that grid, as shown in Figure 4.13, and the likely greater number of buildings in the Core, the more catastrophic building damages are likely to be more in the Core. The dark and light green areas towards the periphery of Kathmandu City may indicate lesser buildings constructed

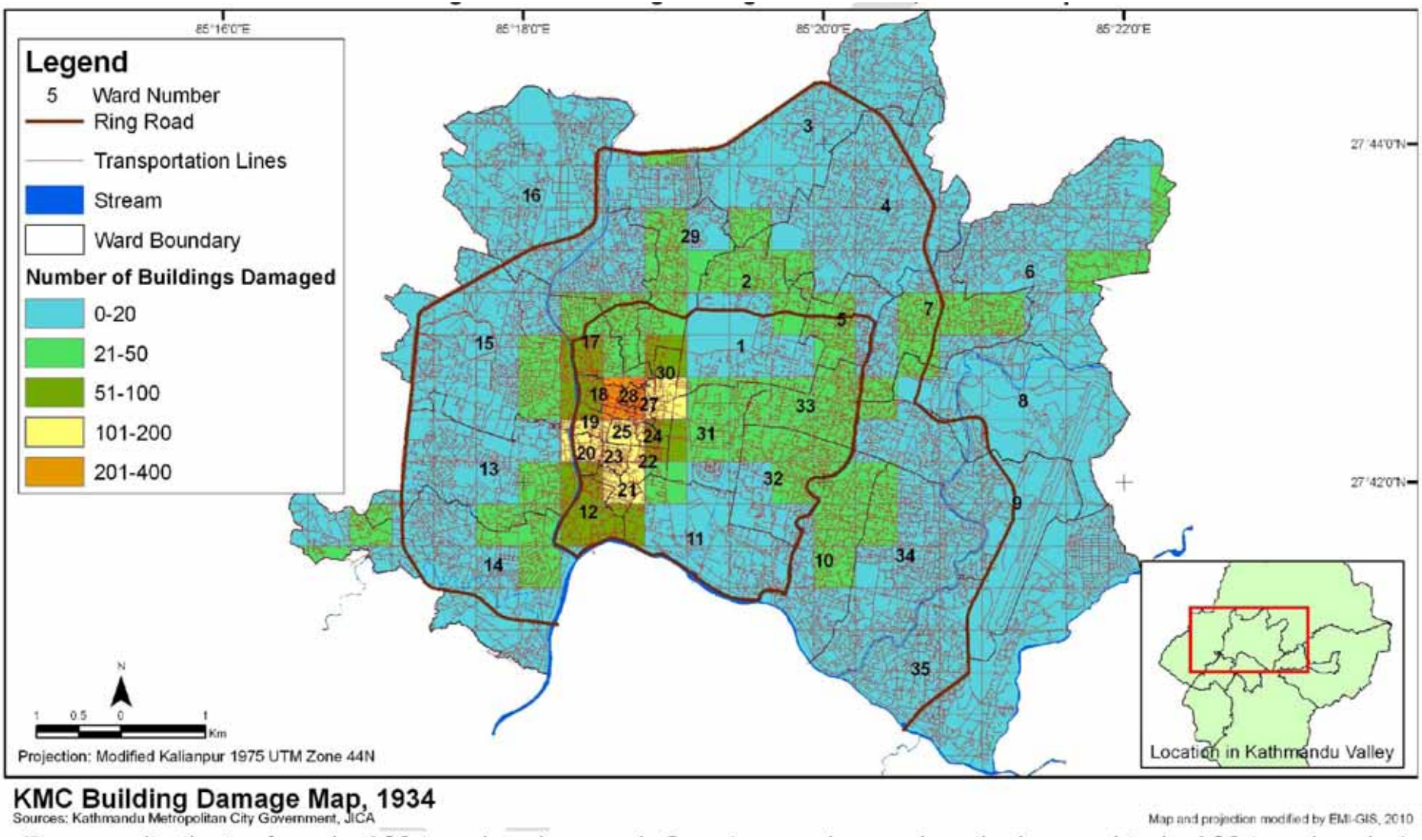



Figure 4.11 Building Damage Distribution, 1934 Earthquake

(Damage distribution from the 1934 earthquake reveals Core Area as the most heavily damaged in the 1934 earthquake.)

Table 4.2 Social and Human Vulnerability of Municipalities in Kathmandu Valley

| Name | Population | Death | (%) | Injured | | | | Total | (%) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Severe | (%) | Moderate | (%) | | |
| Kathmandu District | 908,672 | 14,672 | 1.59 | 44,318 | 4.88 | 75,675 | 8.33 | 134,475 | 14.80 |
| Lalitpur District | 292,095 | 2,366 | .81 | 6,672 | 2.28 | 13,075 | 4.48 | 22,113 | 7.57 |
| Bhaktapur District | 187,059 | 847 | 0.45 | 2,251 | 1.20 | 4,883 | 2.61 | 7,981 | 4.27 |
| Total | 1,387,826 | 17,695 | 1.28 | 53,241 | 3.84 | 93,633 | 6.75 | 16,4569 | 11.86 |
| Kathmandu Municipality | 578,738 | 9,110 | 1.57 | 28,220 | 4.88 | 47,190 | 8.15 | 84,520 | 14.60 |
| Kirtipur Municipality | 43,802 | 224 | 0.51 | 582 | 1.33 | 1,313 | 3.00 | 2,119 | 484 |
| Kathmandu VDCs | 286,132 | 5,148 | 1.80 | 15,516 | 5.42 | 27,173 | 9.50 | 47,837 | 16.72 |
| Lalitpur Municipality | 145,399 | 1,656 | 1.13 | 4,727 | 3.23 | 9,074 | 6.20 | 15,457 | 10.56 |
| Lalitpur VDCs | 146,399 | 1,656 | 1.13 | 4,727 | 3.23 | 9,074 | 6.20 | 15,427 | 10.56 |
| Bhaktapur Municipality | 64,927 | 210 | 0.32 | 544 | 0.84 | 1,234 | 1.90 | 1,988 | 3.06 |
| Mhadyapur Thimi | 37,526 | 78 | 0.21 | 192 | 0.51 | 471 | 1.26 | 741 | 1.97 |
| Bhaktapur VDCs | 84,606 | 599 | 0.66 | 1,516 | 1.79 | 3,177 | 3.76 | 5,252 | 6.21 |

during the time of the earthquake study before 2002. Given the increases in population and the corresponding densification in the core in the past decade; as well as, the expansion of built up areas towards the periphery, this risk to damage distribution is expected to intensify over the same areas. An enlarged image of the Core and portions of the Central area in Figure 4.14 reveals Wards 18 to 30 are very high risk areas to building damage and human life loss.

Risk to life such as death or injury is likely to occur where severe building damage and collapse take place. Figure 4.15 shows that in the Core, where heavy damage or collapse is likely, death toll or its density is highest. Note that the Central areas follow suit in terms of casualties and calculated death toll densities. Figure 4.16 shows an enlarged image of the Core and portions of the central areas, revealing the same Wards 18 to 30 as very high risk areas. Figure 4.17 reveals the distribution of moderate and severe injuries. The Core exhibited the highest intensity in terms of injuries per unit area (greater than 2000 persons per sq. km); but a greater concern is the wider coverage of these intensities, 500 to 2,000 persons per sq. km, indicating tens of thousands of injured persons, which will be a real challenge for post event rescue and relief. The post-event emergency operations will also be severally impeded by lack of access due to debris and collapse buildings. Potential for fire following the earthquake and hazardous material release could further aggravate the impact of the earthquake on life loss. An enlarged image of the Core where moderate and severe injuries are expected may be seen in Figure 4.18.

As a summary, the anticipated disaster in the Kathmandu Valley under the Mid-Nepal Earthquake scenario is characterized by heavy damage of 53,000 buildings, death of 18,000 people and serious injuries to 53,000 more (based on 1991 census data). The risk to life in terms of number of deaths and injuries is More likely to be much higher over the same

areas considering today's density in buildings and population. A current inventory of building densities and characteristics, and the number of population and occupancy types need to be determined in order to get an image of the real conditions in Kathmandu City. These current estimates on risks are assumed to exist and continue to increase, and forms, in part, the basis of decisions in strategizing the land use and urban redevelopment programs in this RSLUP.

### *4.3.5. Natural Resources and Environment*

This section provides a description of the natural environment, based on limited available materials and prior assessments on the subject. A more detailed discussion of this section is included in the KMC Sectoral Profile.

**Flood, landslides 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 snow-fed from the Himalayas. Since the topography of the country is steep and rugged, 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. In July 1993, the Tarai region experienced a destructive flood that claimed the lives of 1,336 people and affected another 487,534. In 1998, floods and landslides again affected Tarai and other parts of the country including the middle Hill region killing 273, injuring at least 80, and impacting 33,549 families. The floods and landslides also ruined the agricultural sector, destroying 45,000 hectares of crops. Similar flooding occurred in 1999 and continues to occur annually.

**Fires.** Fires are a common hazard during the dry season (April-June) when it seldom rains and the temperature in the Tarai region can reach higher than 35∞ Celsius. Fires are prevalent in Tarai and Hill regions where 90.8 percent of the total population lives 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. A major fire blaze in 1999 killed 39 people, injured 10, and affected 1,065 families. The fire, with estimated total losses of NRs45.23 million, destroyed 1,035 houses, 52 cattle sheds, and 148 livestock.

**Earthquakes.** The risk from earthquakes and its impacts have been extensively discussed in the previous sections. A few important points can be repeated here:

- Nepal is a highly seismic area due to its position along major active tectonic setting caused by the subduction of the Indian plate under the Tibetan plate, which moves at a very high geological rate and has caused the creation of the Himalayas. Another generator of earthquakes in the Kathmandu Valley is the seismic gap zone in the middle of Nepal;
- Since 1255, where the earthquake catalogue starts, about 12 major earthquakes (all believed to be at least equal or greater than Magnitude 7 have affected Nepal. They include earthquakes in the following years: 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 killing 4,300 people and destroying 20% of all structures in the Valley and damaging another 40%. In Kathmandu itself, one quarter of all homes were destroyed along with a number of temples in Bhaktapur.
- Thus, the historical seismicity indicates a return time for earthquakes of M>=7 of about 75 years in the country
- In terms of intensity, the earthquake catalogue indicates that one should expect intensity 8 or greater to take place every 36 years on average and intensity 9 or greater every 75 years. These intensities will cause catastrophic damages in the city.
- More alarming is the fact that many of these earthquakes tend to cluster into two zones, one of them being around Kathmandu, where five earthquakes of M>= 7 have taken place since 1800.
- Even more alarming is the fact that physical

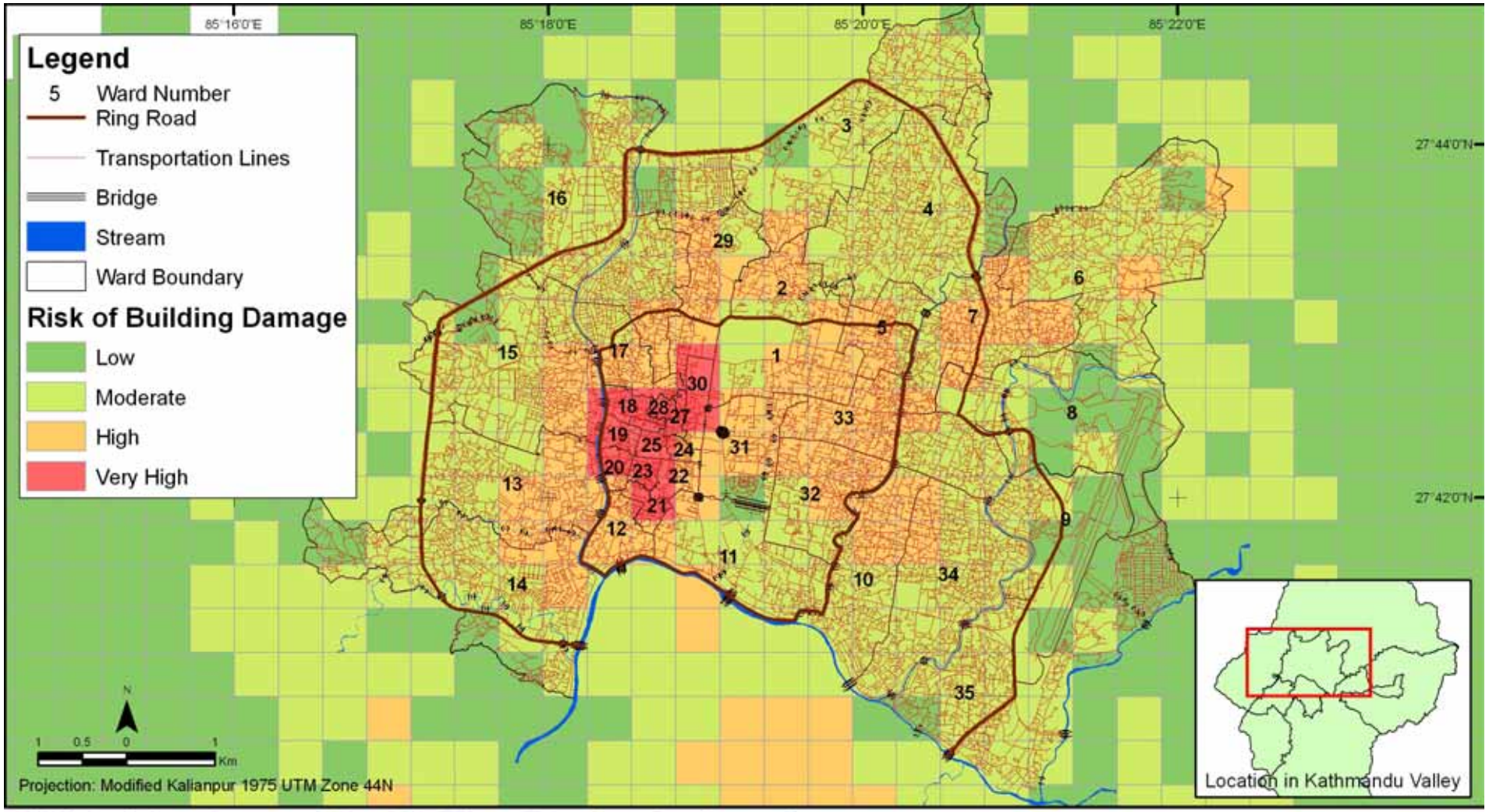



Figure 4.12 Building Damage Distribution in KMC, Mid-Nepal Earthquake Scenario
(Based on the Mid-Nepal Earthquake scenario, the core area of Kathmandu City faces very high risk.)

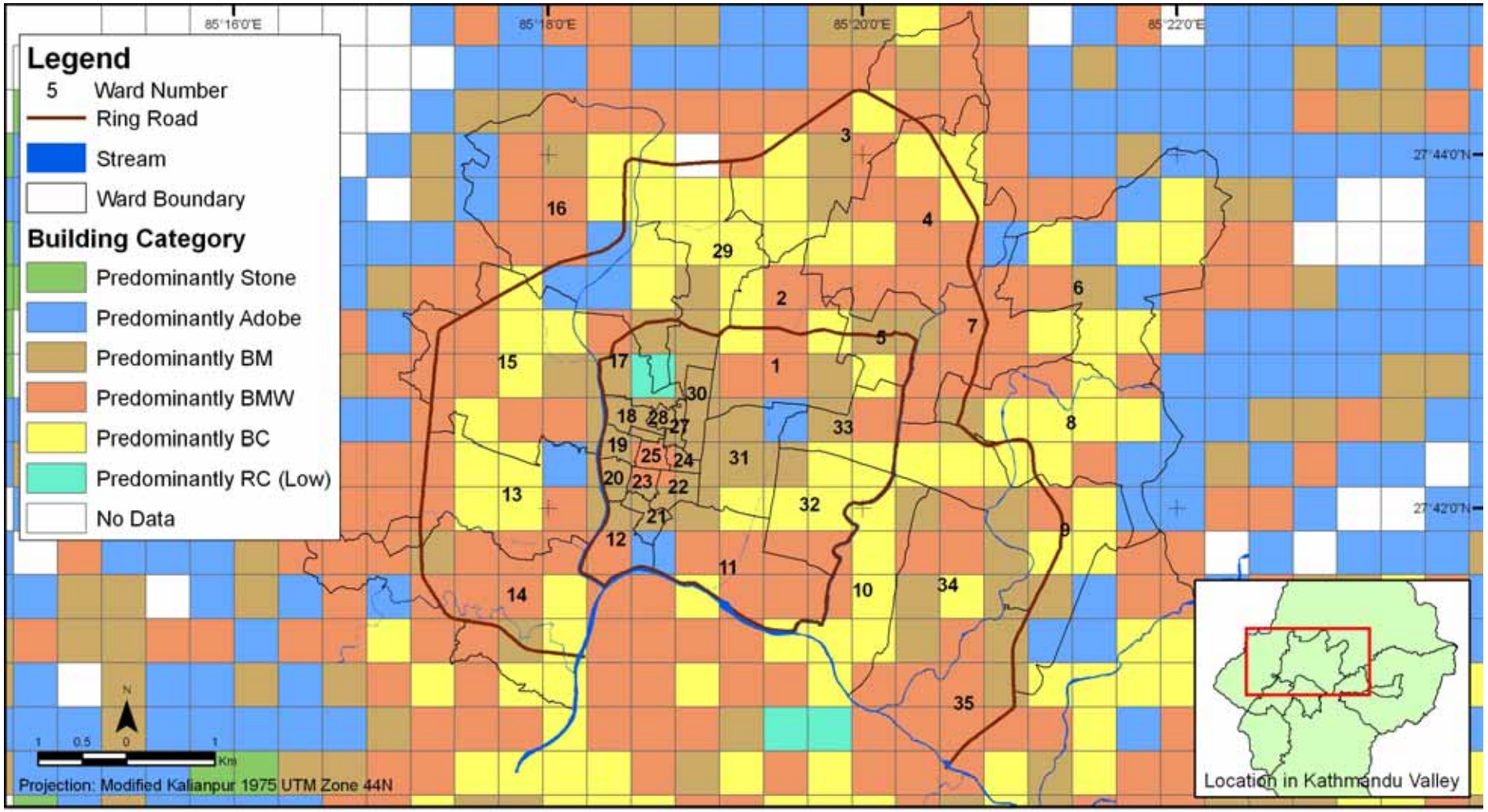



Figure 4.13 KMC Building Materials Inventory

(Use of traditional building materials, such as adobe, stone rubble in mud mortar, or brick in mud mortar is the leading cause of vulnerability and risk. The old buildings in the Core area are made of these materials.)

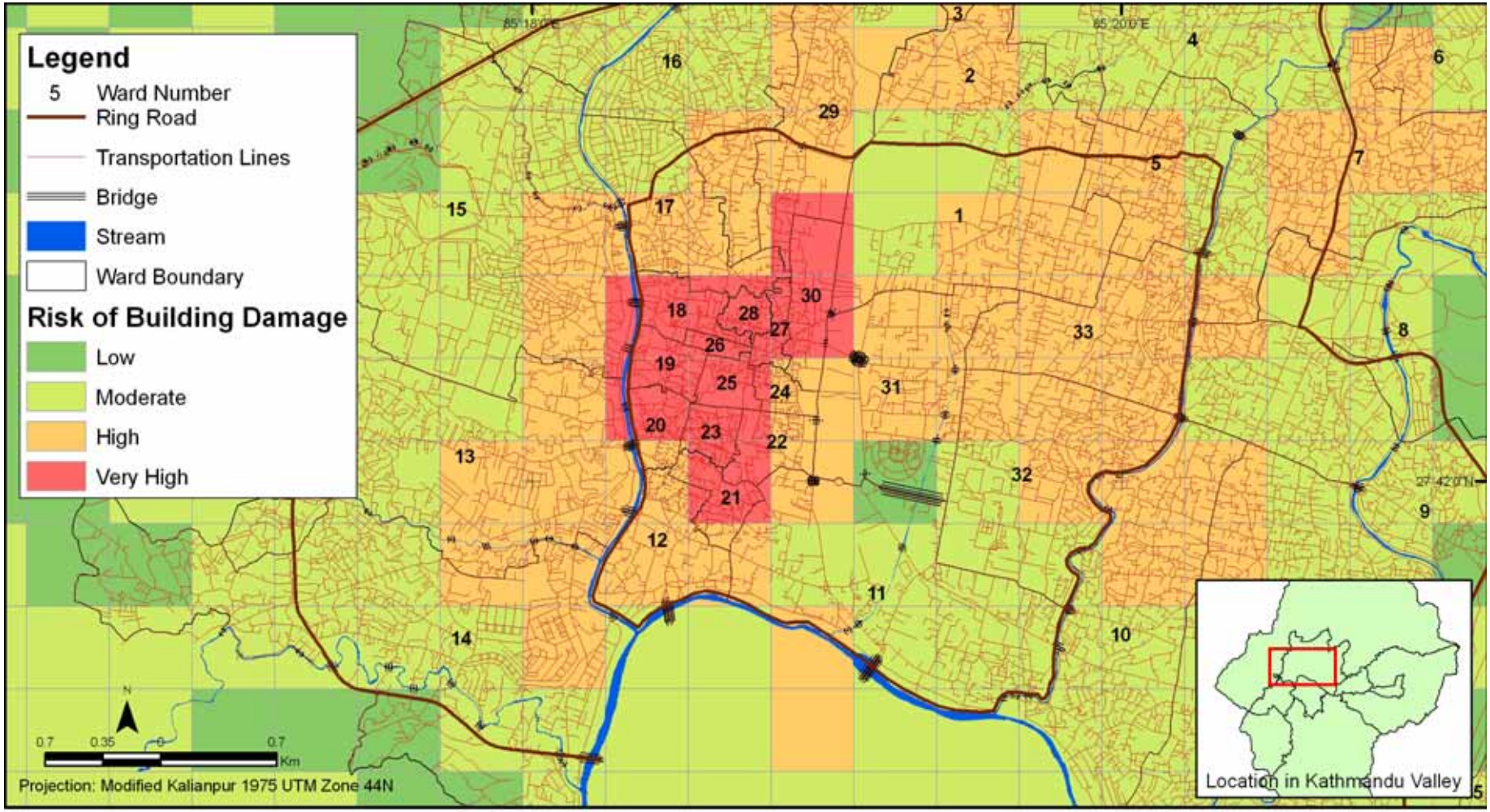



Figure 4.14 Building Damage Distribution at the Core Area, Mid-Nepal Earthquake Scenario
(Building damage is expected to be very high in Wards 18 to 30.)

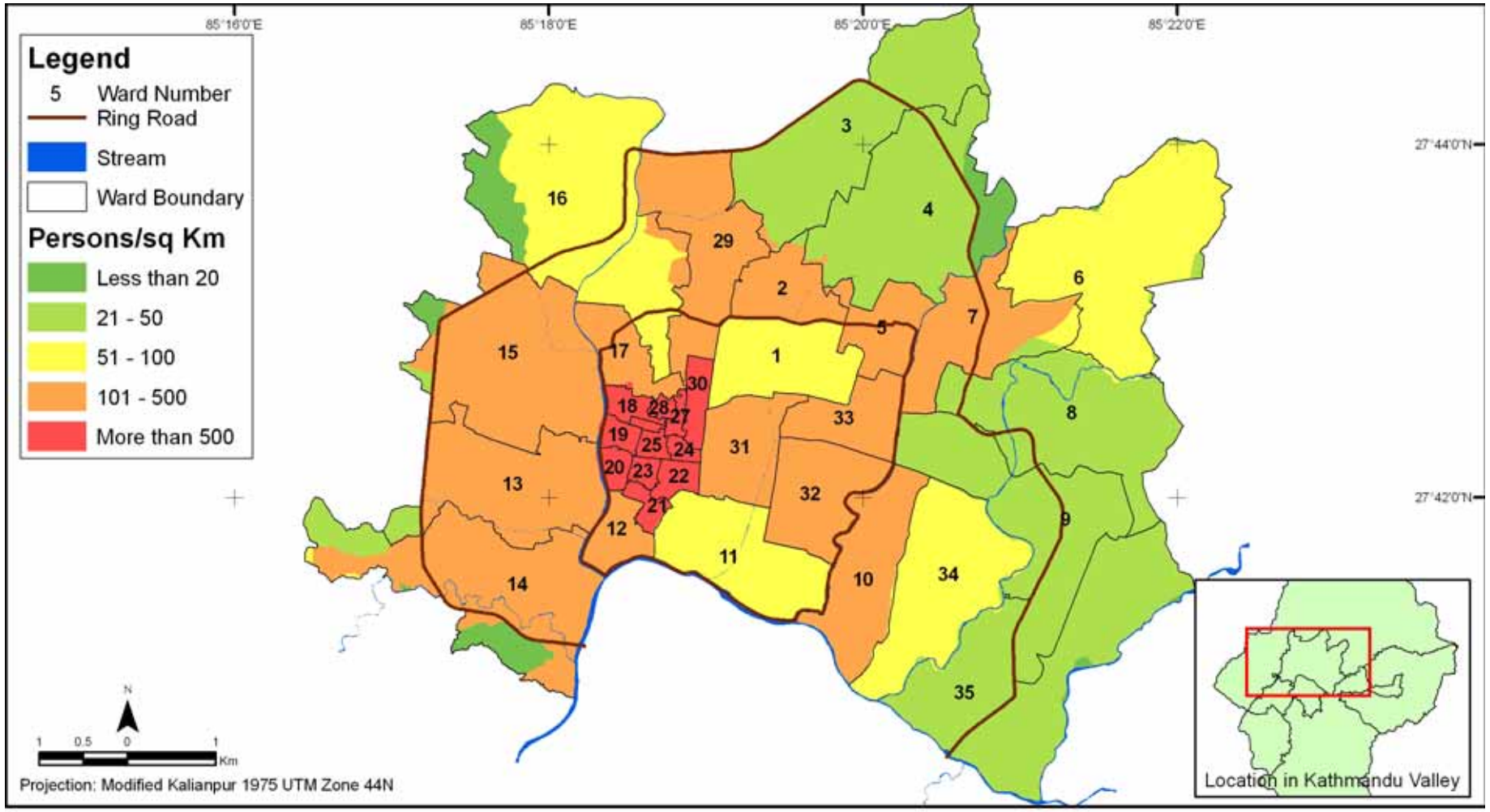



Figure 4.15 Death Toll Density, Mid-Nepal Earthquake Scenario
(At the Core, where heavy damage or collapse is likely, death toll or its density is also highest.)

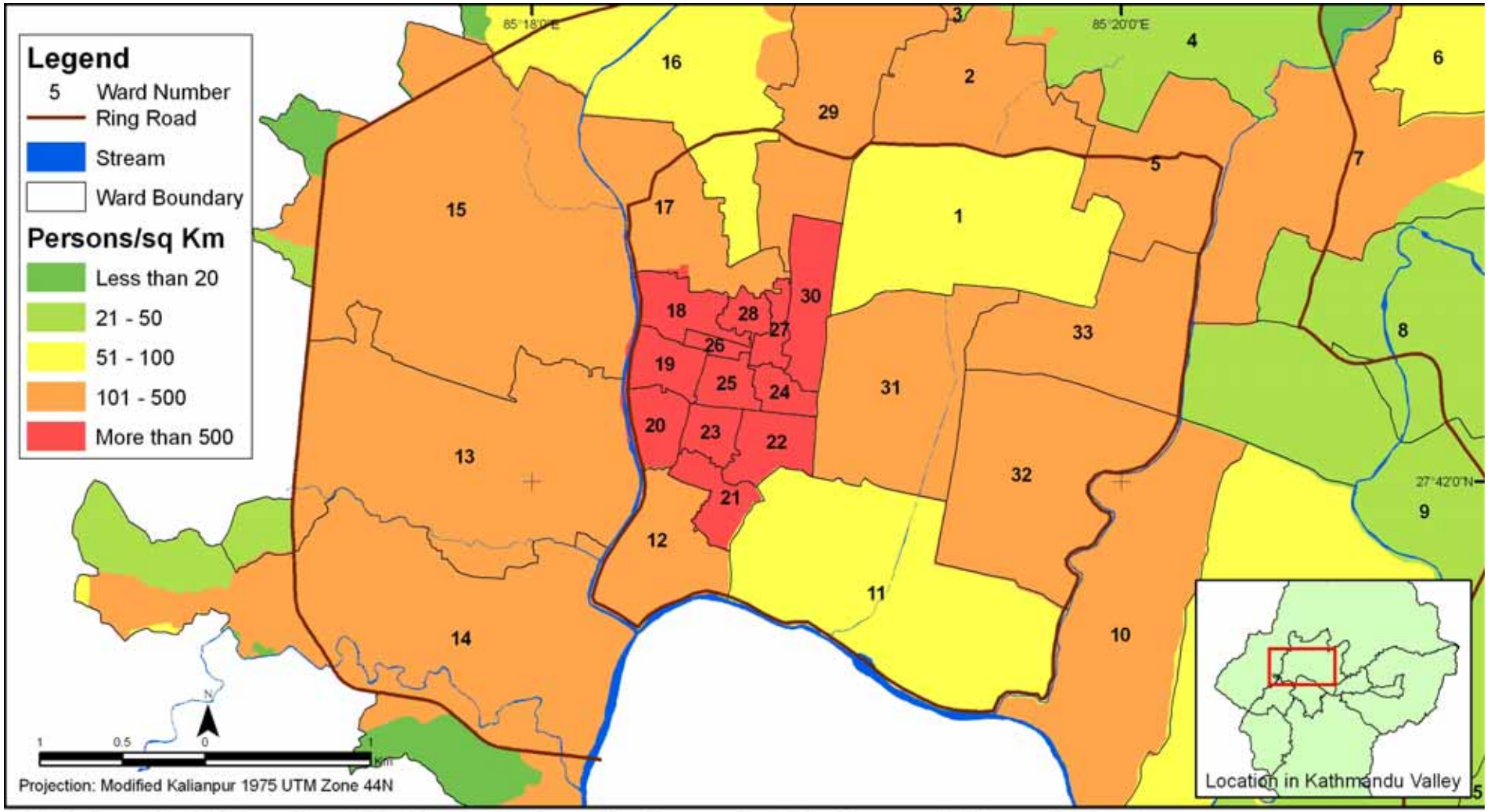



Figure 4.16 Death Toll Density near the Core Area, Mid-Nepal Earthquake
(Risk to life is very high in Wards 18 to 30.)

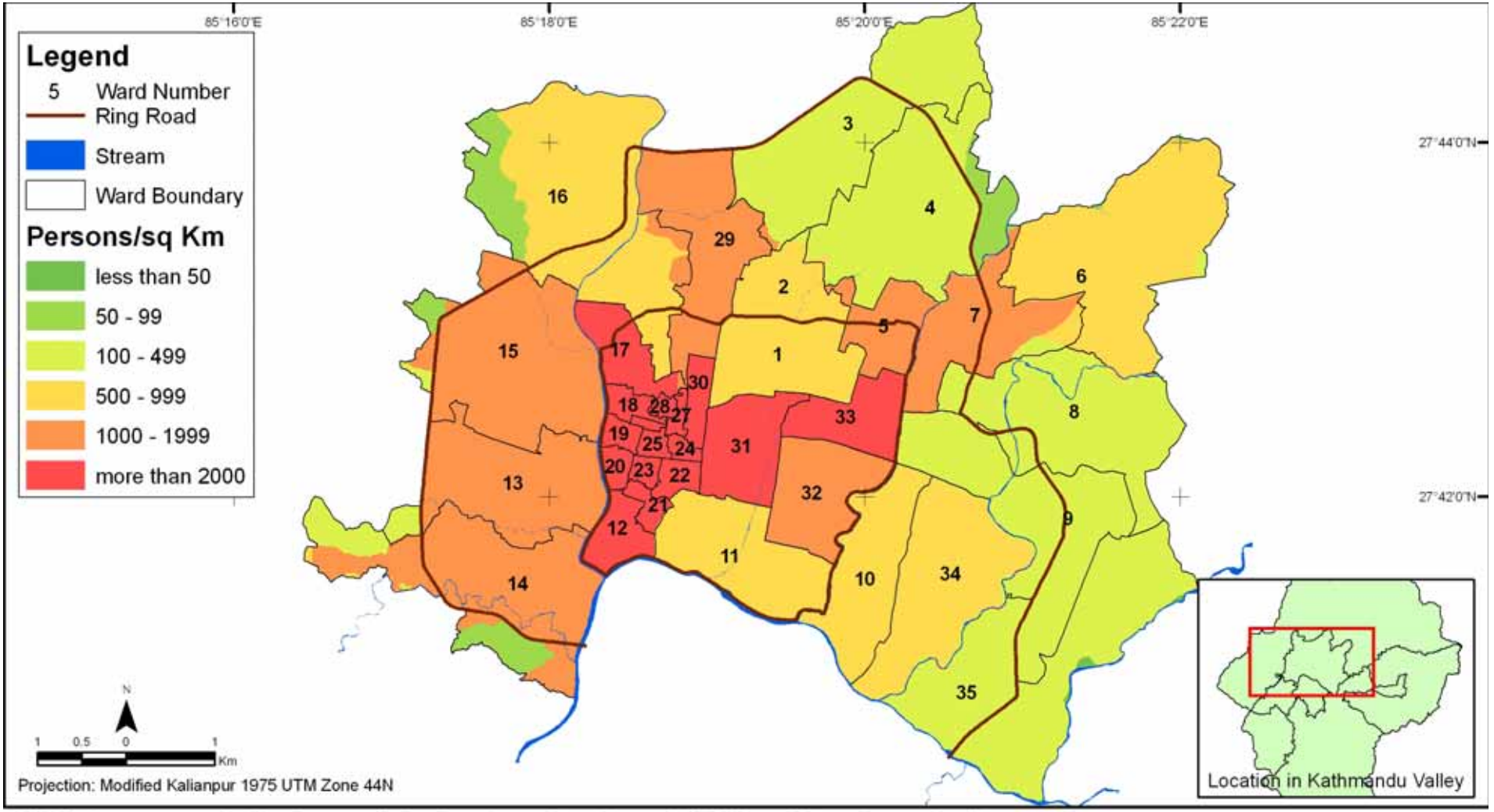



Figure 4.17 Distribution of Severely and Moderately Injured Map, Mid-Nepal Earthquake Scenario

(The highest intensity of injuries spread over wider areas (500 to more than 2000 persons per sq.km) indicates that there will be tens of thousands of injured persons that will be needing assistance in Kathmandu City.)

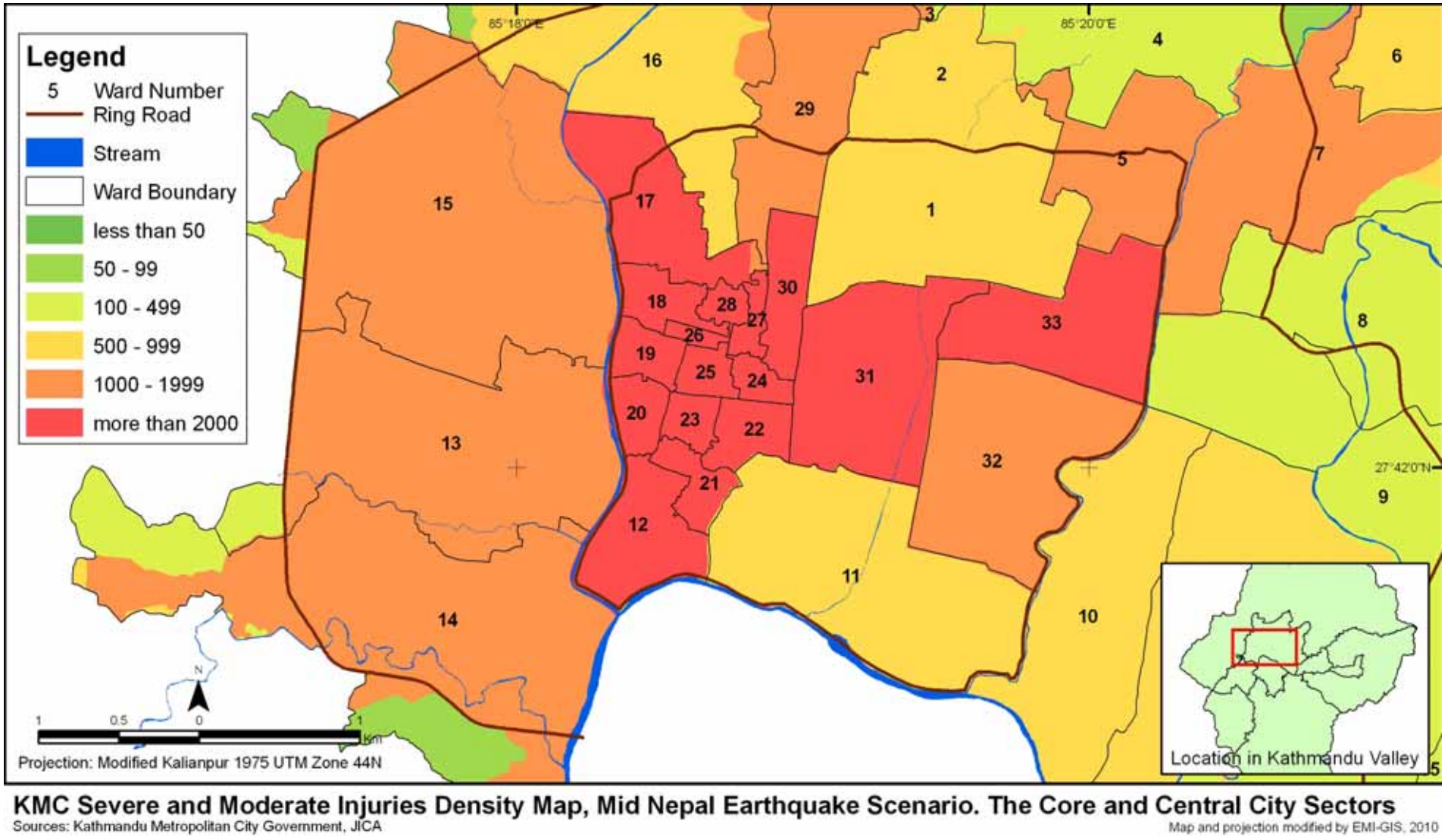



Figure 4.18 Enlarged Image of Distribution of Severely and Moderately Injured, Mid-Nepal Earthquake Scenario
(The highest intensities of person injuries over the different wards range from 500 to more than 2,000 persons per sq.km.)

vulnerability is extremely high because of a number of aggravating factors, including: The large number of old brick and mortar buildings, the lack of any consideration to earthquake loads in the design and construction of buildings and other structures, the lack of structural maintenance, the frequent structural modifications done to buildings to create open areas for commerce, and the high density of buildings. Kathmandu presents one of the most vulnerable environment to earthquake among the major cities in the world.

- The high potential for fire following and potential for hazardous material release that could follow an earthquake due to mix uses of residential, commercial and industrial functions, lack of enforcement of fire safety and hazardous material regulation, and basic safety requirements, as well as high density of buildings. These secondary hazards could aggravate the damage and losses from the shaking.
- The extreme difficulties that will be experienced after an earthquake to organize rescue and relief operations as well as to deliver any other emergency response function such as ensuring public safety and fire fighting, due to congestion, high level of debris on the streets and lack of access due to building collapse and debris
- The extreme difficulties in finding areas for staging relief operations, for organizing emergency response functions, for providing emergency shelter, and temporary housing due to the lack of open space in the city.
- Critical facilities such as schools, hospitals, public safety buildings, essential public buildings, banks, and others important facilities are likely to sustain heavy damages and not be functional after an earthquake.
- Damage to infrastructure mainly water, wastewater and sanitation, drainage, transportation system (including airport and main bridges), power, communication, fuel supply and food supply systems are likely to also be disabled for several days if not months.

These conditions are driving constraint parameters that need to be resolved in the RSLUP, through a change of vision and paradigm for development and through education and awareness. Strategies and actions of the RSLUP would be aimed at reducing vulnerability and improving emergency management capabilities.

**Degraded and denuding water resources.** According to a joint study by MoEST, ICIMOD and UNEP (2007) titled, "Kathmandu Valley Environmental Outlook," the Valley's surface water sources, such as rivers and "kunds", have received tremendous pressure from increasing population and economic activities. The pressure on these water sources has also increased over the years as the agricultural sector intensified its demand for water. Almost all major rivers have been tapped at source for drinking water supplies. This supply is only about 120 million litres per day (mld) during the rainy season and 80 mld during dry season, against the estimated daily demand of 170 mld (NWSC 2001). In dry season, 60-70 percent of the water supply comes from groundwater. Only 79 percent of the total demand for water of the urban population has been met. (MoEST, ICIMOD and UNEP, 2007)

The physical vulnerability of Kathmandu city is a result of several factors related to poor building planning, lack of land use plan and a supporting transport plan to guide development, and inadequate technical capacity and resources at the local government level to address infrastructural demands for health, water, sanitation, and safety. Over the years, the vulnerability of the population against natural and man-made hazards continue to increase and at the same time, continue to threaten the remaining resources and amenities, thus further eroding the quality of life of its residents.

These problems are cross-sectoral and the solutions in each sector need to be integrated in a plan (Figure 4.19). This has implications on future investment projects that need to be harmonized to achieve sustainability. For example, in principle, future constructions should not increase vulnerabilities or risks to already high-risk areas. Another example is that a proposed

decongestion in the core area should be accompanied by appropriate strategies for housing and possible livelihood or business opportunities in other areas of the city for those to be displaced or moved.

### *4.3.6. Land Use and Physical Framework*

**Shortage of habitable land.** The projected population of Kathmandu Valley in 2020 is estimated at 2.5 million compared to 1.6 million in 2001. (KVTDC, 2002) KMC has the highest gross population density in the city core and central areas at 437 persons/ha and 139 persons/ha, respectively, in 2001. This process of densification within the existing Ring Road, as well as the conversion of farmlands, are likely to continue (MoEST, ICIMOD and UNEP, 2007).

The same study by MoEST, ICIMOD and UNEP (2007) states that "rapid urbanization in the Valley has been guided by several factors such as a concentration of political and economic power resulting in employment opportunities and multiple activities; availability of urban basic services such as water, roads, electricity, and telephones; proximity to work areas such as administrative centres and industries; location of an international airport and tourist centres; push factors in rural areas such as natural calamities, unemployment, and social stigma." All these observations apply to KMC.

Taking the Mid-Nepal Earthquake Scenario as reference, riverside areas are vulnerable to liquefaction, while all built-up areas in KMC are prone to strong ground shaking. From an institutional point of view, the existing challenges to urban development, to include the increasing vulnerabilities, result mainly from a lack of land use plan for Kathmandu City and from the non-adoption or loose implementation of the Building Bylaws. (KMC, 2001) The study team similarly describes urban growth as follows: "The growth of settlements in the Valley is generally spontaneous, and there is very little planning intervention on the part of the government to guide its directions. The low-density urban sprawl and uncontrolled settlement development in rural areas similarly pose a challenge for urban managers because of the high cost of providing and maintaining municipal services." (MoEST, ICIMOD and UNEP, 2007)

**Continuing loss of open space.** In KMC, buildings are rampantly constructed over lots without the appropriate size or considerations for road rights-of-way. The lack of riverbank protection has resulted in the erosion of banks, encroaching into adjoining properties and putting the inhabitants at risk. Unplanned settlements and structures, built without consideration of natural hazards aggravates the situation. The importance of open spaces should neither be underestimated nor overlooked. As noted by Serote (2004), "Any city regardless of the amount of land available must maintain a network of public open spaces. The social, cultural and ecological function of open space is vital to any level of settlement. In socio-cultural terms, the value of public open space lies in providing a learning opportunity for citizens to recognize and respect the public domain. Public open space serves as the city's life support system and hence, must be kept in its open character."

**Increasing demand for urban land.** Kathmandu City is the oldest city in Nepal. Consistent with its central place functions, the services and facilities available in KMC also cater to regional needs (Kirthipur, Thimi, Bakthapur, among others), in addition to the local population's.

**Conversion of agricultural lands.** Due to an increasing demand for urban land, existing agricultural lands continue to be converted for urban development. Using up open areas in the fringes appears to be the easiest approach to meet this demand. The land pooling experience by KMC applied only to fringe areas where cost and rearrangement are still manageable. Hence, attempts to pool land in highly dense built-up areas are quite unlikely but potentially useful to meet the demand for new spaces.

**Fragmentation of land parcels arising from inheritance.** Inheritances of common properties lead to dividing the same property among children and kin. As a result, a big parcel of

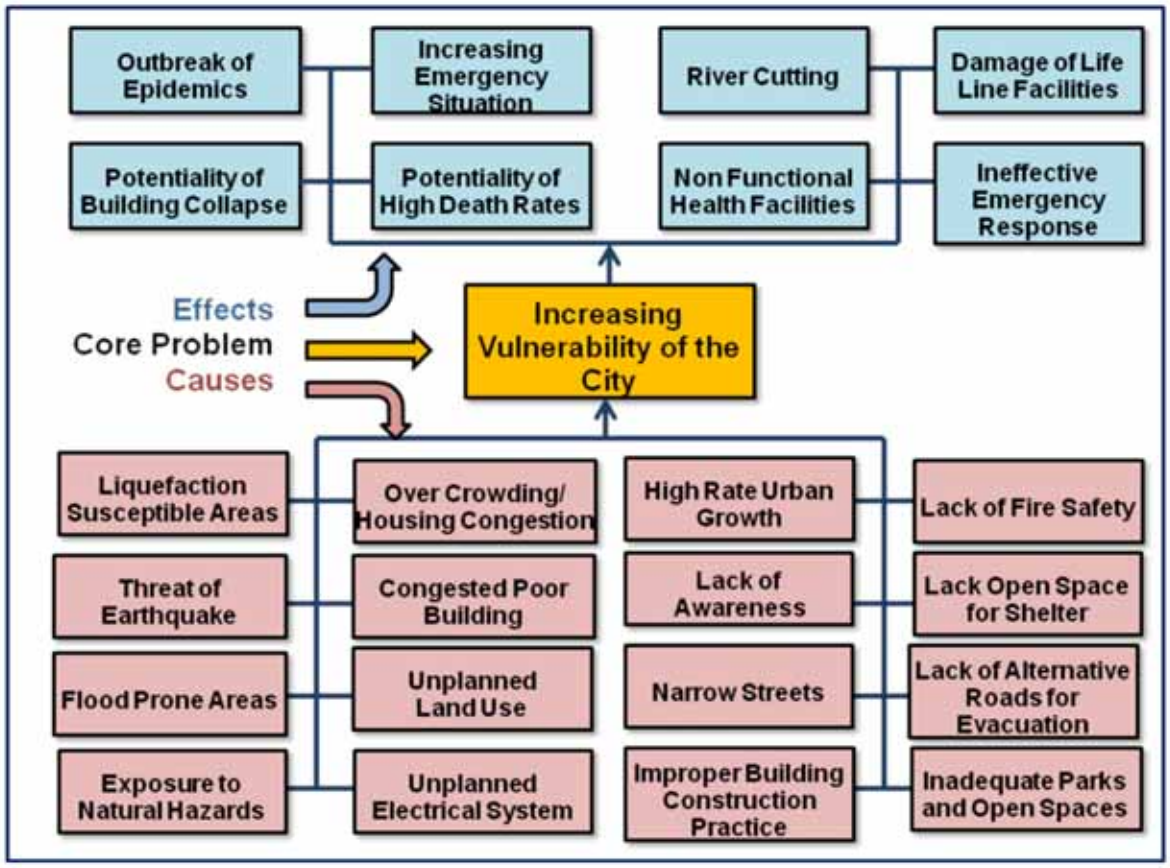



Figure 4.19 Disaster Management-related Issues and Concerns in KMC's Urban Development Process

land may be fragmented into smaller units in the long run, making the area more difficult to maximize or densify. Building spaces may similarly be partitioned to accommodate several households housed therein.

**Backlogs in infrastructure development.** Infrastructure development has not coped with the increasing demand for urban facilities and amenities. It has resulted in overcrowding, housing congestion, unplanned electrical system, lack of fire safety, narrow streets, lack of open space for shelter, and continued exposure to disaster risks, among others.

**Water supply and distribution problems.** Not all households and people in the Valley have access to safe drinking water. The dependency of households for drinking water on a variety of sources is shown in Table 4.3.

Based on the 2005 data from the Department of Drinking Water and Sewerage, less than 75 percent of the total population in the Valley enjoys safe drinking water. Table 4.4 shows the total population of each district and the percentage of the population receiving drinking water.

**Poor wastewater collection and treatment.** Dumping of sewage and garbage into rivers had resulted in poor sanitation and blockages of drains in the city. In most cases, wastewater flow is ultimately collected in storm sewers, as the sewage directly flows into the river without any treatment. The problem has been aggravated by the growth of settlements along the riverbanks. Shortage of water in the river, especially during winter, leads to rivers virtually being used as sewers, increasing pollution concentration. Illegal quarrying of sand also causes environmental problems along the riverbanks, severely affecting the structural safety of bridges at major arterial roads. (MoEST, ICIMOD and UNEP, 2007)

**Heritage area and environment deterioration.** If proper consideration is not given, the natural and cultural heritage will continue to deterio-

Table 4.3 Sources of Drinking Water
**Source: MoEST, ICIMOD and UNEP, 2007**

| | Kathmandu | | Latipur | | Bhaktapur | | Kathmandu Valley | |
|---|---|---|---|---|---|---|---|---|
| | HH | % | HH | % | HH | % | HH | % |
| Tap | 197,851 | 84.1 | 57,237 | 83 | 30,755 | 73.5 | 285,843 | 82.6 |
| Well | 14,714 | 6.3 | 6,745 | 9.8 | 4,843 | 11.6 | 26,302 | 7.6 |
| Tube Well | 13,478 | 5.7 | 825 | 1.2 | 2,977 | 7.1 | 17,280 | 5 |
| Spout | 6,082 | 2.6 | 3,099 | 4.5 | 2,632 | 6.3 | 11,813 | 3.4 |
| River/Stream | 195 | 0.1 | 113 | 0.2 | 29 | 0.1 | 337 | 0.1 |
| Others | 1,616 | 0.7 | 477 | 0.7 | 277 | 0.7 | 2,370 | 0.7 |
| Not Stated | 1,381 | 0.6 | 425 | 0.6 | 339 | 0.8 | 2,145 | 0.6 |
| Total | 235,317 | 100 | 68,921 | 100 | 41,852 | 100 | 346,090 | 100 |

rate because of environmental pollution which inevitably hampers further development of the tourism industry.

Conservation and preservation problems of heritage areas cover several aspects such as those related to institutional coordination, lack of proper preparatory inventories, lack of awareness and understanding about the culture and development pressures, deterioration of structures, loss of cultural significance and congestion. The World Heritage Organization's Integrated Management Framework for KMC's heritage sites described these in detail as follows:

a. non-compliance to building regulations

**Table 4.4 Population Receiving Drinking Water**
Source: MoEST, ICIMOD and UNEP, 2007

| Districts | Estimated Population 2005 | Population benefiting 2005 | Percentage benefiting |
|---|---|---|---|
| Kathmandu | 1,246,110 | 947,630 | 76.05 |
| Latipur | 366,010 | 286,250 | 78.21 |
| Bhaktapur | 244,130 | 152,270 | 62.37 |
| Total | 1,856,250 | 1,386,150 | 74.67 |

by old and new constructions at identified World Heritage Sites, especially at the Hanuman Dhoka Palace Square and Boudda monument zones. The issues pertain more on private buildings enveloping heritage sites, development pressures in heritage sites, and mercantile operations located in close proximity to the heritage sites which contribute to the wear and tear of the structures;

b. lack of inventory to provide intensive investigation of the historical and archeological heritage and the lack of inventory of the building stocks that may be required for retrofitting;

c. lack of community-awareness and appreciation of maintaining heritage ambiance;

d. permitting of the new buildings or alterations in the sites without permission from KMC; and

e. narrow streets and access to nearby safe open areas adds to the risk particularly in times of emergency.

**Air pollution.** Air pollution is caused by emissions from vehicles plying along narrow and winding streets, which is exacerbated by poor road networks and conflicting land uses In unplanned settlements. (See Section 8.3.1 of the Sectoral Profile for more discussion.)

**Electrical power shortage.** Not all households in the Valley have electricity. The proportion of households having electricity in the three districts may be seen in the Nepal Human Development Report 2001 (UNDP 2002). The overall proportion of households connected to electricity is approximately 95 percent.

**Dumping of solid waste.** Illegal dumping of solid waste is a common sight in unplanned settlements. These areas are either not served by the municipal solid waste collection system or the community is not well organized to handle the problem. (See section 8.1 of the Sectoral Profile for waste disposal issues and problems.)

### *4.3.7. Transport and Linkages*

The main road network inside the Kathmandu Valley consists of corridors, one from east to west and the other from north to south, along with a Ring Road surrounding the cities of Kathmandu and Patan. Several radial roads also exist; some radiating from the city core area and others from the Ring Road that are not constructed according to Nepal's road standards and possibly less maintained. Aside from these, there are 33 urban roads in Kathmandu District, 10 in Lalitpur District and 11 in Bhaktapur District. According to the Department of Roads' database, most of these urban roads are narrow and heavily built up on both sides.

**Bridges.** Since most of the bridges were built and supported by various foreign aid agencies, there is no uniform bridge design standard in Kathmandu Valley.

**Airport.** Nepal has only one international airport, the Tribhuvan Airport located in Kathmandu City. It has two terminals, one domestic and one international. The airport is built on terrace deposits with stiff ground. In case of earthquake disasters, if this sole international airport is damaged, not only Kathmandu Valley but the whole nation is in danger of complete isolation from the outside world.

**Perennial traffic congestion.** Roads and streets in Kathmandu City, like its establishments and institutions, do not serve the needs of the local residents only. They are also used by residents from other districts crossing the city to attend college classes, watch movies, shop, transact business with government and private offices, and attend religious functions and worship. All vehicles that carry this volume of traffic must converge in the traditional core and central area where almost all the traffic generators/attractors are concentrated.

Compounding the congestion problem is the inadequacy of the existing circulation network. The inadequacy of existing roads is acutely felt along the arterials or those roads that convey through traffic in the central area. All north-south and east-west vehicular traffic must pass through the central business district thereby aggravating the traffic condition in the city center. With the intention of increasing densities in the central area, and near surrounding areas of the core, the circulation needs to be improved.

### *4.3.8. Natural Hazard Risks to Buildings and Infrastructures*

The components of direct damage to Kathmandu City may include buildings for housing, commerce, industries, tourism, hospitals, roads and bridges and other economic or social infrastructure such as critical lifeline utilities (water, energy) and facilities (transportation, communication, sewerage). The impact can be expressed as a percentage of buildings destroyed or number of breakage points. However, an understanding of the severity of the impact of the damage on life, livelihoods, delivery of critical services, and potential for restoration is also important to acquire. These elements were discussed in other sections of the report including section 4.3.5.
**Risk to buildings.** There were no official building inventory data for Kathmandu Valley in the 2002 JICA study, and so the building vulnerability was estimated from the population and household distribution based on the 1991 census. This is to say that the total number of buildings was estimated and not obtained from field inventory activities. Data on building material used predominantly for building construction were used to assess building vulnerability. The age and height of buildings were not taken into consideration due to unavailability of data and constraints in doing detailed surveys. Among other elements considered were the damage on road network and utilities. Detailed and updated data need to be prepared in future studies. Thus,

the results of the JICA study are very informative of the relative distribution of the impact of earthquake but could be considered to be low estimates in absolute values. For the purpose of the RSLUP, the relative information on risk is very relevant to laying out a strategy and a rationale for land use and development. However, for emergency management purposes, absolute values of damage and loss are also important. Refer to section 4.3.4 for more discussion.

**Risk to roads and bridges.** The density of roads in the Valley, that is, 14 meters per hectare or 5.6 percent of developed land [1], is below international standards. Sixty percent of total vehicles run in roads of the Valley. With a surge in 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 in 2003-04. The total number of vehicles registered in 2005-06 was 27,262. The present trend in addition of vehicles in Bagmati Zone is estimated to be around 12 percent per annum. (Source: Sectoral Profile) Table 4.5 provides the vehicle registration in Bagmati Zone.

As shown in Table 4.6, the growth of motorized vehicles, especially buses, has been tremendous in the last five years. The number of three-wheelers such as tempos has remained fairly static, but the number of buses, including microbuses, has more than doubled in the same period. One of the consequences of this was an increased competition for passengers, with resultant congestion at passenger boarding points and unregulated rates. (See Chapter 7, Section 7.1 of the Sectoral Profile)

The road network within Kathmandu Valley is inadequate. It has experienced a large growth in the number of vehicles as urbanization takes place in a rapid manner. The number of vehicles continues to grow despite the lack of improvement in existing facilities and the disorganized traffic movement; thereby resulting in increased congestion and accidents. These in turn, have decreased vehicle speeds affecting road capacity. 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.

In view of the Mid-Nepal Earthquake scenario, several bridges are likely to be heavily damaged closing most of the access points in and out of Kathmandu City. Figure 4.20 shows the bridge damage distribution for the said scenario. The Kathmandu Valley Earthquake Risk Management Project (KVERMP) has estimated that more than 10 percent road length will be damaged and more than 50 percent of bridges will be impassable if an earthquake with Intensity IX hits Kathmandu Valley. (KVERMP, 1997)

Almost all bridges connecting the international airport are at risk. Most of them had not been

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**Table 4.5 Vehicle Registration in Bagmati Zone, 1998-2006**
Source: DoTM

| 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 |

Table 4.6 Annual Increase in Public Transport Units in Bagmati Zone, 2001-2006

| 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% |

retrofitted nor replaced, so in the case of the Mid-Nepal Earthquake Scenario, disruption of traffic may result in more losses. However, no detailed studies for earthquake loss estimation have been carried out after the KVERMP and JICA studies.

The parts of the road network that will play a vital role during an earthquake were identified and termed the Strategic Road Network for Earthquake Disaster Mitigation in the Kathmandu Valley (Figure 4.21). It includes the road network linking the Valley to other parts of the nation, to the international airport and boundaries, to districts, city centers, municipalities of the Valley, and to water sources in and around the Valley, etc. The Ring Road and other basic networks important for conducting socio-economic activities during normal periods were also included in the Strategic Road Network.

Figure 4.22 below shows the location of other critical facilities exposed to ground shaking and liquefaction under the Mid-Nepal Earthquake scenario.

### *4.3.9. On Incomes and Other Services*

The increasing pressure of urban development on a city has given rise to a number of other issues as discussed below.

**Loss of cultural heritage.** The rich cultural heritage of Kathmandu Valley is believed to gradu-

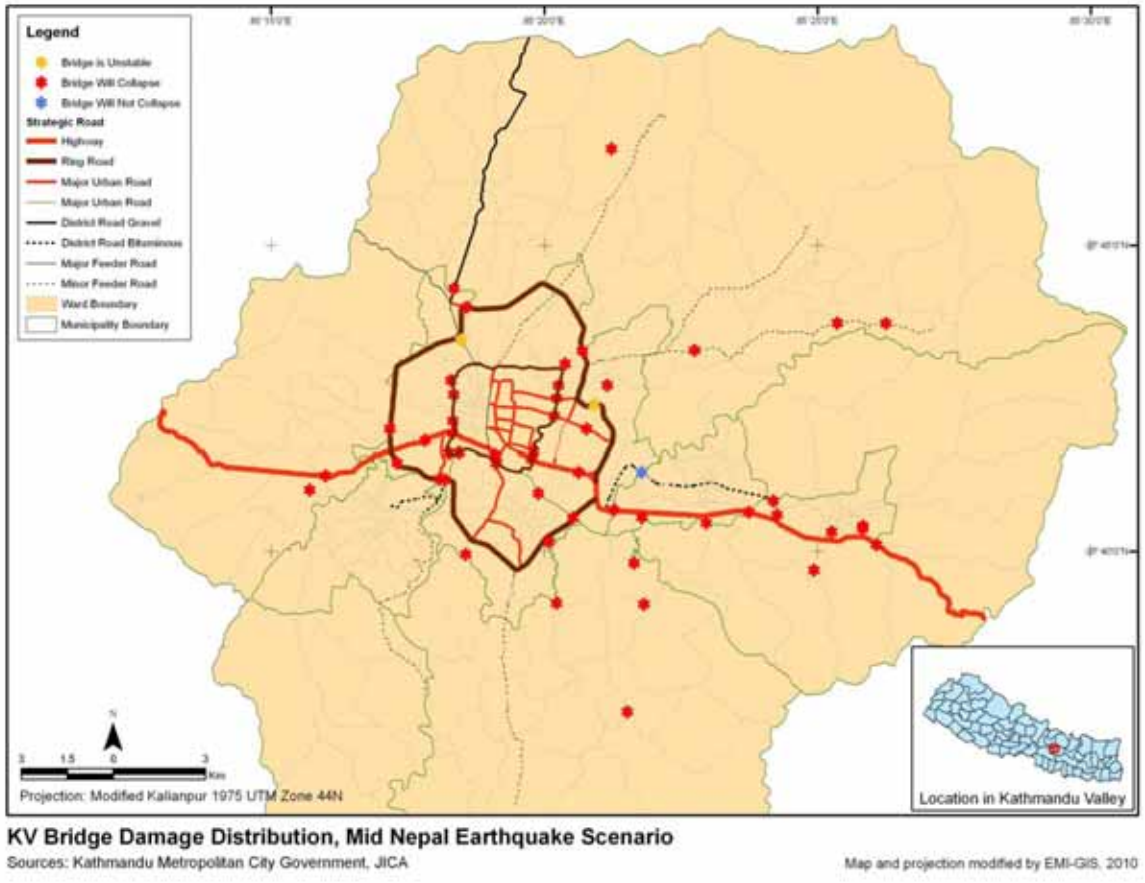



Figure 4.20 Bridge Damage Distribution, Mid-Nepal Earthquake Scenario

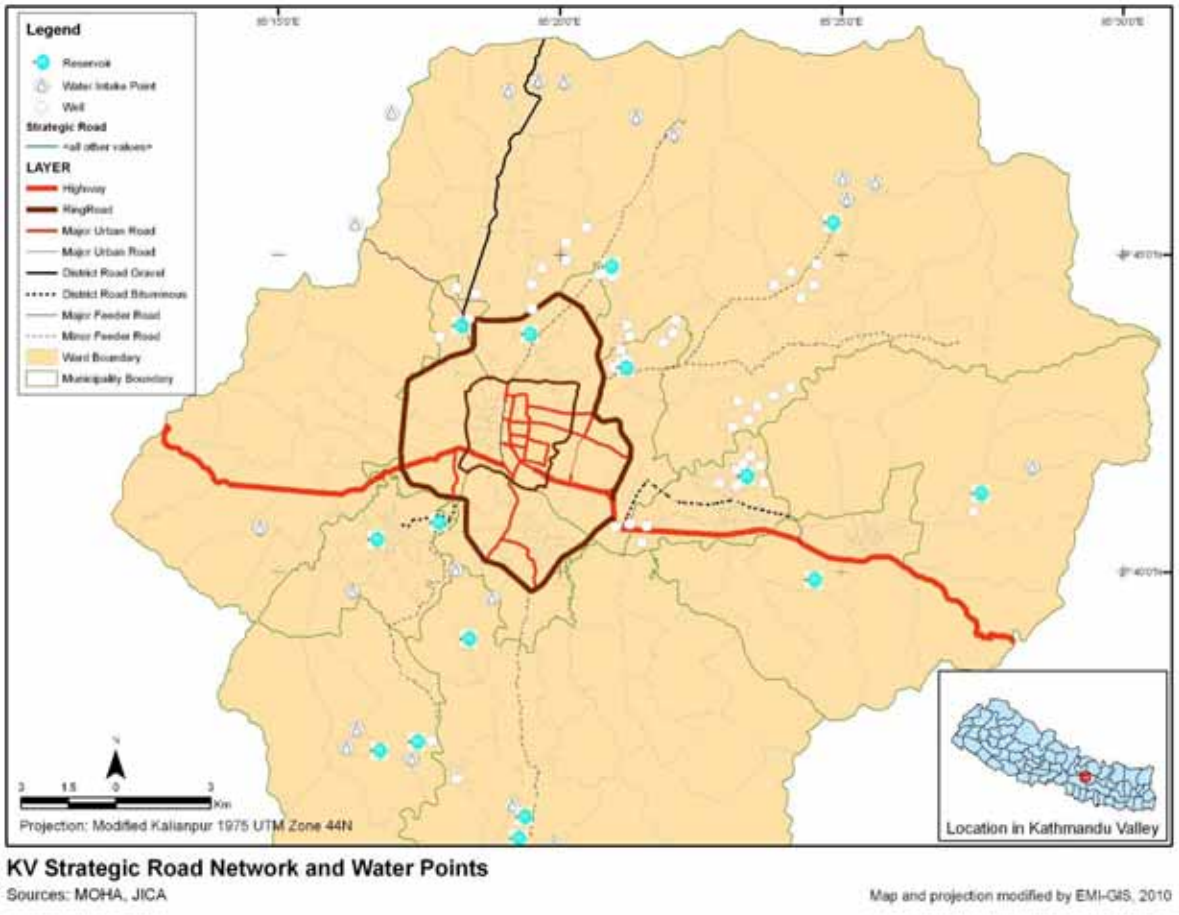



Figure 4.21 Strategic Road Network

ally eroding because of the excessive pressure of commercial activities. Historic ponds, courtyards, public rest houses, and grazing grounds and playing fields are being converted into private property. Similarly, public lands are being registered as private land for profit and speculation, while traditional 'guthis' (trusts), which looked after the management of public lands, have either ceased to exist or are inactive.

**Ineffective education policy.** Figure 4.23 indicates that too much politics and ineffective monitoring of performance of the education sector contributed to insufficient educational facilities and services resulting further in a less desirable quality of education. The number of school dropouts continues to increase, while a growing number of people are having less faith in the educational system because of incompetent graduates and limited employment opportunities.

**Increased crime rate.** Fig. 4.24 shows that the lack of skills coupled with poor quality living, had resulted in lesser possibilities of gaining employment. These may have contributed to the rise in criminality. Political cuddling and limited support in fighting criminality had translated into erosion of confidence in the police system and has allowed anarchism of unlawful elements in the streets, thereby decreasing tourism and lesser faith in the police system. Indirectly, this could have resulted in financial losses to the tourism industry as well as outmigration of residents. These perceptions and beliefs raised in the workshop need to be validated further in other studies.

Decreasing performance of industries (cottage and others). A report by MoEST, ICIMOD and UNEP(2007) notes the establishment of "Udhyog Parishad" (Industrial Development Board) in 1935 and the promulgation of the Company Act in 1936. This paved the way for industrial development in Kathmandu,Valley such as traditional cottage industries(e.g.,textile weaving (handlooms), brick and tiles, pottery,

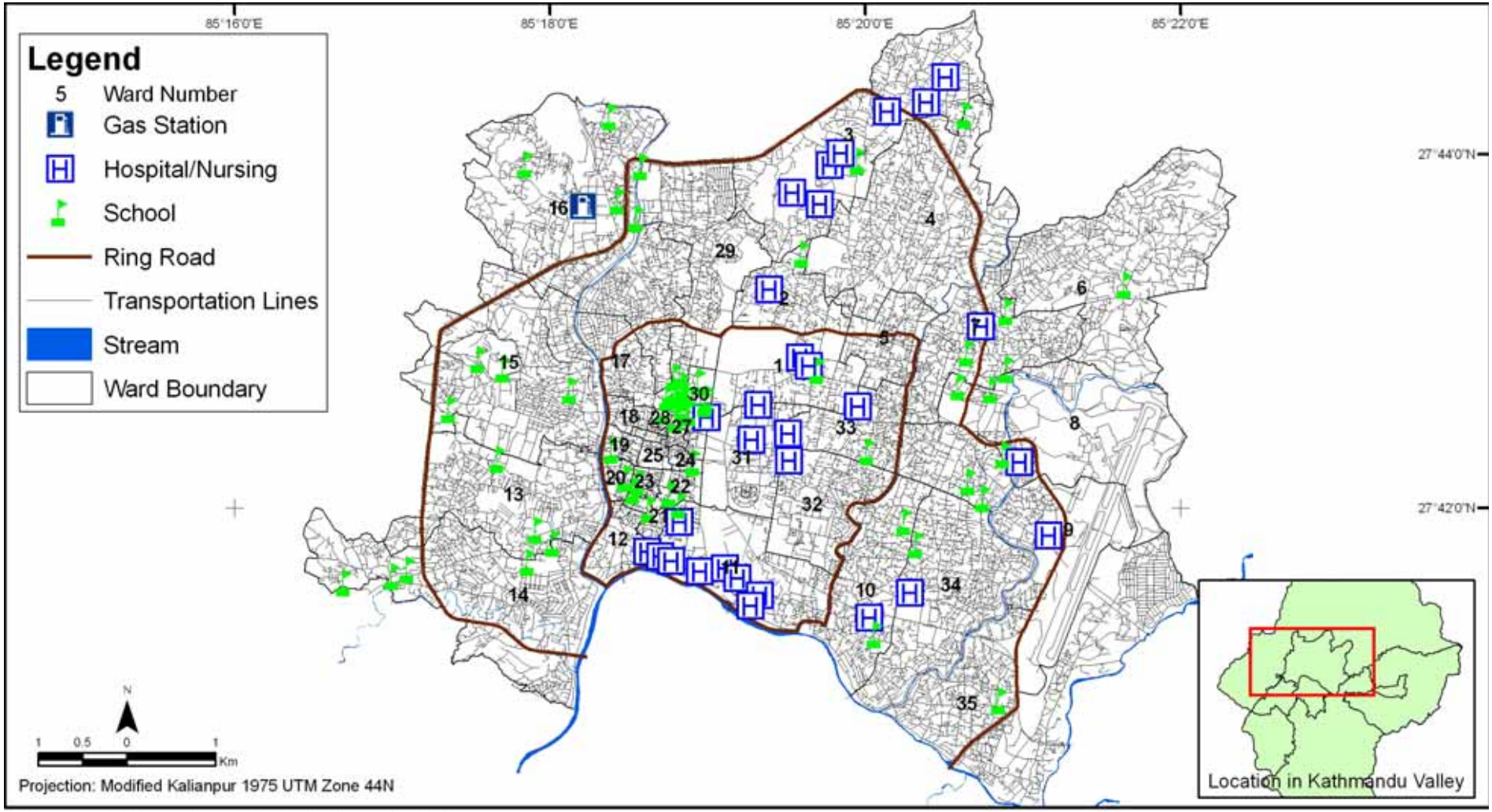



Figure 4.22 Location of Critical Facilities
(Most hospitals are located in the city center.)

handicrafts (e.g. idol making), precious ornaments, traditional food processing and preservation (such as rice milling, beaten rice, oil milling, sweetmeats, and traditional dairy products), wooden furniture and carving, bamboo crafts, traditional textile printing and dyeing, traditional art and paintings, copper and brass metal utensils, herbal medicines, forges, and cordwaining (leather crafts).

Inspite of these developments, the same report reveals other factors related to political rifts, power shortage, work-related disputes and insufficient government support resulted to poor investments and business closures. Where new services are becoming in demand, the lack of skills and possibly training and education programs for such services are hindering people to gain employment. As shown in Fig. 4.25, this resulted in seriously poor living conditions and rise in crimes against persons or the community in general.

**Weak institutional capability.** At the root of all these constraints is the weak capability or know-how of the local government to effectively plan and manage its territory (Figure 4.26). Decades of highly centralized power and resources and the dependence of KMC on the national government may have made it difficult to address growing concerns by its own; but slowly, steps had already been taken by KMC which includes this local planning activity. Henceforth, the KMC officials are sustaining a proactive stance in defining the direction and shaping the pattern of development in their territorial jurisdiction.

A 2007 study confirmed several of these perceptions and beliefs, noting the following points:

- Government is unable to acquire land because of financial constraints while private developers face difficulties in assembling land parcels.
- Developers also face difficulties in procuring land parcels from speculative landowners who either demand exorbitant prices

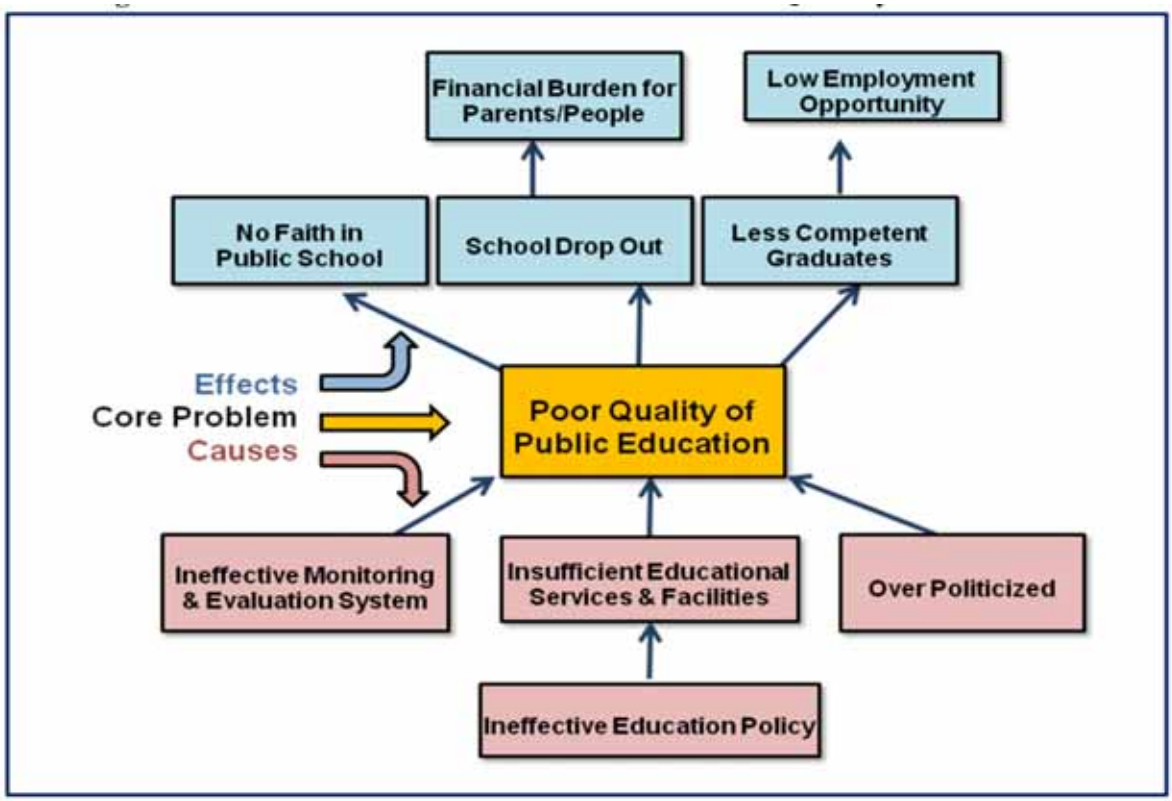



Figure 4.23 Social Issues and Concerns: Poor Quality of Education
(Too much politics and ineffective monitoring of the educational sector's policies and performance contributed to insufficient educational facilities and services.)

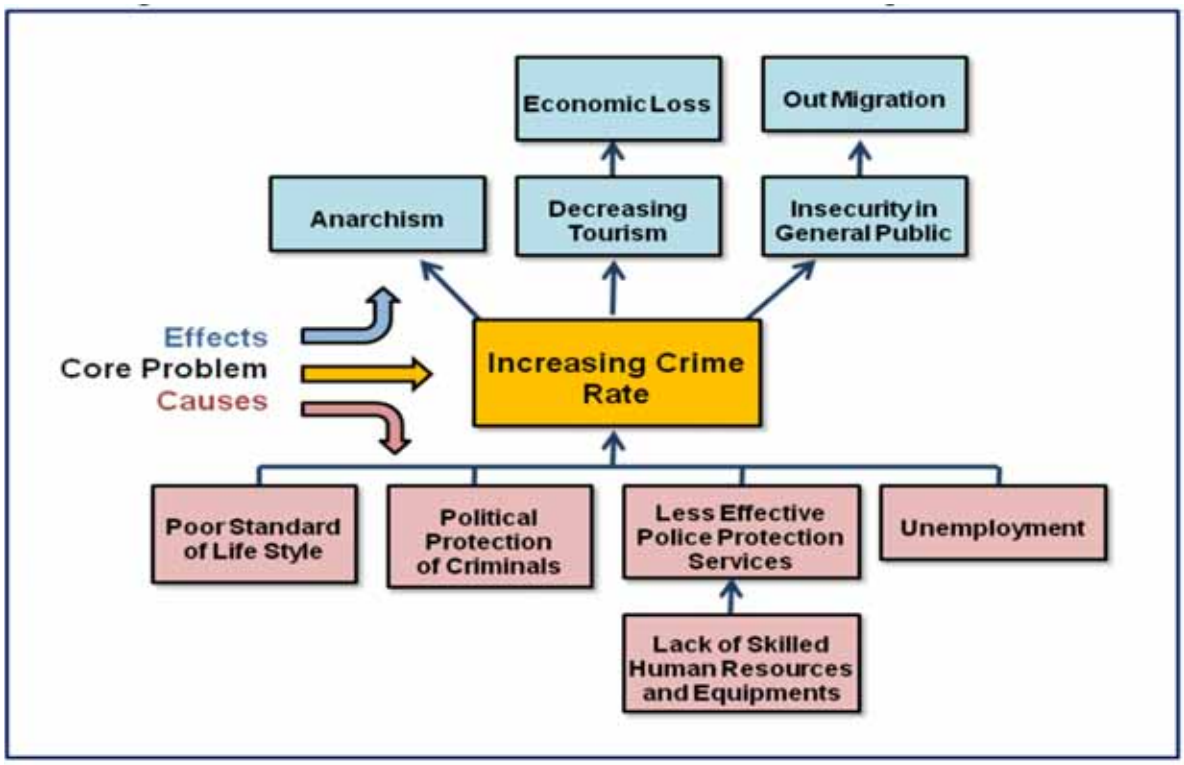



Figure 4.24 Social Issues and Concerns: Increasing Crime Rate
(Lack of skills, poor living quality and insufficient employment opportunities may have contributed to the rise in criminality.)

or simply refuse to sell the land. There is no legal tool that can be used to acquire isolated land parcels from uncompromising landowners.

- Although municipalities are spending a large proportion of their income on personnel expenses, they have very little trained manpower.
- Other institutions are involved in urban development and urban environmental management, but they have very limited resources and programmes.
- Most municipalities and other institutions that have responsibilities for urban environmental management do not have plans and programmes to combat pollution.
- Another major weakness of institutions is in regular monitoring and enforcing compliance with standards and regulations. Nepal has standards for ambient air quality and vehicle emissions, but these are rarely enforced. (MoEST, ICIMOD and UNEP, 2007)

### *4.3.10. Risk to services and livelihood means*

The location of establishments relative to the hazard-prone areas initially determines their exposure. However, the greater risks and negative consequences to the various sectors of the city are felt in the long term, especially if industries are too specialized and heavily concentrated in an area and may not be diverse enough to cope with losses. In view of the limited resource to study thoroughly the service functions of the wards in KMC and outside the Valley, the service functions defining the urban geo-spatial and economic fabric were based on a distribution of establishments from different industries in KMC. As indicated in Fig. 4.27, tourism is concentrated in Wards 1 (Central)and 29(North), with more than three quarters of its business establishments located in these areas. Estimated building damage in these areas are moderate to high. Much more critical are the tourism and services in the core areas which, unfortunately, are expected to experience the most severe damages and loss from an earthquake, and are likely to be completely disabled for a long period of

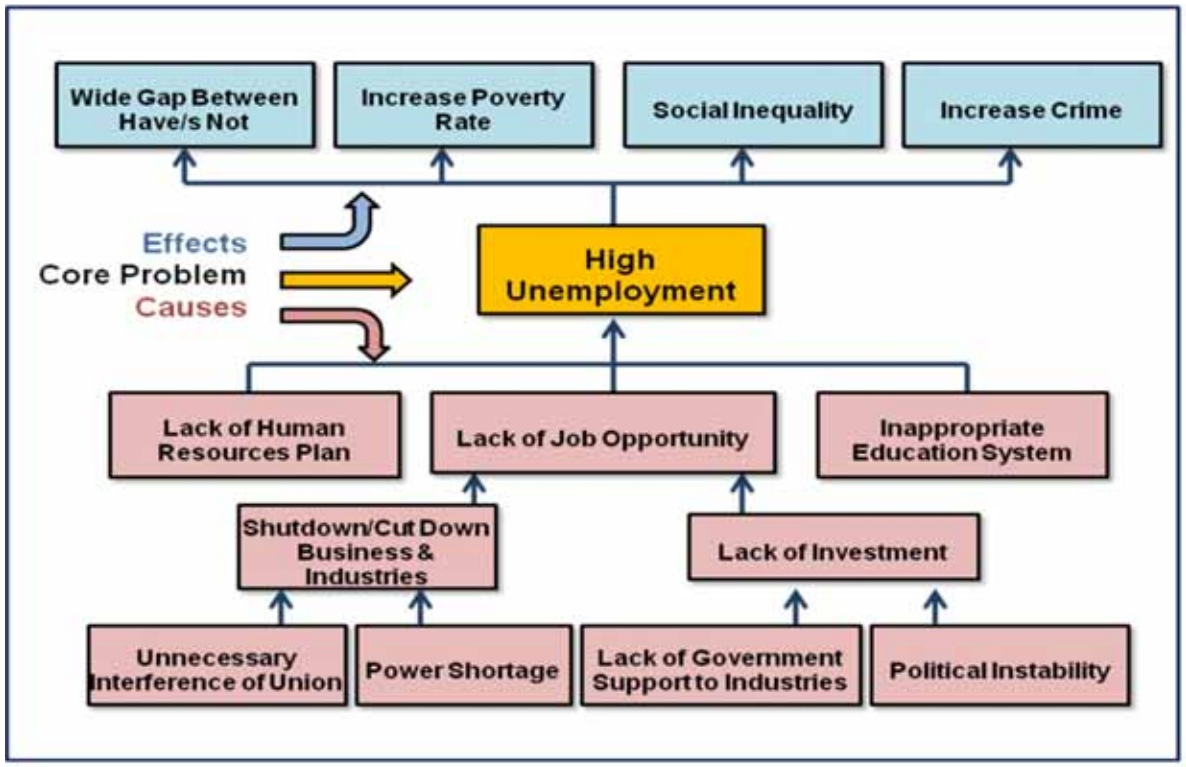



Figure 4.25 Social Issues and Concerns: High Unemployment

(Factors related to political rifts, power shortage, lack of government support to the cottage industries and work-related disputes had resulted in poor investments and closure of businesses. This in turn contributed to a lack of job opportunities, further raising the numbers of unemployed people.)

time. Considering the importance of tourism and service sector to the economic life and the livelihood means of the population, these are areas of high socio-economic vulnerability as well and should be addressed in the RSLUP.

Services are concentrated in the core area but dispersed in other wards. The manufacturing industries are located in the core, northern and eastern sectors. While damage or disruption to these services in the core are likely, a detailed study to fully understand the spatial relationships of these services is necessary to understand better the impact of the earthquake on the economy of KMC. Even with these limitations, removing non-compatible services from the core (heritage area) and relocating them to the periphery appears rational considering the need to decongest the area in order to reduce the exposure of the population. Such approach will reduce the risk in the long term but will also enable of more rational use of land and space.

The identification of appropriate places for relocation is indicative as of this time. Among the key considerations in relocation are the number and availability of other service functions in other wards, which should complement available services in these same areas, as well as the population density to support them. It is assumed that a population density of 60 persons per hectare would be sufficient to support neighborhood services. Based on the 2001 estimates and current projections, this density has already been exceeded in most areas of KMC and in other municipalities in the Valley. Even with these viewpoints and directions, several issues need to be further addressed, such as the implications of the building bylaws to existing constructions and urban form and the changes in travel demand these new centers will create, among others.

## 4.4. Goals, Objectives and Targets

Goals reflect the problems and the actions that may be taken to address them over a long period of time while objectives are more specific,

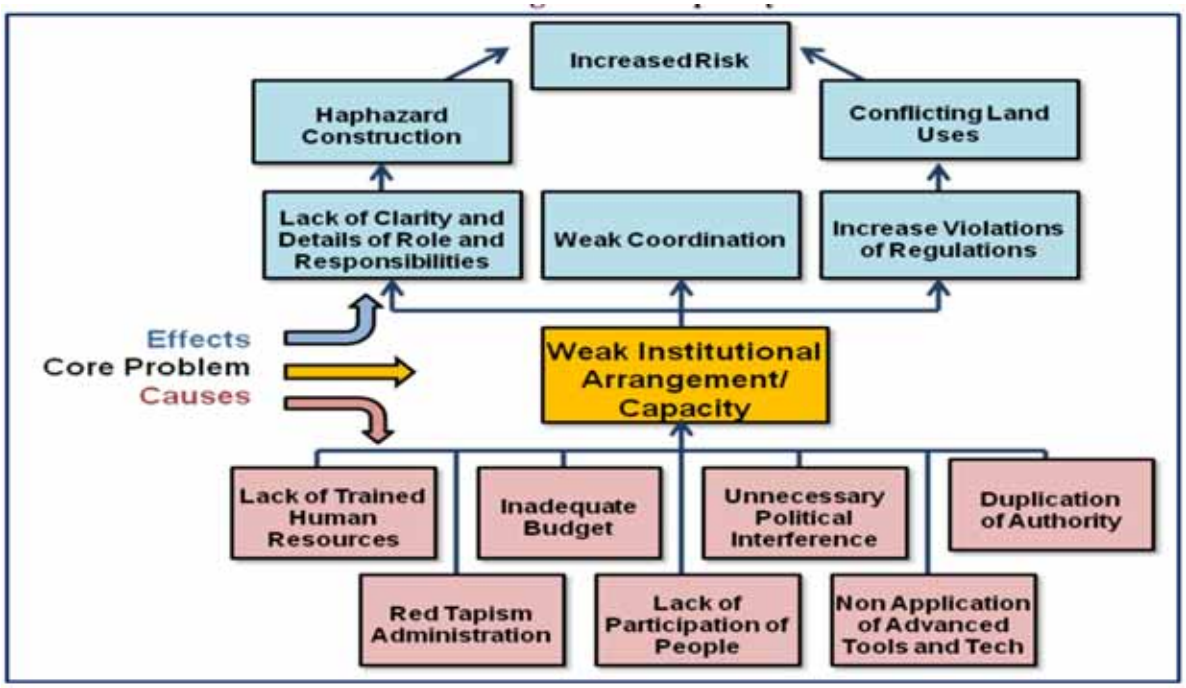



Figure 4.26 Institutional Issues and Concerns: Weak Institutional Arrangement/Capacity
(Weak capability or know-how of the local government to effectively plan and manage its territory has resulted in serious problems related to buildings, infrastructure and land use.)

measurable and time-bound. For KMC, the main problems identified and discussed may be translated into the following goals:

- Reduced and regulated migration;
- Reduced vulnerability and exposure to natural hazards;
- Improve emergency management capabilities
- Increased employment opportunity;
- Reduced crime rate and greater peace and order;
- Strengthened institutional capabilities to carry out functions;
- Reduced pollution; and
- Improved services.

To meet these development goals, they are broken down into manageable actions over short periods and become the objectives to be met. Strategies are then developed and described on how these objectives may be carried out. Tables 3.5 to 3.9 lists down the strategies that were identified and described by the PWC for the following sectors (a) population and settlements, (b) physical resources, (c) economy, (d) incomes and services and (e) land use and physical framework. Land use-related strategies are further detailed in the succeeding chapters.

### 4.5. Implications of Risks on Goals, Objective and Targets

Following the seismic risk information provided, the more important concerns that need to be addressed are those that pose threats:

- To public safety;
- To the sustainability of key production resources or employment activities;
- To the delivery of basic services; and
- To protected areas, flora, fauna, and other protected natural resources.

Hence, the analyses should focus on the implications of these seismic risk information to the development of specific settlements, production and protection land uses, infrastructures of Kathmandu City. The resulting problems and concerns arising from this evaluation should be translated into goals, objectives and targets for risk reduction and increased resilience. The succeeding Tables 4.7 to 4.11 are the outputs of these analysis and goals, objectives and strategies formulation. The land use strategies are the suggested policies and interventions so that sustain-

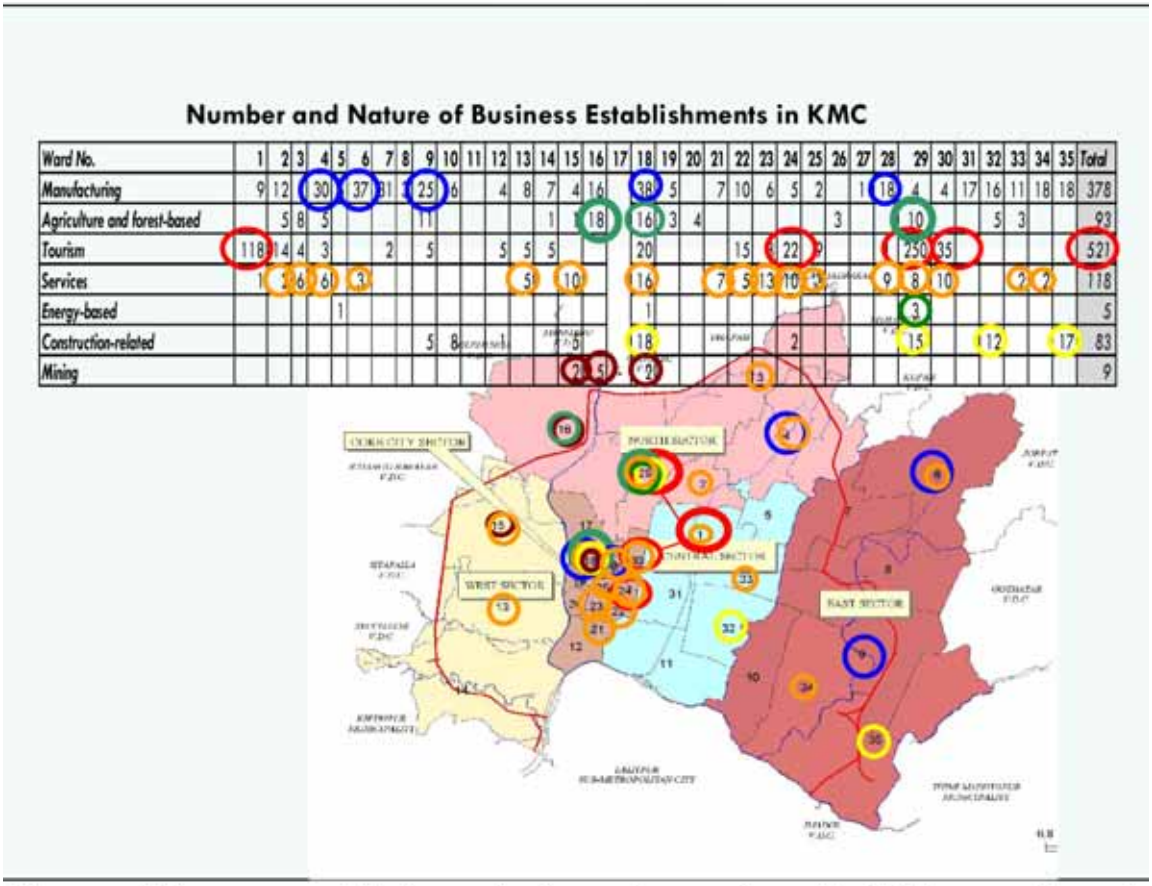



Figure 4.27 Concentration of Business Establishments in KMC
(Many establishments, especially those related to tourism, are located in KMC's core and central sectors, which are believed to be at high risk from earthquakes.)

able development may be carried through an appropriate land use plan and zoning ordinance. In general, the DRR measures may include one or several of the following approaches:

- Avoid or eliminate - remove a risk trigger or deny a risk- creating activity
- Reduce or mitigate - reduce the frequency or the severity by changing physical characteristics or operations
- Share or transfer - shift the risk-bearing responsibility to another party
- Retain - fund potential losses with own resources

## 4.6. Development of Spatial Strategies

The development of strategies started with a description of existing land uses in the city. Guided by the vision, goals, objectives and strategies to address the problems of development and land use in Kathmandu City, a framework for future physical development was reached through several meetings with KMC. The existing land uses, intensities of use and arrangement for the settlement, production, infrastructure and protection areas were based from the current land use map. Possible changes in the intensities through redevelopment of urban spaces, possible conversion of agricultural areas, land pooling opportunities, core area preservation, possible urban expansion outside of Kathmandu City, and development controls prescribed by the building by-laws and information on risk formed the parameters for deciding on the preferred land use. The preferred land use plan that resulted served as the basis for future utilization of resources and a guide for future developments in KMC.

The following activities were undertaken to come up with the strategies:

- Review of existing land uses and trends

- Assessment of the initial physical framework (i.e. demand management strategies, land supply strategies, demand and supply integration and physical framework formulation)

In identifying the strategies, the PWC initially defined the land use and urban development terminologies that may have conflicting contents. From this agreement, the following terms have been consensually adopted:

**Urban Renewal** comprises any or a combination of the following programs, as defined by Weimer and Hoyt (1966):

- Rehabilitation-bringing substandard structures to a standard
- Conservation-combination of rehabilitation and spot clearance in order to upgrade an area
- Redevelopment-demolition, clearance and reconstruction of an entire area

**Preservation** involves maintaining or rebuilding the site or structure near its original form and arrangement. Note that the word "conservation" had rather been equated with "preservation" particularly when referring to heritage sites. For clarity, the urban renewal described for the Core area is largely preservation (e.g., monuments) and a mix of other programs or schemes (e.g., redevelopment).

**Re-blocking** involves realignment of structures to provide alleys and pathways connecting the interior area to major roads and subdividing the area into residential lots for awarding to qualified beneficiaries. Serote (2004) mentions four basic principles of re-blocking, namely:

- maximum retention of structures and minimum displacement of families;
- provision of basic services and utilities;
- land ownership by qualified beneficiaries; and
- maximum community participation.

Serote further adds that: "Land Readjustment is a comprehensive urban redevelopment project which provides urban infrastructure such as roads, parks and sewerage in an integrated manner together with serviced building sites. This is used to transform urban areas that had earlier developed in an unplanned spontaneous manner where houses are built in a very dense haphazard way, where public facilities are inadequate, and where the environment is deteriorating. Land readjustment should result in new public facilities and utilities that are well integrated with the new configuration of building lots wherein each lot is regularly shaped and has a street frontage. In this situation, it is assumed that there is equitable sharing of costs and benefits for all holders of rights in land." (Serote, 2004)

The following strategies were reviewed and considered for KMC.

**Land supply strategies**

1. In-filling of vacant urban lands in order to maximize use of land and delay conversion
2. Densification of inner city areas to aid in urban renewal of Core and Central areas. This includes the construction of new housing sites (e.g. apartment housing, socialized housing)
3. Conservation/Preservation of heritage sites and redevelopment of the Core and Central areas (e.g. land pooling, demolition and new construction)
4. Agricultural land conversion is the primary approach taken by KMC in order to provide land; however, this practice has to be regulated through ordinance and strict implementation of building bylaws (i.e. construction and zoning).

**Demand management strategies**

1. Improved city service in the city Core and Central areas
2. Transfer of future residential population to alternative sites coupled with commercial corridors proposed in the central and eastern sectors of KMC to decongest the Core and relieve it from certain functions. Transfer of traffic and a review of carrying capacity of existing roads.[rtt3]
3. Relocation or resettlements for illegal settlements (ex. in riverside areas).

**Sprawl control strategies**

Discussions on sprawl control led to the following suggestions:

1. Deny further fragmentation of agricultural areas or large lots
2. Maintain a mixed-use development with strict enforcement of building by-laws (e.g. maintaining built-up and open area ratio; building floor area ratio-FAR)
3. Denying utility extension policies (in restricted development zones)
4. Promote park and open space policies (riverside development, land pooling)
5. Greenbelts to prevent encroachment by urban development

## 4.7. Development Opportunities

KMC's biggest advantage is accorded by its culture and heritage through its public squares, monuments and old historical buildings. These had generated tourism and commercial opportunities for fine handicrafts, woven products, food specialties, among others, to flourish. These areas should be prioritized for protection and management by KMC.

The decision to manage the city according to the mandates of the LSGA provides local governments such as KMC and other municipalities to take public control over the direction and pattern of development in their territories. Through this planning exercise, KMC underwent a learning process (e.g. planning, city to city exchanges) and came to a realization that within the territorial jurisdiction of the city, the local government can be proactive in prescribing the use of property to achieve the following results:

- Protected areas are respected and preserved for the benefit of all;
- Production areas are used sustainably so that the needs of the present and future generations will continue to be adequately met;
- Settlement areas are made livable and safe; and
- Infrastructure support is adequately and efficiently provided to help Kathmandu City and the Valley as a whole to become a model in the management of planned change.

## 4.8. Risk Reduction Strategies among Development Strategies

Risk reduction strategies against earthquakes which can appropriately support KMC's development goals and objectives are indicated in the succeeding tables. Originally, the initial development goals, objectives, and targets were considered in the absence of risk information from the previous earthquake study results. With the risk information, its implications on the current and future settings were evaluated. KMC then reviewed the goals, objectives and strategies previously made. Strategies were made sensitive to the seismic risks evaluated. This process ensured that the risk concerns and their solutions are incorporated in the previous decisions. The identified development strategies were then grouped under the following headings: Populations and Settlements (Table 4.7), Physical Resources (Table 4.8), Economy (Table 4.9), Incomes and Services (Table 4.10), and Land Use and Physical Framework (Table 4.11).

The more important strategies and policies towards risk reduction pertain to the following:

- Restrict or discourage new structures in high hazard prone areas;
- Allow some improvements or activities in high-risk areas but disallow residency in the same;
- Provide economic incentives (such as tax relief) to encourage transfer of development from or discourage development in high-risk areas, especially in congested areas in the core;
- Encourage the removal or relocation of occupants in high-risk buildings;
- Set in place mechanisms that would discourage people to acquire or encroach hazard-prone areas for redevelopment;
- Consider a transport system that is similarly risk-sensitive;
- Prepare post-event recovery and reconstruction plans for the Valley;

- Pursue urban expansion within the framework of Kathmandu Valley wide development.
- Improve capabilities for emergency response by improving access to emergency vehicles, reducing density (mainly in the core), creating and identification of open space, identifying and posting escape roads, improving fire fighting and search and rescue capabilities, and emergency response planning;
- Protect critical facilities, such as hospitals, police stations and emergency shelters (e.g., pursue vulnerability assessment and appropriate mitigation), water systems, among others;
- Building safer and more resilient structures through better construction methods and management
- Reducing high potential for fire and potential for hazardous material release that could follow an earthquake due to mix uses of residential, commercial and industrial functions, through better enforcement of fire safety and hazardous material regulation, as well as basic safety requirements

Table 4.7 Population and Settlements

| Issues/Problems | Goals | Objectives | Strategies |
|---|---|---|---|
| Uncontrolled migration into city core resulting to settlements in risk areas. | Regulate exceedingly high population densities in urban core and adjacent wards | • Limit the population density in urban cores to sustainable proportions (7 out of 10 core city wards already exceeding 500 ppha) e.g. wards no. 20, 21, 23, 24, 26, 27,28 .Possibly decongest the area within 5 to 7 years<br>• In view of seismic risks, reduce the number of high risk population in city core | • Encourage business, commercial opportunities in safe areas in outer fringe areas - use exemption, reduction in fees in new businesses Ward 35, 6, 7, 4, 3, 16, 13, 14, 15)<br>• Provision of additional taxes, fees in the construction, establishment of new businesses in core – increase rent taxes<br>• Regulate developments at the core using density control mechanisms such as buffers and zoning (ex. FAR)<br>• Decongest / relocate population from the city core who are at high risk to safer locations outside KMC Identify areas for open space for emergency operations and shelter<br>• Incorporate disaster risk reduction and emergency management as explicit goals of any transport or traffic improvement study (i.e., disaster-resilient transport)<br>• Promote public-private partnership approach for infrastructure development<br>• Set in place mechanisms that would discourage people to acquire or encroach hazard-prone areas for redevelopment<br>• Create database of services that are deficient in different areas; and make them available to investors; conduct information campaign<br>• Provide incentives to the developers and promoters in terms development controls e.g. in FAR, permit fees<br>• Identify safe locations for development outside KMC<br>• Provide a comprehensive plan for developing outer fringes which should comply with DRR parameters<br>• Campaign for Disaster resilient infrastructures |

Table 4.8 Physical Resources

| Issues/Problems | Goals | Objectives | Strategies |
|---|---|---|---|
| Urban sprawl in periphery of KMC (Ring Road, Ward 21,11,9, Gongabu, Chabhil, Kalanki, Koteshwor, etc.) | Reduce/ regulate urban sprawl at the periphery | Reduce/ regulate urban sprawl | Promote planned and disaster resilient urban development at the periphery (Ward nos. 3, 4, 6, 7, 8, 35, 36, 13, 14, 15, 16) |
| Water pollution - mainly due to household sewage and wastes, and industrial effluents dumped into the river without treatment | Reduce pollution in water bodies (mainly rivers) | • Reduce waste pollution generation in two main rivers (Phase 1 - Bagmati and Bishnumati; Phase 2 - Samakhusi, Tukucha, Dobikhola, Manohar etc.) from their sewer sheds<br>• Promote use of septic tanks and septage treatment technologies | • Strict enforcement of individual Industrial wastewater treatment<br>• Sewerage connection to those areas which do not have connection and development of cost efficient sewage management programs<br>• Waiver /discount on building permit fees<br>• Introduce environmental bonds (polluter's pay principle)<br>• Subsidy on material purchase (e.g. cement purchase)<br>• Promote safe construction of sewerage system<br>• Incorporate disaster risk reduction measures in infrastructures<br>• Incorporate DRR in potentially pollutive infrastructures(e.g. hazardous material release) |
| High level of air pollution – mainly due to poor road conditions producing dust and particulates, vehicular emissions, and industrial pollution due to brick kilns (Balaju industrial district, ring road, etc.) | Reduce the air pollution levels in KMC | • Proper repair and maintenance of road conditions specially along the Ring Road.<br>• Construction and maintenance of sidewalks | • Update transport master planning for Valley/KMC<br>• Integrated DRR in planning and construction of sidewalks<br>• Phase wise construction.<br>• Provision of road tolls for resource generation<br>• Involve private companies<br>• Effective cleaning of roads<br>• Phase wise development of specific road sections |
| | | Control of vehicular and industrial pollution. | Effective implementation of pollution control. e.g. stickers. |
| Noise pollution – mainly due to traffic noise | Reduce traffic noise pollution | Control use of traffic horns. Along major roads, near hospitals and universities. | Define horn free zones.<br>Prohibition of pressure horns.<br>Awareness campaigning against use of horns. |
| Flooding resulting in damages to buildings and infrastructure (ex. Balkhu, Samakhusi) | Reduce flooding and damages due to flooding. | • Reduce flooding in Balkhu, Samakhusi areas<br>• Reduce the affected population to flooding<br>• Undertake flood risk assessment studies | • Watershed management of the Balkhu, Samakhusi region<br>• Study impacts of Climate change in watershed such as earlier snow melt, heavy spring flooding, increased heat, and decreased water supply, among others<br>• Detailed planning of river bank areas.<br>• Reclaim salvage zone areas and provide easements<br>• Mitigation of frequently flooded areas (Balkhu, Samakhusi) |

| Issues/Problems | Goals | Objectives | Strategies |
|---|---|---|---|
| Erosion of river banks | Reduce erosion of river banks | River bank protection of KMC river areas<br>Reduce risk to lives and property | • Construction of retaining walls and the use of bio-engineering techniques to prevent erosion<br>• Study impacts of Climate change in watershed earlier snow melt, heavy spring flooding, increased heat, and decreased water supply |
| Earthquake risks (City-wide ) | Reduce vulnerability / exposure to earthquake risks<br>Improve emergency capabilities | • Risk-resilient transport and traffic management studies<br>• Effective enforcement of building code compliance in all new construction. | • A risk sensitive transport planning to support Valley land use planning<br>• Identification of emergency access roads, emergency escape roads and open space for emergency operations<br>• Identify areas for access of emergency vehicles; regulate access of vehicles to provide priority to emergency vehicles<br>• Special master planning for preservation and risk reduction at the Core<br>• Awareness campaign for RSLUP and enforcement processes |
| | | • Detailed studies of physical vulnerability of buildings and infrastructure | • Awareness campaigns for house owners.<br>• Training of planners, architects, engineers, masons, contractors.<br>• Conduct microzonation and vulnerability assessment of buildings and infrastructure |
| | | • New and updated regulation for reinforcing critical facilities such as schools and hospitals | • Regulatory incentives for retrofit of privately owned buildings<br>• Seismically retrofit and protect historical and cultural heritage fabric and other public buildings from degradation and damage<br>• Development of retrofit plans for critical buildings (e.g., schools and hospitals) and critical infrastructure with rational methodology for prioritization |
| | | • Creation of open space | • Strict checking of building plans and designs during building permit; Enforcement of zoning provisions<br>• Inventory and monitoring urban area changes<br>• Study of post-earthquake planning, rehabilitation and reconstruction<br>• Review of building by-laws and zoning (sensitive to seismic risks)<br>• Implementation of Emergency Operation Plan for KMC<br>• Tap use of resource plans |
| | | Reduce earthquake risks to lives and property. Disaster mitigation planning, financing | • Systematic natural hazards mapping to strengthen risk sensitive land use planning over time<br>• Development and implementation of emergency operations plan (national and local)<br>• Capacity building, training, awareness and resource generation for KMC and government agencies<br>• Provision of subsidy in building materials for retrofitting.<br>• Technical assistance to planners, architects, engineers and technicians<br>• Promote retrofitting of existing buildings and infrastructure<br>• Risk-sensitive urban redevelopment at the city core<br>• Develop and propose an post earthquake disaster rehabilitation plan for KMC |

| Issues/Problems | Goals | Objectives | Strategies |
|---|---|---|---|
| Increase disaster risk from fire hazards (city core, fringes, petroleum / gas outlets and depots) | Reduce fire hazards risks | Reduce risk to fire hazard in all areas | • Fire risk reduction through development control<br>• Strengthen and decentralize fire fighting capacity.<br>• Increase current fire fighting capability<br>• Regulate location and construction of petroleum /gas outlets and depots |

**Table 4.9 Economy**

| Issues/Problems | Goals | Objectives | Strategies |
|---|---|---|---|
| Low incomes, lack of livelihood opportunities | Increase incomes/ livelihood opportunities | Provide employment to families | • Encourage export competitive industries (handicrafts, weaving)<br>• Provide microfinance to low income earners |
| Lack of work opportunities in surrounding regions | Increase work opportunities in the periphery | Provide employment to families | • Establish economic centers such as along business sub zones<br>• Provide centers for employment skills training |
| Ineffective agricultural development policies | Increase agricultural productivity | Increase production of remaining areas in the next 10 years | • Possible agricultural land zoning to discourage fragmentation of agricultural areas<br>• Encourage agricultural centers to be developed near productive agricultural sites ( No identification was made) |
| Power shortages occurring daily | Reduce the occurrence of power outages | | No specific measures given at this time due to incomplete information |
| Political instability affects economic activities (e.g. tourism) | Resolve political instability | | No specific measures given at this time due to incomplete information |
| Government support to industries/ services are lacking | Provide support to growing industries/services | | No specific measures given at this time due to incomplete information |

Table 4.10 Incomes and Services

| Issues/Problems | Goals | Objectives | Strategies |
|---|---|---|---|
| Poor services, control and enforcement mechanisms | Improve inter-institutional coordination | • Make data and information available to various stakeholders and to the general public<br>• Create oversight boards<br>• Create consumer interest protection mechanisms<br>• Development based on integrated planning rather than user-demand<br>• Reinforcing enforcement mechanisms and regulatory authority<br>• Fighting corruption and arbitrary decision-making | Coordinated development, repair works by different agencies( e.g. coordination with w/s, telephony, sewerage, public works, user committee) |
| • Lack of affordable housing<br>• Housing shortage of 33,260 housing units in 2001 | Provide affordable housing | Provide affordable housing by construction of apartment houses. | • Provide access to new housing sites<br>• Promotion of socialized housing for low income earners<br>• Improve sites/ services<br>• Private sector-led development of affordable housing |
| Housing/ building stock deteriorating and made up of old buildings | Improve housing stock in the Kathmandu Valley | Improve housing stock in KMC | • Promote housing repairs/rehabilitation/new construction loan programs<br>• Encourage owners to have their buildings assessed by civil/ structural engineers and provide the necessary adjustments |
| Housing/ building stock deteriorating and made up of old buildings | Improve housing stock in the Kathmandu Valley | Improve housing stock in KMC | • Promote housing repairs/rehabilitation/new construction loan programs<br>• Encourage owners to have their buildings assessed by civil/ structural engineers and provide the necessary adjustments |
| • Building stock and land use not following current building ordinances<br>• Development controls not followed resulting to poor access of interior areas, and irregular shaped areas | Building by laws implemented | Building By Laws are implemented strictly for new construction Existing building stock shall be reviewed for possible and doable adjustments | • MoPPW,KVTDC and KMC jointly implements inventorying of building by law violations, and joint reviews on existing FAR with respect to seismic risks<br>• MoPPW, KVTDC and KMC jointly implements the Building By Laws, introduce penalty systems and provides necessary resource for evaluation and monitoring |

| Issues/Problems | Goals | Objectives | Strategies |
|---|---|---|---|
| • Limited capacity of KMC for urban sanitation. The city's sanitary capacity cannot cope with the city's growing waste generation capacity. This brings in several environmental, health and sanitation-related problems for the city | Improve urban/ rural sanitation in KMC | Improve sanitation in 35 ward areas in 10 years . | • Provide more city service centers which includes public toilets, bathrooms,<br>• Provide sanitary location for slaughter houses<br>• Provide sanitary location for solid and liquid waste management facility in the city (landfill, recycling station, transformation, waste reduction centers)<br>• Segregation of decaying and non decaying materials at the source.<br>• Promoting chemical composting process.<br>• Campaign for 3R. i.e. Reduce, Reuse, Recycle. |
| • Lack of an comprehensive solid waste management system<br>• Lack of permanent landfill site | Improve solid waste management in ten years | Improve solid waste management in KMC | Promote solid waste management program for the city |

**Table 4.11 Land Use and Physical Framework**

| Issues/Problems | Goals | Objectives | Strategies |
|---|---|---|---|
| High risk public buildings and infrastructures under strong earthquake events | Urban renewal of city core | Provide protection to heritage sites, buildings in Core area against strong earthquake events and heavy influx of tourists and local visitors | • Provide phasing of preservation and redevelopment of heritage sites and surrounding areas<br>• Improve sites/ services in nearby areas and those sites serving visitors of heritage sites<br>• Private sector-led development of affordable housing: re-blocking<br>• Open up a network of linear and central parks ;Improve access and reduce congestion<br>• Protect human potential and livelihood means<br>• Development of an Earthquake Rehabilitation Master Plan |
| Occupation of easements and public areas prone to flooding (illegal structures) | Removal of illegal structures in easements, public owned areas | Removal of squatters in riverside areas | Socialized (affordable) housing for urban poor |

| Issues/Problems | Goals | Objectives | Strategies |
|---|---|---|---|
| Absence / Poor implementation of urban land development controls and building codes, ordinances | Enforcement of development controls and building ordinances | Implement urban land development controls and building codes | • Review of development controls for development sprawl in peripheral areas<br>• Development of new building and layout ordinances in view of the earthquake risks-initiate micro-zonation<br>• Urban wastewater and storm water management |
| Deterioration of urban core public buildings, squares and monuments | Well conserved historic city core | • To preserve and rehabilitate historic public buildings<br>• To improve tourism based commercial activities in historic buildings / adaptive re-use<br>• To continue socio-cultural practices in historic settings | • Provide incentives to historic buildings<br>• Increase awareness on significance of historic buildings<br>• Strict enforcement of bye-laws<br>• Promote use of historic buildings<br>• Develop local area plans |

# Chapter 5. Towards a Preferred Urban Form

The constraints and opportunities discussed in Chapter 4 point to the need to bridge the gap between KMC's vision and the current reality. This requires spatial strategies that will contribute to achieving the desired scenario. The chosen urban form will serve as a framework for a detailed allocation of space and location of various activities and facilities for the planning period. Two scenarios could result depending on the interventions that are introduced by major stakeholders. One is called trend scenario, where past and current conditions simply continue. This happens when there is no major government or private intervention other than those that are already on-going, programmed or committed. The other scenario is called development scenario, which occurs when major government and private sector interventions are introduced. The latter will produce new patterns of growth and create discontinuities in current trends. (Serote, 2004)

## 5.1. Demand-Supply Balancing of Land Requirements

The process of generating alternative spatial strategies for KMC involved five sets of activities namely, (a) available supply and projected demand for land, (b) demand-supply balancing of urban land requirements; (c) map overlaying or sieve analysis; (d) generation and characterization of alternative urban forms; and (e) evaluation and selection of the most preferred spatial strategy. These are discussed in more detail in the succeeding sections.

Land, as the platform of activities, is finite while population and socio-economic development activities increase through time. Demand-supply balancing seeks to determine whether there is adequate supply of land to meet the projected demand for urban use 10 years hence, which is the timeframe used for this planning exercise. This activity proceeds as follows: (a) projection of future demand; (b) assessment of land supply; and (c) matching demand with supply.

### *5.1.1. Available Supply and Projected Demand for Land*

As shown in Table 5.1, residential land use covers more than 50 percent of the total land use in Kathmandu City. The urban area covering residential, business, service and mixed use is 3,720 hectares or about 72.9 percent of the total land area. Agricultural area covers about 911 hectares, while a disproportionate amount of greens total to only 911 hectares. Residential area by wards is larger in the East and West sectors, where mixed-use "other residential areas" categories are found. At the Core and Central sectors, the areas are smaller. The residential areas in the North Sector have slightly bigger areas than near the Central Sector areas. For settlements planning, certain parameters should be determined to assess the true availability of land supply. These include actual use, existing densities, built up to non-built up occupancy ratios, and actual building floor to area ratios (FAR). Given the constraints in resources in coming up with such inventories, assessing the capacity of the 2006 land use to carry the future population was taken using several assumptions, namely: (a) the estimate of 13 square meters per person (See Table 4.4.1 in Sectoral Profile); (b) use of 5 members per household, which translates to about 65 sq.m housing for a family of five; (c)the use of FAR=1 or 2; and (d) the ratio of built and un-built areas of 0.5. Table 5.1 below displays the scenario used in the plan.

**Table 5.1 Land Use Distribution in Hectares, 2006**
Source: T. Pradhan, KMC GIS

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

The first row of numbers in Table 5.2 assumes that potential residential areas, as identified in Table 5.1, are available and that all possible residential areas assume a FAR of 1.0 and that only 50 percent of the land area can be built upon by housing or residential structures. The second condition describes increasing the FAR to 2.0 to indicate more intense use and having a similar ratio of 0.5. The ratio of 0.5 somehow assures that open spaces are created when constructing residences and allows for the easements and road right-of-way. These assumptions are within the FAR ranges prescribed by KVTDC for various residential uses, which may reach as high as 4.0.

Table 5.2 Assumptions in Estimating Capacity of Residential Land

| Conditions | FAR | Ratio of Built-up area to Land Area |
|---|---|---|
| 1 | 1.0 | 0.5 |
| 2 | 2.0 | 0.5 |

In Table 5.3, the two scenarios are given in columns 5 to 7 and columns 8 to 10. Columns 5 and 8 are estimates of the population capacity of the residential areas in each ward identified in Table 5.1. Columns 6, 7, 9 and 10 reflect the remaining population that needs to be housed. The following expressions help clarify the numbers shown.

**Condition 1:** The numbers in column 6 and 7 mean that with a FAR=1, and ratio of buildable land to total residential land as 0.5, the following interpretations are given:

- In the East sector, the projected population in either 2015 or 2020 cannot be accommodated by its allotted residential areas. Wards 6, 7, 9, 10, 34 and 35 are likely to be congested if population is to be housed in the same areas. Ward 8 has enough space to accommodate less than a thousand but this is likely to be exceeded in 2020.
- In the Central sector, Wards 5, 11, 31 and 32 buildable area with this FAR cannot accommodate the population projected. Ward 1, based on either year can accommodate its own population. Ward 33 exceeds its capacity under this condition in 2020.
- In the North, the heaviest concentration of population is in Ward 16 and capacity based on this FAR and percent buildable area cannot meet the increases in population. Ward 3 apparently remains available for densification while Wards 2, 4 and 29 will exceed their limit in 2020.
- In the Core, population can no longer be met by the available residential land in either year, revealing a similar congestion, even if a FAR of 1 is maintained. As a heritage site, a FAR of 1 is somehow reasonable, since high rise buildings are not to be allowed to obstruct the monuments.
- In the West area, the population cannot be maintained by the available land area in either year.

To facilitate possible strategies, columns 6 and 7 are shaded red indicating the space in these areas that can no longer support the housing requirements of its population. These areas need

Col. (5 or 8) Residential capacity (Rc) =

[FAR x (Ratio) x Ward area (Has.) x 10,000 sq. m. /ha] 13 sqm/person

Ex. Ward 6 Rc 2020 = [1.0 x 0.5 x188 has. x 10,000 sqm/ha] 13 sqm/person =72,308 person

Col. (6,7 or 9,10) Pop'n to be housed further =

Pop'n Projection (Yr in Col. 4) - Residential capacity (Col 5 or 8)

Ex. Pop'n to be housed further (2020) = 182,833 (in2020) - 72,308 (in 2020)=110,525person

be decongested or possibly re-planned. This may also be identified by having a (+) excess number in 2015 and a (+) excess number in 2020

A yellow shade indicates that the population capacity may be exceeded in 2020 but possibly not in 2015. Raising the FAR in these areas may create available buildable space, though vertically. This may be identified by having a (+) excess number in 2015 and a (-) available capacity number in 2020.

A green shade may indicate possibility of land areas available for expansion and planned development. This may be identified by having a (-) available capacity in 2015 and a (-) available capacity number in 2020

While these are simplistic assumptions, it is indicative of the possible congestion that may result and the areas which may need possible expansion or densification. An actual inventory in these areas is needed.

**Condition 2:** The numbers in column 9 and 10 mean we raise the FAR=2 while maintaining the ratio of buildable land to total residential to 0.5 to provide the open spaces. It is given the following interpretations:

- In the East sector, the projected population by 2015 or 2020 cannot be accommodated by its allotted residential areas. Wards 7, 34 and 35 are likely to remain congested even if doubling of the FAR is set. Wards 6, 8, 9 and 10 have enough space to accommodate its own population but likely to be exceeded in 2020.
- In the Central sector, Wards 5 and 31 can accommodate the population projected in 2015 but unlikely in 2020. Wards 11 and 32 still remain congested as raising the FAR to 2 may not solve the problem of providing buildable spaces. Wards 1 and 33 can accommodate a larger population and may be possible for densification.
- In the North, the heaviest concentration of population to be housed still remains in Ward 16, even if a FAR of 2 is maintained. Ward 3 increases its capacity along with Wards 2, 4 and 29 even up to 2020.
- In the Core, for most areas, even raising the FAR to 2 will no longer meet the projected population in either year, revealing a truly congested situation.
- In the West, raising the FAR to 2 increases the residential capacity and can meet residential demand in 2015 but not in 2020.

Column 11 provides strategies which may be looked into; however, the recommendations still require validation from an inventory of areas available for infill, densification or limited expansion. Given the large numbers of population to be housed, it is a likely possibility that new sites outside of KMC may need to be explored for residential uses. This necessarily will result in a Valley-wide view of development with the other municipalities serving as centers of services.

Another way of estimating the land requirements is to use planning standards for land allocation. The standards set by the Housing and Land Use Regulatory Board of the Philippines was used initially to ascertain demand for land for various uses and later checked against total land supply for KMC. Where demand for land exceeds available supply, this indicates possibility of looking for open areas elsewhere.

The demand for land uses depends on the number of future population and the standards set by government for the particular land use. By the year 2020, the demand for various types of land uses will become more intense and may no longer be able to accommodate the demand for Kathmandu City as shown in Table 5.4 below. As the population of Kathmandu is expected to grow to 1,589,214 by 2020, the demand for residential land will likewise increase to 4,131.96 hectares by 2020, while infrastructure use will require another 3,019.51 hectares. Combined with future demand for all other land uses, the city would not be able to accommodate these demands given KMC's finite supply of land which totals 5,076.6 hectares. The city would need to maximize the use of land or find alternative strategies such as vertical expansion, urban expansion outside of KMC, etc. in

Table 5.3 Estimates of Projected Population against FAR-Based Capacities of Residential Area

| | KMC | Population Census | | Population Projection | | | Residential capacity (person) | Population to be housed further (person) | Population to be housed further (person) | Residential capacity (person) | Population to be housed further (person) | Population to be housed further (person) | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) | (2) | (3) | | (4) | | | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| | YEAR | 1991 | 2001 | 2010 | 2015 | 2020 | 2015/2020 | 2020 | 2015 | 2015/2020 | 2020 | 2015 | |
| SECTOR | WARD | | | | | | FAR=1. (Ratio=0.5) | | | FAR=2 (Ratio=0.50) | | | |
| EAST | 6 | 17509 | 39316 | 81423 | 122011 | 182833 | 72308 | 110525 | 49703 | 144615 | 38218 | -22604 | raise FAR |
| | 7 | 19797 | 39530 | 73658 | 104084 | 147078 | 52692 | 94386 | 51392 | 79038 | 68040 | 25046 | decongest |
| | 8 | 7756 | 9434 | 11252 | 12410 | 13687 | 13077 | 610 | -667 | 19615 | -5928 | -7205 | raise FAR |
| | 9 | 16516 | 29263 | 48966 | 65178 | 86757 | 49231 | 37526 | 15947 | 73846 | 12911 | -8668 | raise FAR |
| | 10 | 12806 | 25977 | 49096 | 69925 | 99592 | 51154 | 48438 | 18771 | 76731 | 22861 | -6806 | raise FAR |
| | 34 | 20045 | 46136 | 97695 | 148213 | 224856 | 69231 | 155625 | 78982 | 103846 | 121010 | 44367 | decongest |
| | 35 | 12467 | 35184 | 89510 | 150370 | 252612 | 79231 | 173381 | 71139 | 118846 | 133766 | 31524 | decongest |
| | Total | 106896 | 224840 | 439030 | 636723 | 923436 | | | | | | | |
| CENTER | 1 | 8731 | 8464 | 8231 | 8104 | 7979 | 17308 | -9329 | -9204 | 25962 | -17983 | -17858 | expand, |
| densify | | | | | | | | | | | | | |
| | 5 | 8646 | 15340 | 25700 | 34233 | 45598 | 23846 | 21752 | 10387 | 35769 | 9829 | -1536 | raise FAR |
| | 11 | 10055 | 15244 | 22169 | 27296 | 33609 | 14231 | 19378 | 13065 | 21346 | 12263 | 5950 | decongest |
| | 31 | 12455 | 14502 | 16630 | 17945 | 19364 | 12692 | 6672 | 5253 | 19038 | 326 | -1093 | |
| | 32 | 14613 | 24355 | 38570 | 49794 | 64284 | 22692 | 41592 | 27102 | 34038 | 30246 | 15756 | decongest |
| | 33 | 17925 | 21597 | 25541 | 28035 | 30773 | 28462 | 2311 | -427 | 42692 | -11919 | -14657 | expand |
| | Total | 72425 | 99502 | 132428 | 155222 | 181938 | | | | | | | |
| NORTH | 2 | 9163 | 13655 | 19553 | 23870 | 29139 | 27692 | 1447 | -3822 | 41538 | -12399 | -17668 | expand, |
| densify | | | | | | | | | | | | | |
| | 3 | 14347 | 20782 | 29008 | 34913 | 42019 | 56538 | -14519 | -21625 | 84808 | -42789 | -49895 | expand, |
| densify | | | | | | | | | | | | | |
| | 4 | 15337 | 29539 | 53283 | 73946 | 102622 | 92692 | 9930 | -18746 | 139038 | -36416 | -65092 | expand, |
| densify | | | | | | | | | | | | | |
| | 16 | 21286 | 45450 | 89956 | 131447 | 192074 | 73846 | 118228 | 57601 | 110769 | 81305 | 20678 | |
| | 29 | 19179 | 24543 | 30642 | 34663 | 39212 | 38846 | 366 | -4183 | 58269 | -19057 | -23606 | expand, |
| | Total | 79312 | 133969 | 214735 | 279085 | 362718 | | | | | | | |
| CORE | 12 | 9940 | 10313 | 10661 | 10859 | 11061 | 8462 | 2599 | 2397 | 12692 | -1631 | -1833 | expand |
| | 17 | 11605 | 19876 | 32259 | 42217 | 55249 | 21154 | 34095 | 21063 | 31731 | 23518 | 10486 | |
| | 18 | 8081 | 8065 | 8051 | 8043 | 8035 | 6154 | 1881 | 1889 | 9231 | -1196 | -1188 | expand |
| | 19 | 7588 | 7400 | 7235 | 7145 | 7056 | 4231 | 2825 | 2914 | 6346 | 710 | 799 | decongest |
| | 20 | 8920 | 8240 | 7672 | 7374 | 7088 | 3462 | 3626 | 3912 | 5192 | 1896 | 2182 | decongest |
| | 21 | 12383 | 12369 | 12356 | 12349 | 12342 | 4615 | 7727 | 7734 | 6923 | 5419 | 5426 | decongest |

| | KMC | Population Census | | Population Projection | | | Residential capacity (person) | Population to be housed further (person) | Population to be housed further (person) | Residential capacity (person) | Population to be housed further (person) | Population to be housed further (person) | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) | (2) | (3) | | (4) | | | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| | YEAR | 1991 | 2001 | 2010 | 2015 | 2020 | 2015/2020 | 2020 | 2015 | 2015/2020 | 2020 | 2015 | |
| | 22 | 7884 | 5840 | 4458 | 3837 | 3302 | 3077 | 225 | 760 | 4615 | -1313 | -778 | decongest |
| | 23 | 8711 | 8289 | 7927 | 7732 | 7543 | 2308 | 5235 | 5424 | 3462 | 4081 | 4270 | decongest |
| | 24 | 6288 | 5272 | 4499 | 4119 | 3772 | 1154 | 2618 | 2965 | 1731 | 2041 | 2388 | decongest |
| | 25 | 5744 | 4310 | 3328 | 2883 | 2497 | 1154 | 1343 | 1729 | 1731 | 766 | 1152 | decongest |
| | 26 | 4248 | 3764 | 3376 | 3178 | 2991 | 1154 | 1837 | 2024 | 1731 | 1260 | 1447 | decongest |
| | 27 | 8112 | 7789 | 7509 | 7358 | 7210 | 1923 | 5287 | 5435 | 2885 | 4325 | 4473 | decongest |
| | 28 | 5077 | 5462 | 5833 | 6051 | 6276 | 1538 | 4738 | 4513 | 2308 | 3968 | 3743 | decongest |
| | 30 | 11033 | 9896 | 8973 | 8498 | 8049 | 5000 | 3049 | 3498 | 7500 | 549 | 998 | decongest |
| | Total | 115614 | 116885 | 118041 | 118688 | 119339 | | | | | | | |
| WEST | 13 | 14746 | 29721 | 55849 | 79288 | 112565 | 60000 | 52565 | 19288 | 90000 | 22565 | -10712 | raise FAR |
| | 14 | 18425 | 34488 | 60632 | 82953 | 113491 | 71923 | 41568 | 11030 | 107885 | 5606 | -24932 | raise FAR |
| | 15 | 19627 | 32441 | 50993 | 65559 | 84285 | 49615 | 34670 | 15944 | 74423 | 9862 | -8864 | raise FAR |
| | | 52798 | 96650 | 166544 | 225331 | 304868 | | | | Total | 466708 | -104312 | |

order to accommodate the projected demand for future uses of land for its growing population.

### *5.1.2. Matching Demand with Supply*

Inventory of the supply of buildable land within KMC still needs to be pursued in order to identify available urban land for the next ten years. The sites that were initially explored in this study were taken from the recommended locations in the Kathmandu Valley Earthquake Study in 2002 and from the zones identified "as other residential areas" in the KVTDC land use plan. Possibilities of infilling and densification appear few, with the exception of land pooling and use of land from institutional zones. At this time, the quantifications are limited and suggestions made herein are essentially based from evaluations of recent remote sensed images and with reference to the earthquake study results and the KVTDC 2007 land use map. The Kathmandu Valley land use map, shown in Figure 5.1, already indicates that new development sites are only possible in VDCs and identifies KMC as mostly urban with little pockets for expansion.

**In-filling of vacant urban lands**

Vacant lands are land parcels within existing developed areas that were bypassed by development and remain unutilized. When these lands are put to use, the process is known as "in-filling." Due to limited resources available for producing an inventory of these areas, KMC initially identified the sites through previous maps. However, these areas for possible in-filling need to be surveyed, and the amount and size of land recorded. In previous meetings, the PWC had expressed their reservation regarding the availability of such areas in KMC. There is very little public land for in-filling as most open spaces are from privately owned lands, where

Table 5.4 Land Use Demand Projections, 2020

| SECTOR | Projected Population 2020 | Commercial 0.1 ha per 1000 | Industrial 0.8 ha per 1000 | Residential 2.6 ha per 1000 | Infrastructure 1.9 ha per 1000 | Institutional 0.3 ha per 1000 | Parks/ Open 0.05 ha per 1000 |
|---|---|---|---|---|---|---|---|
| EAST | 923436 | 92.34 | 738.75 | 2,400.93 | 1,754.53 | 277.03 | 46.17 |
| CENTER | 181938 | 18.19 | 145.55 | 473.04 | 345.68 | 54.58 | 9.10 |
| NORTH | 362718 | 36.27 | 290.17 | 943.07 | 689.16 | 108.82 | 18.14 |
| CORE | 119339 | 11.93 | 95.47 | 310.28 | 226.74 | 35.80 | 5.97 |
| WEST | 304868 | 30.49 | 243.89 | 792.66 | 579.25 | 91.46 | 15.24 |
| TOTAL | 1,589,214 | 158.92 | 1,271.37 | 4,131.96 | 3,019.51 | 476.76 | 79.46 |

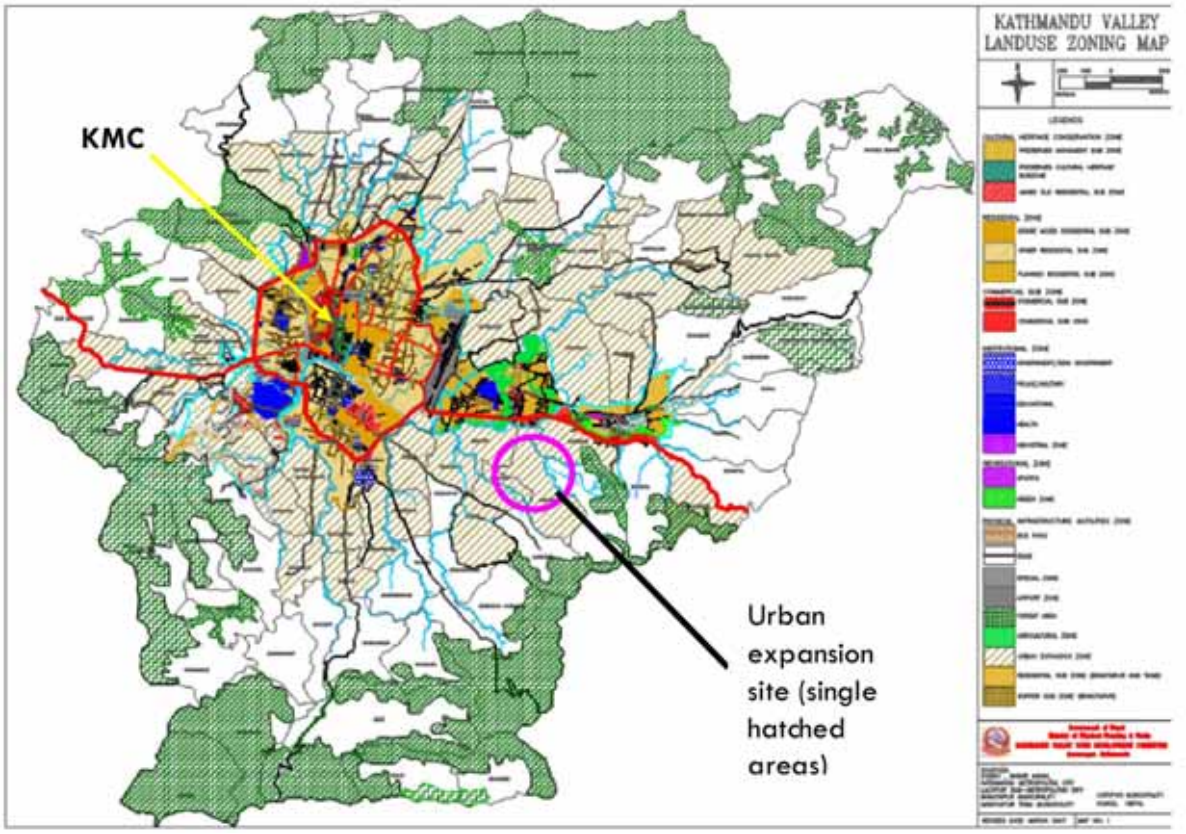



Figure 5.1 Kathmandu Valley Land Use Zoning Map, 2007
Source: KVTDC, Building Bylaws 2007
(New development sites are only possible in VDCs as there are little pockets for expansion available within KMC.)

government has little control. Part of these open spaces may be recognized by the dispersed white spaces in Figure 5.2.

**Densification of inner city areas**

Increasing the FAR in areas of low hazard and designing structures appropriately to withstand strong ground shaking appear to be a feasible option to take. For residential purposes, this approach towards densification can be pursued through land pooling in zones identified as "other residential sub-zones." This may actually be easier said than done, especially when applied in moderate to highly dense areas, as there are likely oppositions to readjusting privately owned land for provisions of easements and open spaces, efficiency of use, road widening and putting order in the arrangements following the building by-laws. The perception that exclusive use of land amounts to absolute control in the use of the land makes government interventions for controlling land development for public benefit and welfare impossible. In high valued areas, redevelopment costs can be recovered through increased FAR. Pursuing densification shall be guided by the Nepali Building Code and the KVTDC land use zone in general. New areas for commercial operations or new areas for housing (e.g., apartments, townhouses or row houses, high-rise structures) suggested in this RSLUP aim to decongest the core, leaving the heritage area available only for compatible uses.

In view of the seismic risks identified in the 2002 JICA study, the densification of areas must initially be subjected to site hazard assessment or seismic microzonation studies. These will aid in sensitizing the FAR and height parameters suggested in the Building Bylaws of 2007.

**Urban renewal in slum and blighted areas**

Strongly related to the strategy on densification, urban renewal or redevelopment of slums and blighted areas usually results in increased densities in inner city areas surrounding the core (i.e. heritage area). Residential density increases when dilapidated make-shift structures are converted into row houses or medium-rise walk-up units. Potential urban renewal projects surrounding the core, specifically in the dense mixed residential sub-zone immediately surrounding the heritage buffer zones can be targeted.

The urban renewal will be complemented by riverside development programs possibly connecting to open spaces and parks. These may be found along areas of the Bagmati and Bishnumati Rivers, as identified in the Bhagmati River Development Plan. New developments shall be regulated, including the provision of a 100 meter buffer strip surrounding the main rivers.

**Preservation of World Heritage Sites**

There is a strong advocacy to preserve the monument zones and buffer zones of heritage sites. The Integrated Management Framework prepared jointly by the Government of Nepal, Ministry of Culture, Tourism and Civil Aviation, and the Department of Archaeology provides the principles and guidelines for conserving the monuments, the necessary building bylaws and the process for rectifying buildings which are inappropriate in the monument zones.

**Agricultural land conversion**

Among the supply augmentation strategies available to KMC, agricultural land conversion is considered the most feasible. The absence of irrigation infrastructure and other agricultural support facilities render the remaining croplands marginal. The conversion of these areas requires approval, the rationale for which is often based on the non-productivity and unsuitability of the land for agricultural purposes.

**Valley-wide development**

Given the limited space for new development sites within Kathmandu City, the Valley-wide perspective of expanding in new areas appears viable since KMC and other municipalities, namely, Bakthapur, Thimi, Lalitpur and Kirthipur, can be developed to host region-wide services. With densities of at least 60 persons/ha the VDCs can ably support new economic

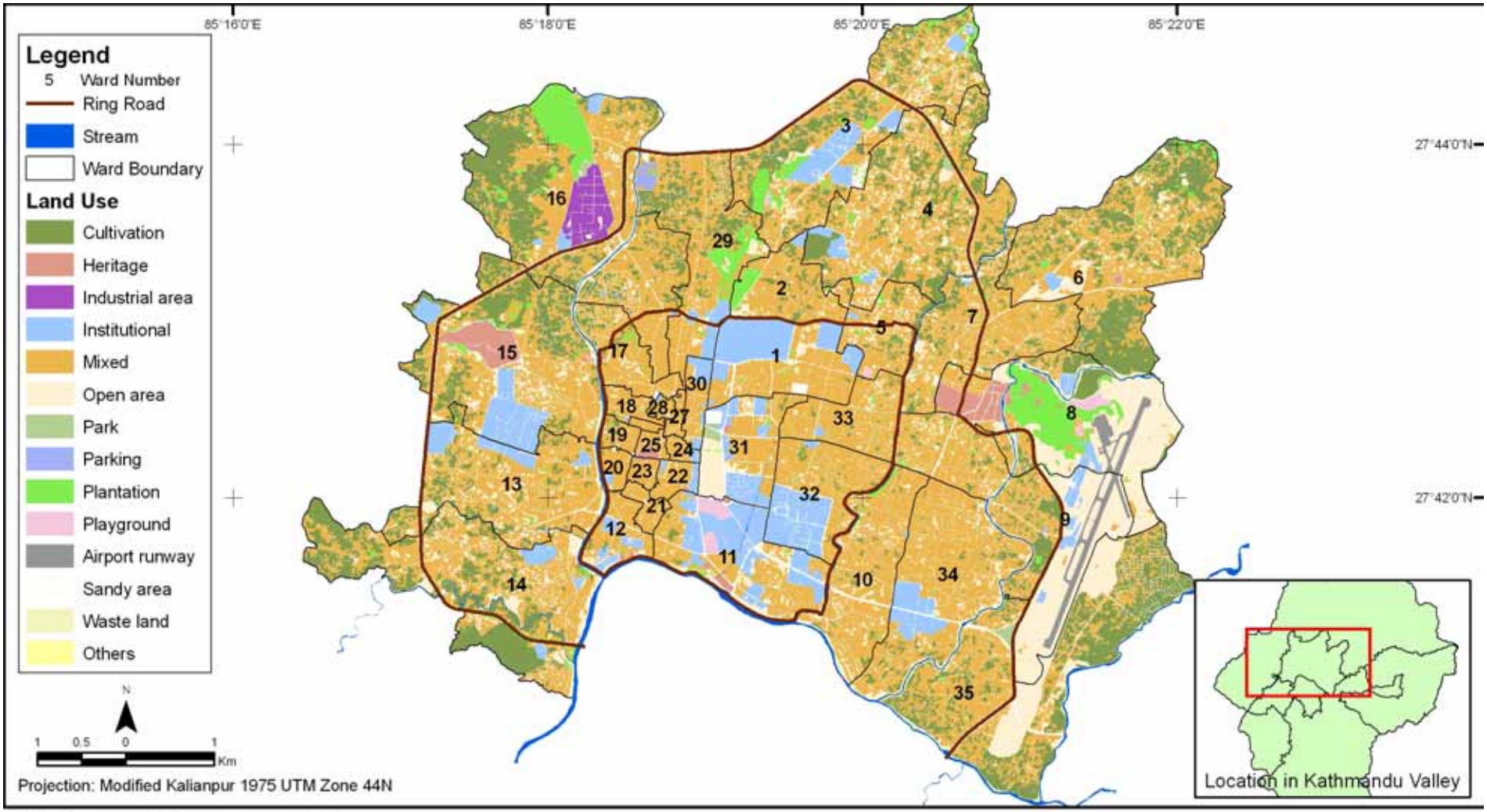



Figure 5.2 Kathmandu Metropolitan City Land Use Zoning Map, 2008
(Vacant areas in KMC are shown as dispersed white spaces.)

centers located close to these cores. A valley-wide transport plan supporting the new roles of these centers can relieve congestion in KMC and offers a fresh chance of planning the land use of the Valley with the disaster risks in mind. This may not only help achieve sustainability for KMC, but for the Valley as a whole.

**Towards a risk-sensitive transport plan**

The zoning system used in describing traffic trends is based on the aggregated zoning system from the 1993 JICA Study on Kathmandu Valley Urban Road Development. The complete zoning system of the JICA Study consists of 41 traffic analysis zones (TAZ). Of these, 18 zones cover the KMC. The aggregated zone system consists of 25 individual zones. Table 5.5 presents the description of the zoning system.

Table 5.6 shows the correspondence of among the TMZ, KMC wards and the Planning Zones within and around the immediate vicinity of the KMC administrative area. The core area is represented by Zone 1 in TAZ while the central area corresponds to Zones 3 and 4. With the correspondence between the planning zone and traffic zones clearly identified, various future land use and redevelopment scenarios can be reflected in the transport analysis. For example, a reduction in the population and land use activity of the core area implies a decrease in the total number of trips coming out and going into Zone 1.

**Business-as-usual scenario**

As discussed in Chapter 7, Section 7.1 of the KMC Sectoral Profile, the analysis of business-as-usual (BAU) traffic situation established the expected traffic patterns if there are no specific pro-active programs or interventions implemented during the planning horizon. In most cases, it corresponds to a 'do-nothing' scenario.

In terms of average daily traffic condition, the model results pointed out those existing road capacities for majority of the road section which are still sufficient. However, several road sections are already becoming saturated. These include sections of Arniko Highway from Tinkune-

**Table 5.5 Traffic Analysis Zone Description**
Source: JICA Study on Kathmandu Valley Urban Road Development, 1993

| Zone | City/Municipality/Villages |
|---|---|
| 1 | Kathmandu Metropolitan City |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | Lalitpur Sub-Metropolitan City |
| 10 | |
| 11 | |
| 12 | |
| 13 | Bhaktapur Municipality |
| 14 | |
| 15 | Madhyapur Thimi Municipality |
| 16 | Alapot, Bhadrabas, Thali, Danchhi, Mulpani, Gothatar |
| 17 | Nagarkot, Changunarayan, Chhaling, Duwakot, Jhaukhel |
| 18 | Bagesowri, Sudal, Tathali, Kautunje, Balkot, Dadhikot, Sipadol, Chitapol, Nankhel, Gundu, Sirutar |
| 19 | Imadol, Tikathali, Lubhu, Siddhipur, Harisiddhi, Lamatar, Godamchau, Thaiba, Bisankhunarayan, Godawari |
| 20 | Sainbu, Khokana, Dhapakhel, Sunakothi, Bungamati, Theco, Jharuwarasi, Chhampi, Chapagaun, Badikhel |
| 21 | Kirtipur Municipality, Machhegaun, Chalnakhel, Talkududechour, Sheshnarayan, Satikhek, Daxinkali, Chhaimale, Dukuchhap |
| 22 | Ichangunarayan, Bhimdhunga, Ramkot, Sitapaila, Chouketar Dahachok, Badd Bhanjyang, Seuchatarm Naikap Purano Bhanjyang, Balambu, Thankot, Naikap Naya Bhanjyang, Tinthana, Mahadevsthan, Satungal, Matatirtha |
| 23 | Sangla, Kabhresthali, Jitpurphedi, Futing, Dharmasthali, Goldhunga, Manamaiju |
| 24 | Jhor Mahankal, Budanilkantha, Chapali Chandeshwori, Chunikhel, Tokha Saraswoti, Mahankal, Khadka Bhardrakali Gongabu, Dhapasi |
| 25 | Sundarijal, Nanglebhare, Lapsephedi, Baluwa, Nayapati, Gagalphedi, Bajrayogini (Sankhu) Gokarneswor, Kapan, Indrayani, Sankhu Suntol, Jorpati, Sankhu Pukhulachhi |

Table 5.6 Comparison of Zoning Systems
Source: JICA Study on Kathmandu Valley Urban Road Development, 1993

| Planning Zone | TAZ | KMC Wards |
|---|---|---|
| Core | 1 | 21, 22, 23, 24, 25, 26, 27, 28, 30 |
| Central | 3, 4 | 1, 5, 11, 12, 17, 18, 19, 20, 30, 21, 31, 32, 33 |
| South | 9, 10, 11, 12 | Lalitpur Sub-Metropolitan City |
| North | 2, 7 | 2, 3, 4, 16, 29 |
| West | 5, 6 | 13, 14, 15 |
| East | 8 | 6, 7, 8, 9, 10, 34, 35 |

Koteshwar, Kamal Pokhari and the Kanti Path.

During peak-hour conditions, traffic volumes along the Inner Ring Road are still manageable. However, serious traffic congestion is experienced along key road sections including the following:

- Tripureshwar;
- Arniko Highway from Tinkune-Koteshwar;
- Bag Bazar;
- Kamal Pokhari;
- Kanti Path;
- Singha Durbar;
- Bhadrakali;
- Naya Bazar; and
- Kupandol

In 2020, it is expected that the daily capacity of key road sections especially those that are located in close proximity to the urban core will be exceeded. As such, major transport interventions will have to be introduced. During the peak-hour condition, traffic volumes along the Inner Ring Road are still relatively better than in other road sections. Severe congestion is expected on the following road sections:

- Tripureshwar;
- Thapathali;
- Arniko Highway from Tinkune-Koteshwar;
- Bag Bazar;
- Kamal Pokhari;
- Kanti Path;
- Singha Durbar;
- Ramshah Path'
- Bhadrakali;
- Naya Bazar; and
- Kupandol

**Redevelopment Analysis**

Table 5.7 presents the development scenarios for KMC for the years 2015 and 2020. The area coverage of KMC corresponds to Zones 1 to 8 of the traffic zoning system. The capacity value of the respective zones refers to the number of persons that can be accommodated adequately in available dwelling spaces based on a lot area of 13.0 square meters per person. In a sense, this is the 'carrying' capacity of the zones. These values are calculated with the assumptions of a FAR equal to 2.0 and a Built-up Ratio equal to 50 percent. The need to transfer a fraction of the population from the core to other wards will certainly result to changes in traffic demands and

Table 5.7 Development Scenarios, 2015 and 2020

| TAZ | 2001 Population | 2009 Population | Capacity | 2015 | | 2020 | |
|---|---|---|---|---|---|---|---|
| | | | | Estimated Population | Excess Capacity | Estimated Population | Excess Capacity |
| 1 | 94,203 | 100,351 | 104,615 | 108,435 | (3,820) | 119,068 | (14,453) |
| 2 | 24,543 | 29,964 | 77,692 | 34,663 | 43,029 | 39,212 | 38,480 |
| 3 | 22,119 | 27,155 | 90,000 | 31,974 | 58,026 | 37,118 | 52,882 |
| 4 | 75,698 | 99,886 | 156,154 | 123,070 | 33,084 | 148,030 | 8,124 |
| 5 | 86,891 | 133,653 | 290,000 | 185,449 | 104,551 | 249,459 | 40,541 |
| 6 | 77,891 | 133,943 | 246,923 | 197,006 | 49,917 | 276,359 | (29,436) |
| 7 | 65,661 | 103,288 | 346,154 | 143,092 | 203,062 | 190,239 | 155,915 |
| 8 | 189,656 | 342,931 | 615,385 | 521,821 | 93,564 | 754,803 | (139,418) |

may result in new volumes and changes in lane capacities. Two scenarios are proposed - the core residential population is transferred (a) to the Eastern area (Zone 8) or (b) to the Western side in land pooled areas.

For the year 2015, it is expected that the capacity for Zone 1 which is the Old Core Area will be exceeded by around 3,800 persons. Once the capacity is exceeded, this will manifest in congested dwelling conditions. The other zones, on the other hand, will still have manageable dwelling conditions. However, the 2020 estimates provide sobering results as Zones 1, 6 and 8 are expected to have exceeded their carrying capacities. The Volume/Capacity (V/C) ratio at peak hours in 2015 and 2020 are shown in Figures 5.3 and 5.4, respectively. The red color indicates that the ratio is equal or greater than .9, which means that the road has reached congested condition.

As a possible redevelopment strategy for 2015, some functions in Zone 1 can be transferred to Zone 8 (available excess of 93,564) which is considered as a development promotion area. This is denoted as Scenario 1 (where possible apartment housing and commercial strips may be located). Considering the carrying capacity of Zone 1, about 5 percent of its estimated 2015 population needs to be relocated. In terms of traffic, this may involve the transfer of about 10 percent of the total trip production and attraction from Zone 1. In 2015, the estimated trip production/attraction for car trips is around 62,000. On the other hand, the estimated trip production/attraction for Zone 8 under the BAU case is around 50,000. Thus, around 6,000 car trips will be added to Zone 8.

Another strategy might be to transfer some of the population base of Zone 1 to land pooled areas in Zone 6 which corresponds to Ward 15 in the northwest section of KMC. This is denoted as Scenario 2.

Table 5.8 and 5.9 present the changes in Volume/Capacity (V/C) ratio for Scenario 1 and Scenario 2 comparing it with the BAU scenario. Scenario 1 would be much effective in improving road traffic conditions along Durbar Marg and Kanti Path, as well as sections of the Inner Ring Road, Balaju and Swayambhunath areas. However, traffic condition is expected to worsen along Bag Bazar, Dilli Bazar and Kamal Pokhari.

Scenario 2 would have moderate impacts compared with the BAU scenario. However, traffic is expected to worsen along major road sections providing ingress/egress at the northern sections of KMC. A notable increase in traffic demand will be expected along Naya Bazar, Ramshah Path, as well as northern sections of the Inner Ring Road. Figure 5.5 indicates the V/C ratio for 2015, where a V/C ratio of 0.9 means that the road has reached congested condition.

While another scenario of transferring future residential population to the North is a possible option, the two scenarios already reveal limited possibilities of transferring further until 2020 in the East and West sectors, considering that the capacity of the residential land is already limited in accommodating future population. In this assumption, a FAR of 2.0 was used. Any transfer of population only shifts traffic volumes within KMC; hence, while some roads are relieved partly of congestion, other roads are taking up these increases. This similarly shifts the risks of the population caused by blockages, damaged roads and its implications on emergency operations need to be studied. Looking at it from a Valley-wide perspective, with decongestion achieved by shifting population outside KMC up until 2020 or so, changes in through traffic conditions from outside the Valley need to be studied to determine exactly the strategic roads to be developed with the emerging patterns of risks considered and managed.

The analysis for 2020 should be subject to further discussions with KMC and concerned national government agencies as it is expected that the carrying capacities of these zones will be reached. On the other hand, new expansion areas outside of Kathmandu City can be explored. However, this should be worked out in coordination with relevant agencies.

A risk-sensitive transportation planning

Table 5.8 Change in V/C Ratio for Scenario 1

| No. | Road | Section | Direction | Change in V/C Ratio | % Change |
|---|---|---|---|---|---|
| 1 | Kalimati | Kalanki-Kalimati | EB | 0.05 | 6.5% |
| 2 | Kalimati | Kalanki-Kalimati | WB | -0.08 | -8.8% |
| 3 | Tripureshwar | Kalimati-Tripureshwar | EB | 0.06 | 5.9% |
| 4 | Tripureshwar | Kalimati-Tripureshwar | WB | -0.01 | -0.8% |
| 5 | Thapathali | Tripureshwar-Thapathali | EB | 0.08 | 5.0% |
| 6 | Thapathali | Tripureshwar-Thapathali | WB | 0.01 | 0.7% |
| 7 | Arniko Highway | Thapathali-Tinkune | EB | -0.02 | -2.2% |
| 8 | Arniko Highway | Thapathali-Tinkune | WB | 0.07 | 7.3% |
| 9 | Arniko Highway | Tinkune-Koteshwar | EB | -0.04 | -2.1% |
| 10 | Arniko Highway | Tinkune-Koteshwar | WB | 0.02 | 1.0% |
| 11 | Arniko Highway | Koteshwar-Thimi | EB | | |
| 12 | Arniko Highway | Koteshwar-Thimi | WB | | |
| 13 | Arniko Highway | Thimi-Bhaktapur | EB | | |
| 14 | Arniko Highway | Thimi-Bhaktapur | WB | | |
| 15 | Bag Bazar/Dilli Bazar | Ratna Park-Dilli Bazar | EB | -0.07 | -3.2% |
| 16 | Bag Bazar/Dilli Bazar | Ratna Park-Dilli Bazar | WB | 0.09 | 4.5% |
| 17 | Bag Bazar/Dilli Bazar | Dilli Bazar-Battisputali | EB | 0.07 | 6.7% |
| 18 | Bag Bazar/Dilli Bazar | Dilli Bazar-Battisputali | WB | 0.23 | 25.0% |
| 19 | Battisputali | Battisputali-Sinamangal | EB | -0.04 | -5.5% |
| 20 | Battisputali | Battisputali-Sinamangal | WB | -0.13 | -17.6% |
| 21 | Kamal Pokhari | Kamaladi-Gaushala | EB | 0.77 | 20.9% |
| 22 | Kamal Pokhari | Kamaladi-Gaushala | WB | -0.13 | -2.7% |
| 23 | Kanti Path | Tripureshwar-Asan | NB | 0.05 | 2.4% |
| 24 | Kanti Path | Tripureshwar-Asan | SB | -0.08 | -3.9% |
| 25 | Kanti Path | Asan-Thamel | NB | -0.11 | -6.7% |
| 26 | Kanti Path | Asan-Thamel | SB | 0.01 | 0.7% |
| 27 | Singha Durbar | Maitighar-Prithwi Path | NB | -0.03 | -1.9% |
| 28 | Singha Durbar | Maitighar-Prithwi Path | SB | 0.15 | 9.1% |
| 29 | Ramshah Path | Prithwi Path-Bag Bazar | NB | 0.01 | 0.9% |
| 30 | Ramshah Path | Prithwi Path-Bag Bazar | SB | 0.05 | 3.9% |
| 31 | Hattisar | Bag Bazar-Naxal | NB | 0.04 | 3.9% |
| 32 | Hattisar | Bag Bazar-Naxal | SB | 0.02 | 1.8% |
| 33 | Bhadrakali | Maitighar-Prithwi Path | NB | 0.33 | 14.3% |
| 34 | Bhadrakali | Maitighar-Prithwi Path | SB | -0.21 | -15.9% |
| 35 | Durbar Marg | Bag Bazar-Naxal | NB | | |
| 36 | Durbar Marg | Bag Bazar-Naxal | SB | -0.08 | -7.7% |
| 37 | Inner Ring Road | Bansbari-Balaju | EB | -0.03 | -2.9% |
| 38 | Inner Ring Road | Bansbari-Balaju | WB | -0.02 | -2.1% |
| 39 | Inner Ring Road | Balaju-Swayambhunath | NB | -0.05 | -6.3% |
| 40 | Inner Ring Road | Balaju-Swayambhunath | SB | -0.08 | -10.3% |
| 41 | Inner Ring Road | Swayambhunath-Kalanki | NB | -0.01 | -1.2% |
| 42 | Inner Ring Road | Swayambhunath-Kalanki | SB | -0.02 | -2.4% |
| 43 | Inner Ring Road | Kalanki-Balkhu | NB | 0.01 | 1.0% |

| No. | Road | Section | Direction | Change in V/C Ratio | % Change |
|---|---|---|---|---|---|
| 44 | Inner Ring Road | Kalanki-Balkhu | SB | -0.03 | -2.9% |
| 45 | Inner Ring Road | Balkhu-Satdobato | NB | -0.02 | -2.2% |
| 46 | Inner Ring Road | Balkhu-Satdobato | SB | -0.01 | -1.1% |
| 47 | Inner Ring Road | Satdobato-Koteshwar | NB | 0.03 | 3.3% |
| 48 | Inner Ring Road | Satdobato-Koteshwar | SB | | |
| 49 | Inner Ring Road | Tinkune-Chabahil | NB | 0.03 | 2.7% |
| 50 | Inner Ring Road | Tinkune-Chabahil | SB | 0.01 | 0.8% |
| 51 | Inner Ring Road | Chabahil-Bansbari | NB | -0.01 | -1.2% |
| 52 | Inner Ring Road | Chabahil-Bansbari | SB | 0.02 | 2.4% |
| 53 | Naya Bazar | Balaju-Thamel | NB | -0.14 | -9.2% |
| 54 | Naya Bazar | Balaju-Thamel | SB | -0.06 | -4.1% |
| 55 | Lazimpat | Thamel-Panipokhari | NB | 0.05 | 4.5% |
| 56 | Lazimpat | Thamel-Panipokhari | SB | 0.08 | 7.3% |
| 57 | Maharajgunj | Panipokhari-Bansbari | NB | -0.01 | -1.3% |
| 58 | Maharajgunj | Panipokhari-Bansbari | SB | 0.05 | 6.3% |
| 59 | Kupandol | Thapathali-Kupandol | NB | 0.03 | 1.0% |
| 60 | Kupandol | Thapathali-Kupandol | SB | 0.03 | 1.0% |
| Average | | | | 0.02 | 1.1% |

**Table 5.9 Change in V/C Ratio for Scenario 2**

| No. | Road | Section | Direction | Change in V/C Ratio | % Change |
|---|---|---|---|---|---|
| 1 | Kalimati | Kalanki-Kalimati | EB | 0.03 | 3.9% |
| 2 | Kalimati | Kalanki-Kalimati | WB | -0.05 | -5.5% |
| 3 | Tripureshwar | Kalimati-Tripureshwar | EB | 0.06 | 5.9% |
| 4 | Tripureshwar | Kalimati-Tripureshwar | WB | -0.03 | -2.5% |
| 5 | Thapathali | Tripureshwar-Thapathali | EB | 0.07 | 4.4% |
| 6 | Thapathali | Tripureshwar-Thapathali | WB | 0.01 | 0.7% |
| 7 | Arniko Highway | Thapathali-Tinkune | EB | 0.02 | 2.2% |
| 8 | Arniko Highway | Thapathali-Tinkune | WB | -0.04 | -4.2% |
| 9 | Arniko Highway | Tinkune-Koteshwar | EB | 0.02 | 1.0% |
| 10 | Arniko Highway | Tinkune-Koteshwar | WB | -0.03 | -1.5% |
| 11 | Arniko Highway | Koteshwar-Thimi | EB | | |
| 12 | Arniko Highway | Koteshwar-Thimi | WB | | |
| 13 | Arniko Highway | Thimi-Bhaktapur | EB | | |
| 14 | Arniko Highway | Thimi-Bhaktapur | WB | | |
| 15 | Bag Bazar/Dilli Bazar | Ratna Park-Dilli Bazar | EB | -0.17 | -7.7% |
| 16 | Bag Bazar/Dilli Bazar | Ratna Park-Dilli Bazar | WB | 0.06 | 3.0% |
| 17 | Bag Bazar/Dilli Bazar | Dilli Bazar-Battisputali | EB | -0.06 | -5.8% |
| 18 | Bag Bazar/Dilli Bazar | Dilli Bazar-Battisputali | WB | 0.26 | 28.3% |
| 19 | Battisputali | Battisputali-Sinamangal | EB | -0.06 | -8.2% |
| 20 | Battisputali | Battisputali-Sinamangal | WB | -0.03 | -4.1% |
| 21 | Kamal Pokhari | Kamaladi-Gaushala | EB | 0.73 | 19.8% |

| No. | Road | Section | Direction | Change in V/C Ratio | % Change |
|---|---|---|---|---|---|
| 22 | Kamal Pokhari | Kamaladi-Gaushala | WB | -0.82 | -16.8% |
| 23 | Kanti Path | Tripureshwar-Asan | NB | 0.06 | 2.9% |
| 24 | Kanti Path | Tripureshwar-Asan | SB | -0.15 | -7.4% |
| 25 | Kanti Path | Asan-Thamel | NB | -0.07 | -4.3% |
| 26 | Kanti Path | Asan-Thamel | SB | 0.02 | 1.3% |
| 27 | Singha Durbar | Maitighar-Prithwi Path | NB | -0.10 | -6.4% |
| 28 | Singha Durbar | Maitighar-Prithwi Path | SB | 0.11 | 6.7% |
| 29 | Ramshah Path | Prithwi Path-Bag Bazar | NB | 0.01 | 0.9% |
| 30 | Ramshah Path | Prithwi Path-Bag Bazar | SB | 0.19 | 14.8% |
| 31 | Hattisar | Bag Bazar-Naxal | NB | 0.06 | 5.9% |
| 32 | Hattisar | Bag Bazar-Naxal | SB | 0.08 | 7.2% |
| 33 | Bhadrakali | Maitighar-Prithwi Path | NB | 0.02 | 0.9% |
| 34 | Bhadrakali | Maitighar-Prithwi Path | SB | -0.07 | -5.3% |
| 35 | Durbar Marg | Bag Bazar-Naxal | NB | 0.03 | 2.9% |
| 36 | Durbar Marg | Bag Bazar-Naxal | SB | -0.02 | -1.9% |
| 37 | Inner Ring Road | Bansbari-Balaju | EB | -0.01 | -1.0% |
| 38 | Inner Ring Road | Bansbari-Balaju | WB | | |
| 39 | Inner Ring Road | Balaju-Swayambhunath | NB | 0.05 | 6.3% |
| 40 | Inner Ring Road | Balaju-Swayambhunath | SB | 0.01 | 1.3% |
| 41 | Inner Ring Road | Swayambhunath-Kalanki | NB | 0.04 | 4.8% |
| 42 | Inner Ring Road | Swayambhunath-Kalanki | SB | 0.03 | 3.6% |
| 43 | Inner Ring Road | Kalanki-Balkhu | NB | 0.01 | 1.0% |
| 44 | Inner Ring Road | Kalanki-Balkhu | SB | -0.02 | -2.0% |
| 45 | Inner Ring Road | Balkhu-Satdobato | NB | 0.04 | 4.5% |
| 46 | Inner Ring Road | Balkhu-Satdobato | SB | -0.01 | -1.1% |
| 47 | Inner Ring Road | Satdobato-Koteshwar | NB | 0.03 | 3.3% |
| 48 | Inner Ring Road | Satdobato-Koteshwar | SB | | |
| 49 | Inner Ring Road | Tinkune-Chabahil | NB | 0.03 | 2.7% |
| 50 | Inner Ring Road | Tinkune-Chabahil | SB | 0.01 | 0.8% |
| 51 | Inner Ring Road | Chabahil-Bansbari | NB | -0.01 | -1.2% |
| 52 | Inner Ring Road | Chabahil-Bansbari | SB | 0.02 | 2.4% |
| 53 | Naya Bazar | Balaju-Thamel | NB | -0.14 | -9.2% |
| 54 | Naya Bazar | Balaju-Thamel | SB | -0.06 | -4.1% |
| 55 | Lazimpat | Thamel-Panipokhari | NB | 0.05 | 4.5% |
| 56 | Lazimpat | Thamel-Panipokhari | SB | 0.08 | 7.3% |
| 57 | Maharajgunj | Panipokhari-Bansbari | NB | -0.01 | -1.3% |
| 58 | Maharajgunj | Panipokhari-Bansbari | SB | 0.05 | 6.3% |
| 59 | Kupandol | Thapathali-Kupandol | NB | 0.03 | 1.0% |
| 60 | Kupandol | Thapathali-Kupandol | SB | 0.03 | 1.0% |
| | | Average | | 0.02 | 1.1% |

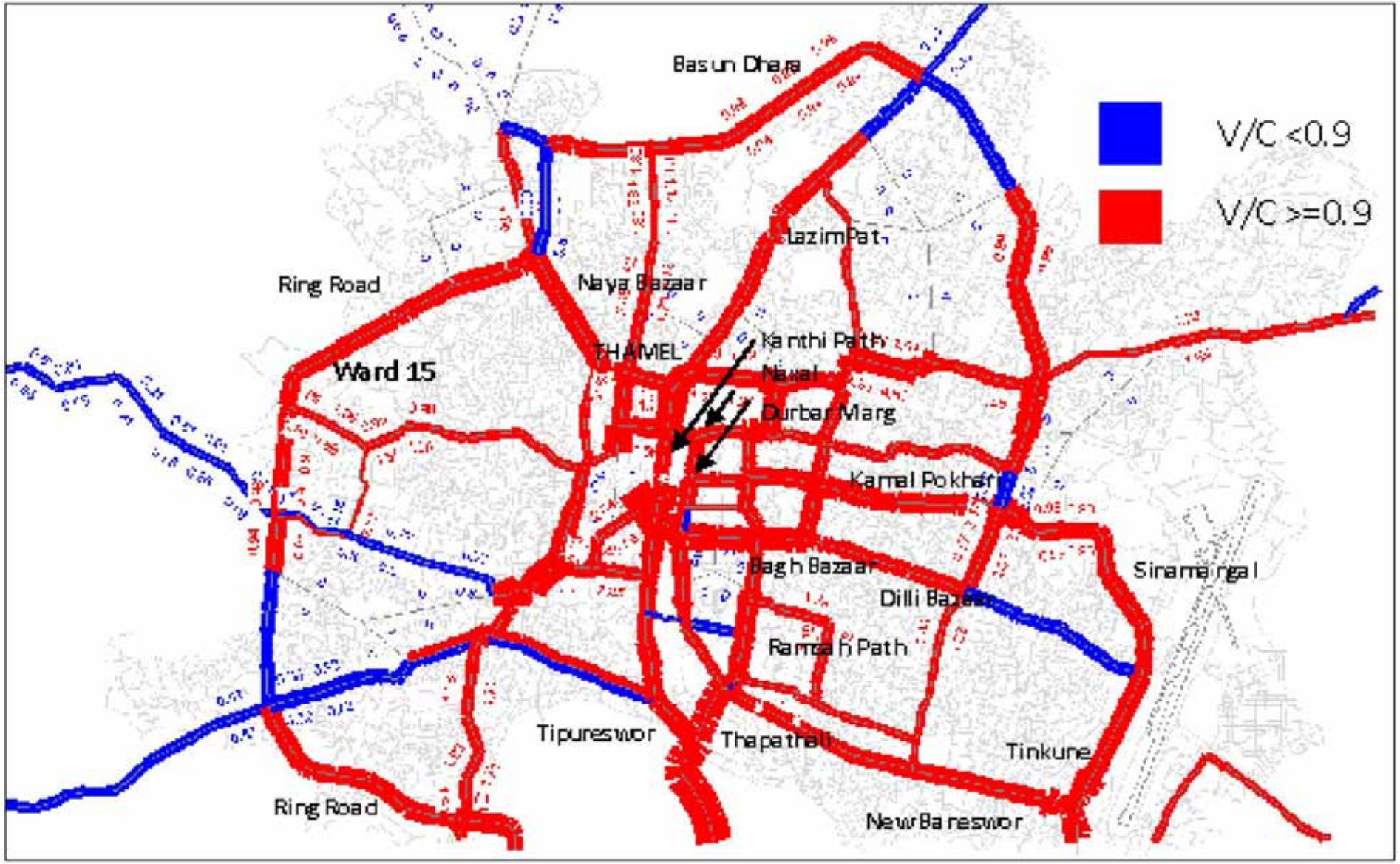



Figure 5.3 Business-as-usual V/C Ratio at Peak Hour Condition, 2015
(Identified road areas experience heavy traffic under this scenario. Volume capacity ratio of 0.9 means that the road has reached congested condition.)

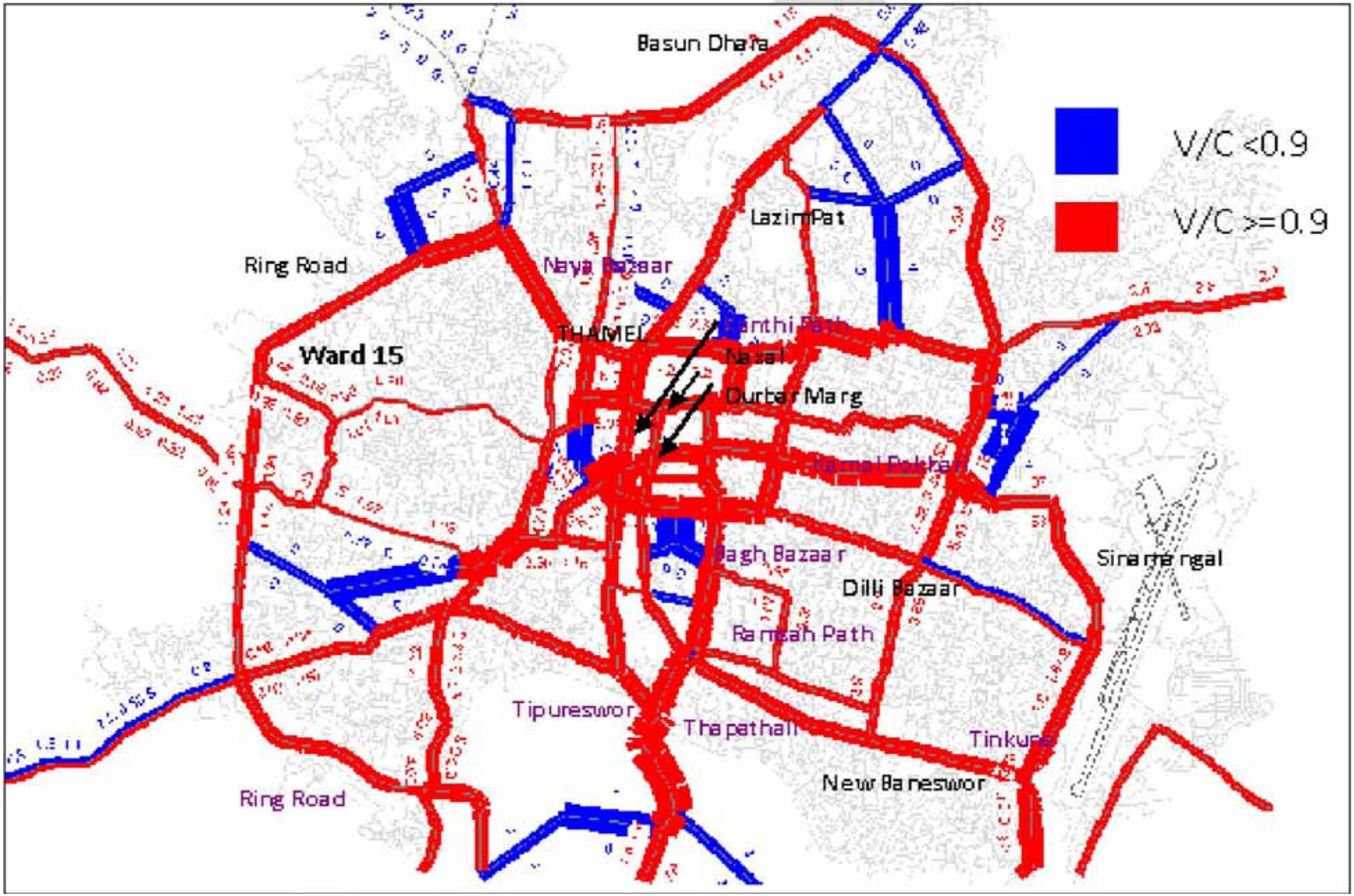



Figure 5.4 Business-as-usual V/C Ratio at Peak Hour Condition, 2020
(Identified road areas experience heavy traffic under this scenario. Volume capacity ratio of 0.9 means that the road has reached congested condition.)

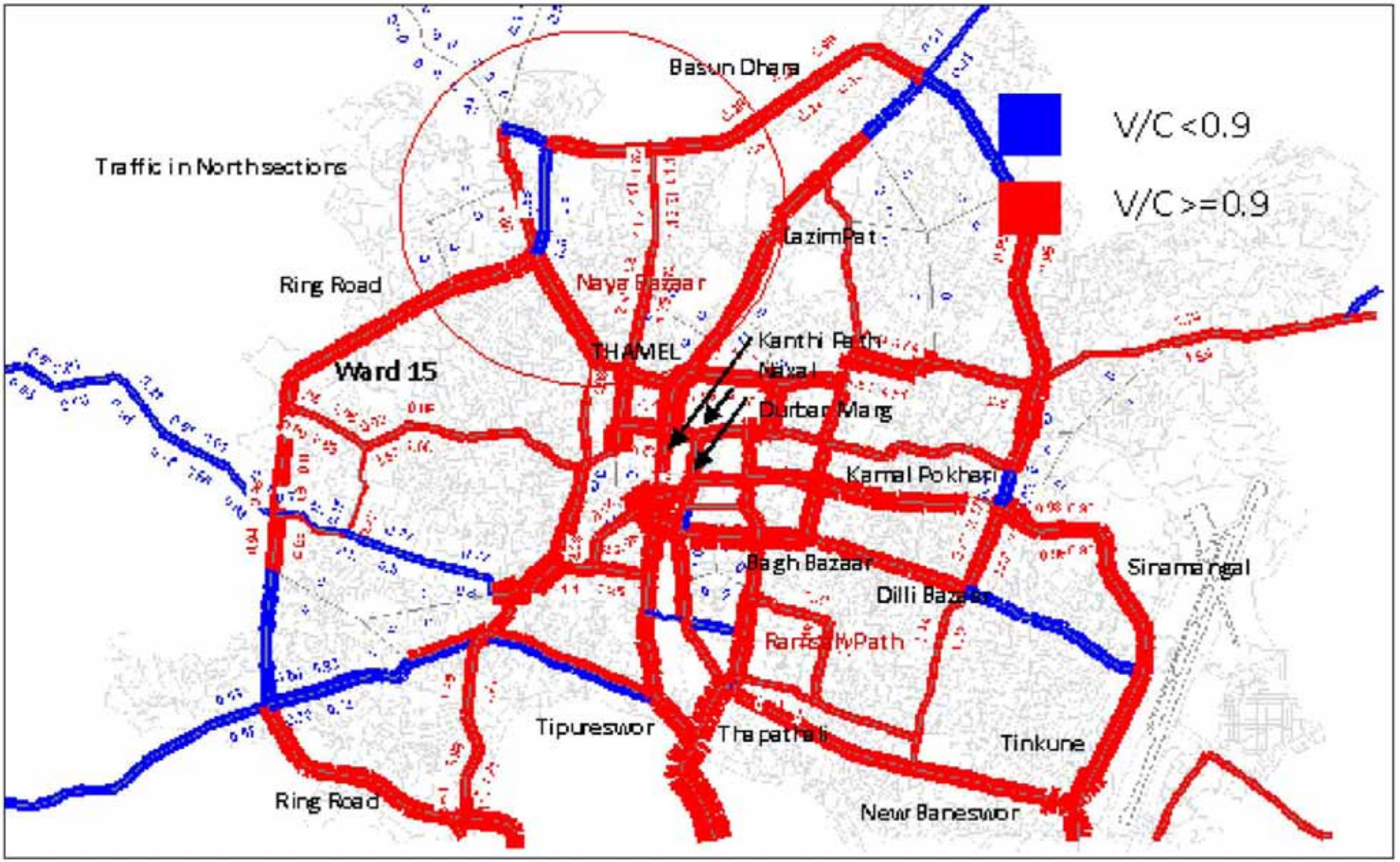



Figure 5.5 V/C Ratio for Scenario 2, 2015

(Road areas identified in this figure experience heavy traffic under this scenario. Volume capacity ratio of 0.9 means that the road has reached congested condition. Circle indicates areas where increases are greater. The red bands mean that the V/C value is greater than or equal to 0.9)

methodology can provide insights on the transport implications of possible redevelopment strategies for KMC. However, there is also a need to conduct detailed land use and transport inventory for Kathmandu City and adjacent areas to ascertain the existing land utilization rates in terms of FAR and Built-up Ratio.

A full-scale land use and transport planning project needs to be conducted to develop an updated planning database for the entire Valley as the last comprehensive study was undertaken in 1993. It is also recommended that the transportation model developed be further developed and institutionalized in Kathmandu City. As such, appropriate capacity-building activities should be pursued.

For this current RSLUP, the scenario of transferring residential populations from the core and some commercial functions to the Eastern sector is taken as a possible development scenario. However, this scenario is limited in addressing the housing and service functions for future population of KMC. Hence, the recommended results of Table 5.3 and the possibilities of developing Kathmandu City as part of a Valley-wide plan are likely directions within and beyond the ten-year frame of this plan.

### 5.2. A Risk-Sensitive Plan

Sieve mapping, the process of overlaying several thematic maps to determine the location of areas suitable for urban expansion, was performed with hazard and risk maps placed on top of each other. The thematic maps overlaid and compared are the following:

(a) Population density maps (2001)
(b) Land use maps (2001)
(c) KMC infrastructure maps (2001)
(d) Hazard and risk maps (2002)
(e) KVTDC land use zone maps (2007)

This RSLUP uses the current land use map (2006) and the KVTDC land use plan (2007) as references. The difference of this plan with the other plans comes mainly from the incorporation of the risk assessment results from JICA's 2002 Kathmandu Valley Earthquake Study into the decision process of the land use planning activities and the eventual articulation of such results in the land use plan and maps.
The preferred plan serves as the basis for the physical development and land use within Kathmandu City. By identifying areas prone to seismic hazards and their attendant risks, it is intended to guide the actions, programs and projects to consider the seismic hazards and their risks aimed at reducing vulnerabilities and addressing risk through the following key land use approaches:

- Reduction of intensity of use in the core areas using building controls (FAR, open space requirements) and following the Kathmandu Valley Land Use Plan of 2007;
- Improvements of emergency management capabilities and reinforcement of critical facilities
- Selection of evacuation or development sites for disaster management; and
- Identification of potential sites for development within and outside of Kathmandu City.
- Restrict or discourage new structures in high hazard prone areas;
- Allow some improvements or activities in high-risk areas but disallow residency in the same;
- Set in place mechanisms that would discourage people to acquire or encroach hazard-prone areas for redevelopment;

### 5.3. The Preferred Urban Form

Given the economic and social importance of roads, bridges, water and other public utilities in achieving Kathmandu City's vision, there is an immediate need to protect new and existing infrastructure against seismic risk. The risk to damage is still present, mostly from old building stock. The immediate concerns center on reducing the risks to building damage and minimizing further loss of life, especially in core areas and in dense residential sub-zones. Future populations

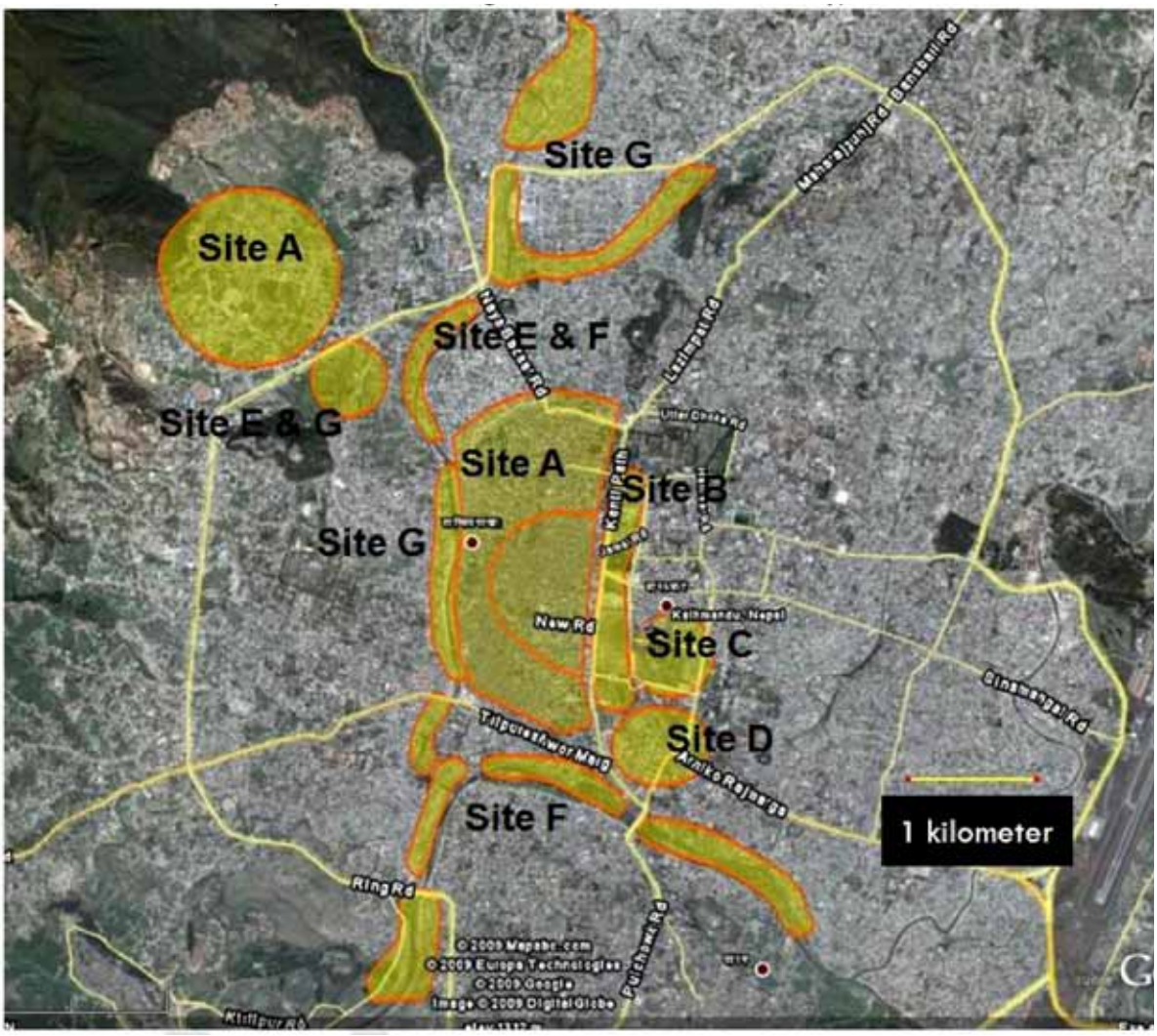



Figure 5.6 Development Sites Eyed within KMC
Source: Earthquake Disaster Mitigation in the Kathmandu Valley, March 2002
(Green areas in the map located along the waterfront pertain to possible development of the riversides, which can add to the number of open spaces and parks for evacuation.)

will benefit by being located in safe and planned locations within and outside KMC. Figure 5.6 provides the different areas for disaster mitigation as suggested in the 2002 JICA study. Figures 5.7 and 5.8 refer, respectively, to the old city core and its vicinity, where many old buildings were estimated to be damaged. Open spaces (E) and green belts, or possible new towns (G), were proposed at that time; however, some of these areas are already occupied and may no longer accommodate such proposed uses.

The strategy proposed at this time focuses on protecting assets and locating future structures in safe and planned areas. At the same time, the strategy also considers future planned expansion in the Valley, possibly forming a multi-centered development, supported by a properly planned transport system, which is similarly sensitive to disaster risks. This may hold the most promising prospect towards the realization of the KMC vision within the Valley. Within a planning period of ten years, the chosen urban form will serve as a guide for improving KMC's infrastructure, as well as maintaining a reasonable and achievable balance between the natural and built-up areas, resulting in improved livability conditions for KMC. This mission of achieving full potential use of the land, subject to the limitations and constraints of geology, existing land use and physical arrangements, and the corresponding costs and benefits tied up with

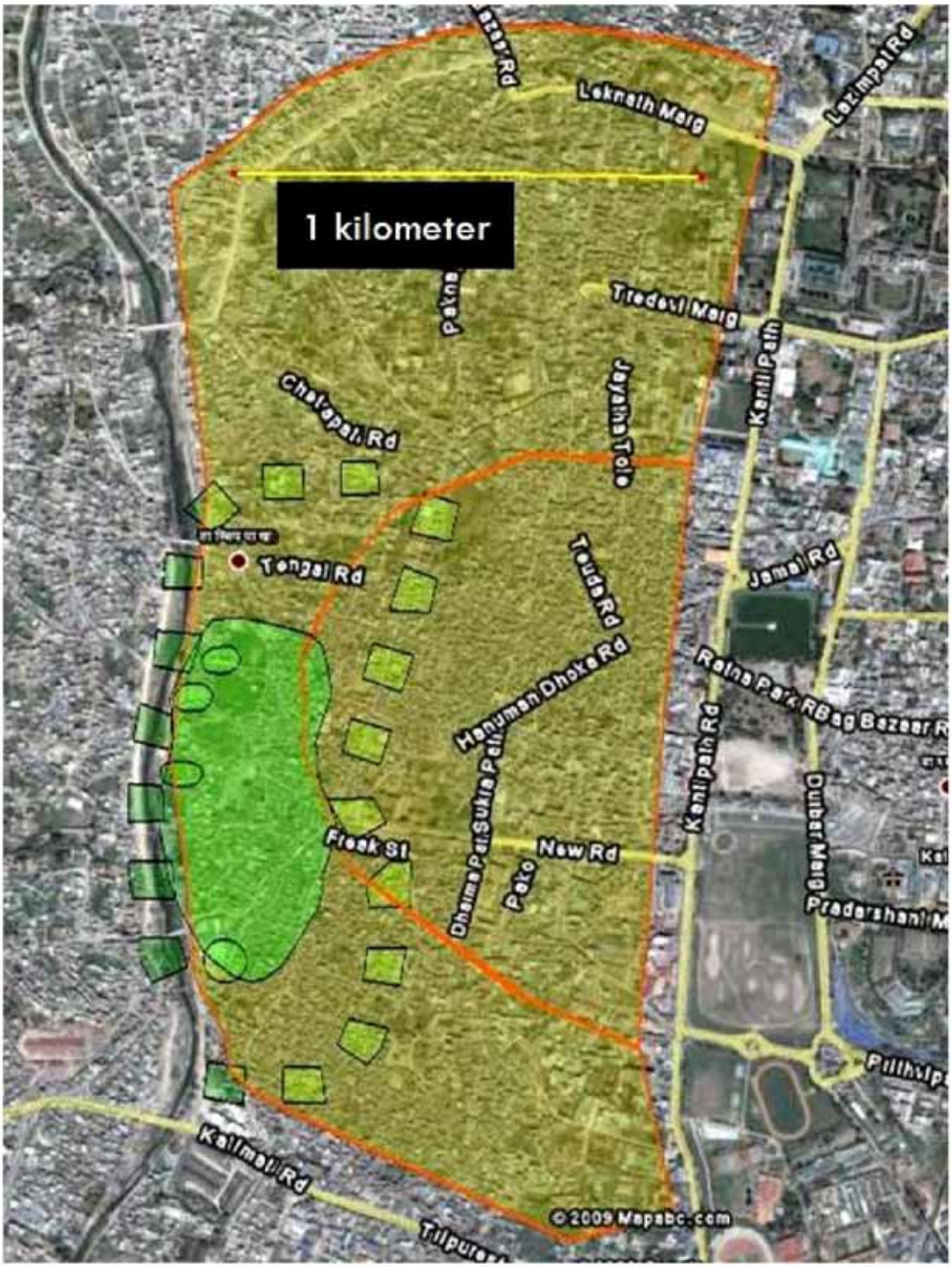



**Figure 5.7 Site A: Conservation Area and Highly Dense Mixed Residential Areas**
Source: Earthquake Disaster Mitigation in the Kathmandu Valley, March 2002
Background image from Google, 2009

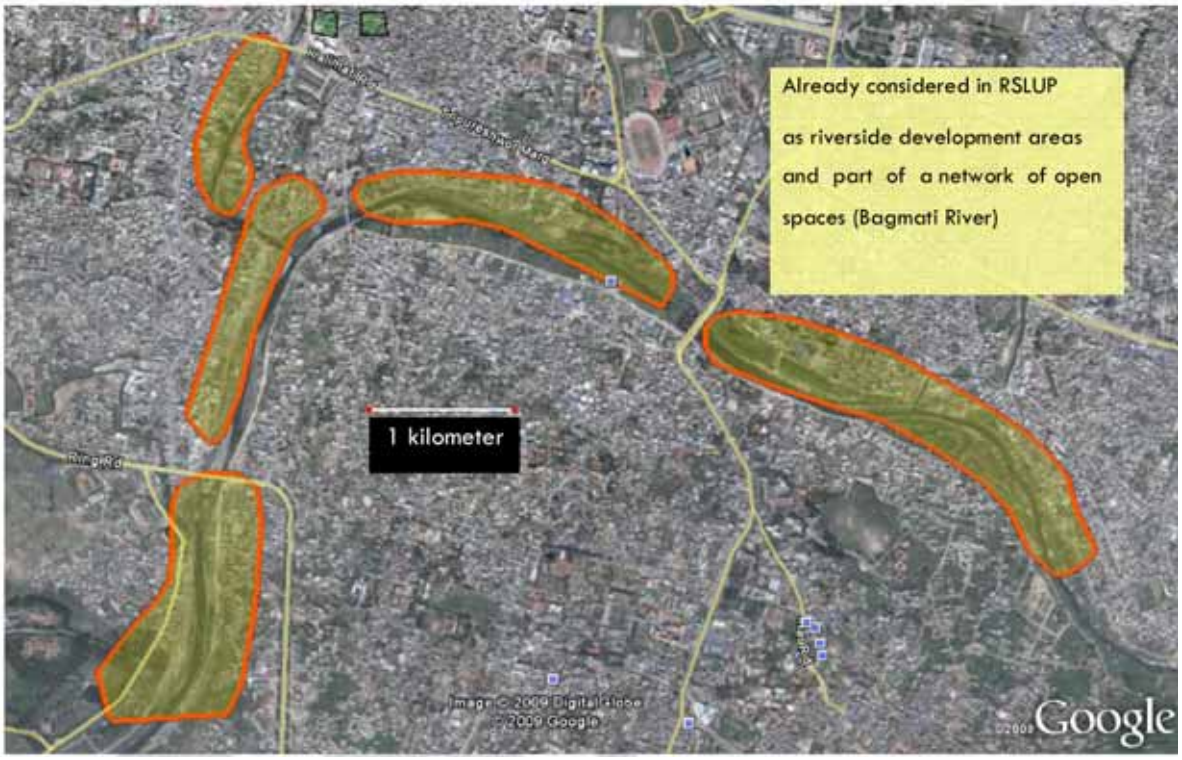



**Figure 5.8 Site F: River Side Areas**
Source: Earthquake Disaster Mitigation in the Kathmandu Valley, March 2002
Background image from Google, 2009

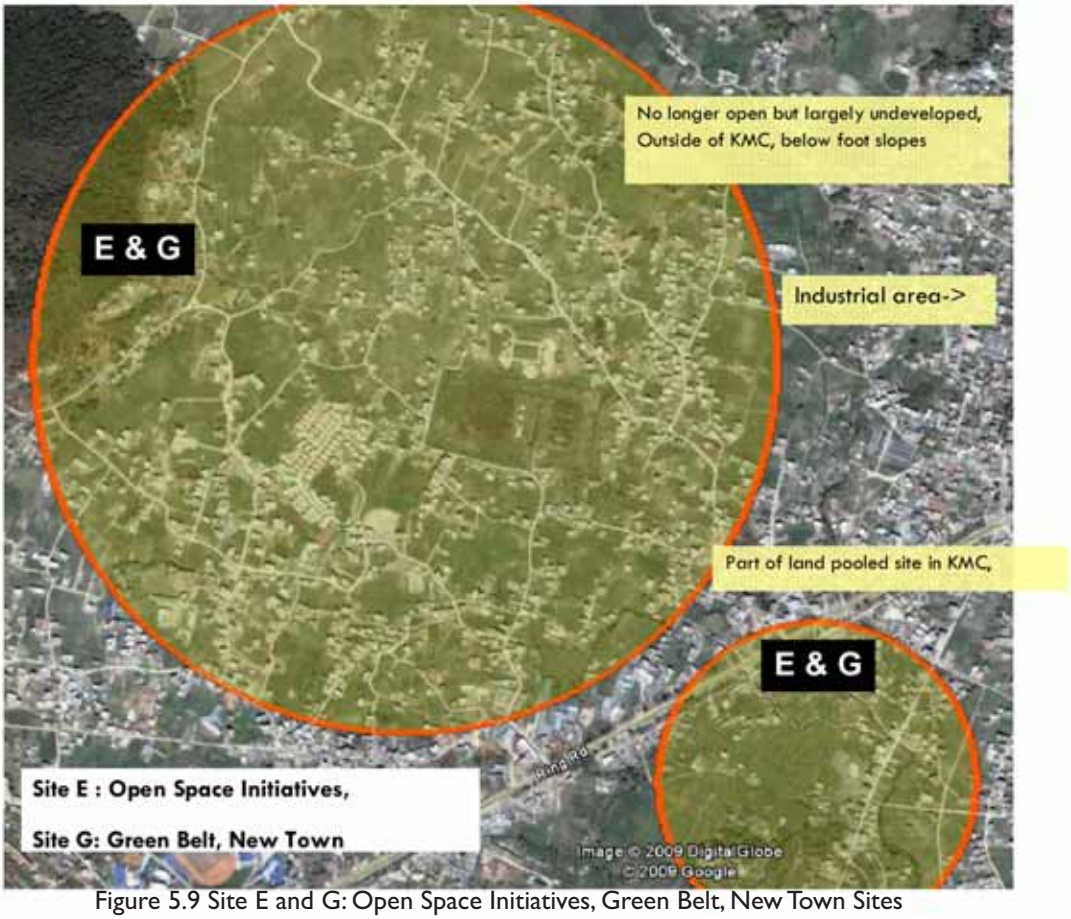



**Figure 5.9 Site E and G: Open Space Initiatives, Green Belt, New Town Sites**
Source: Earthquake Disaster Mitigation in the Kathmandu Valley, March 2002
Background image from Google, 2009

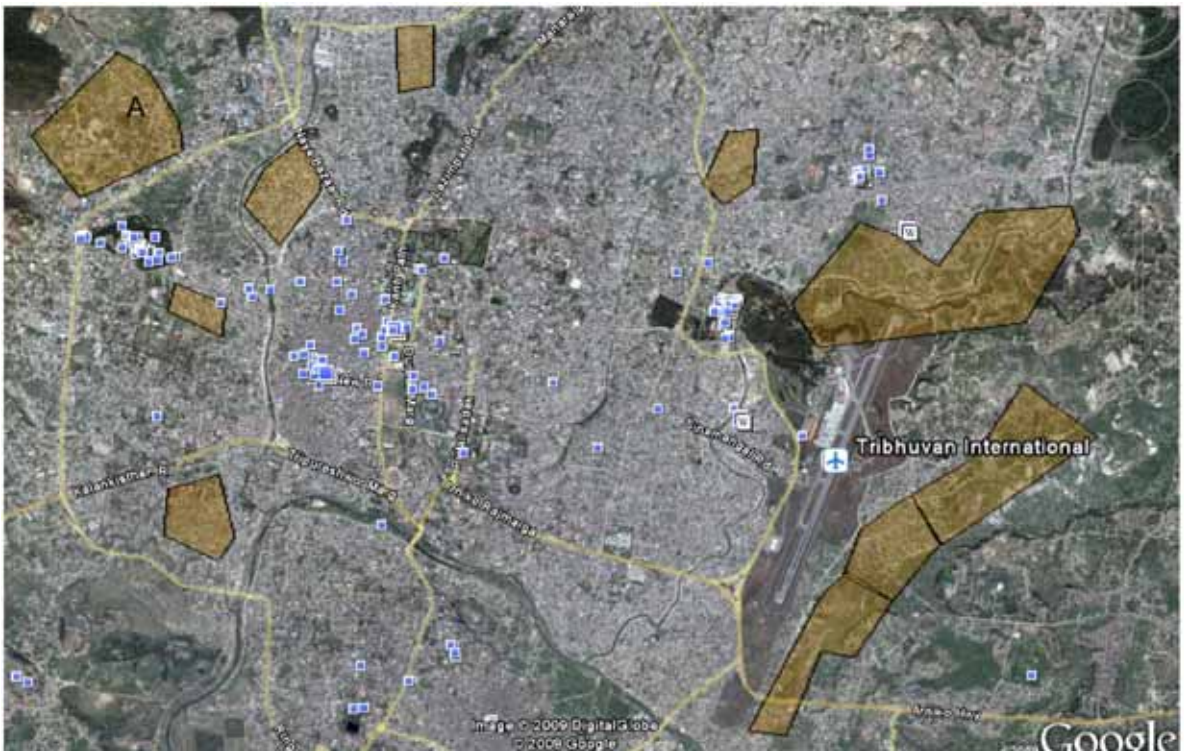



**Figure 5.10 Overview of New Settlement areas in the Kathmandu Valley**
Source: Earthquake Disaster Mitigation in the Kathmandu Valley, March 2002
Background image from Google, 2009

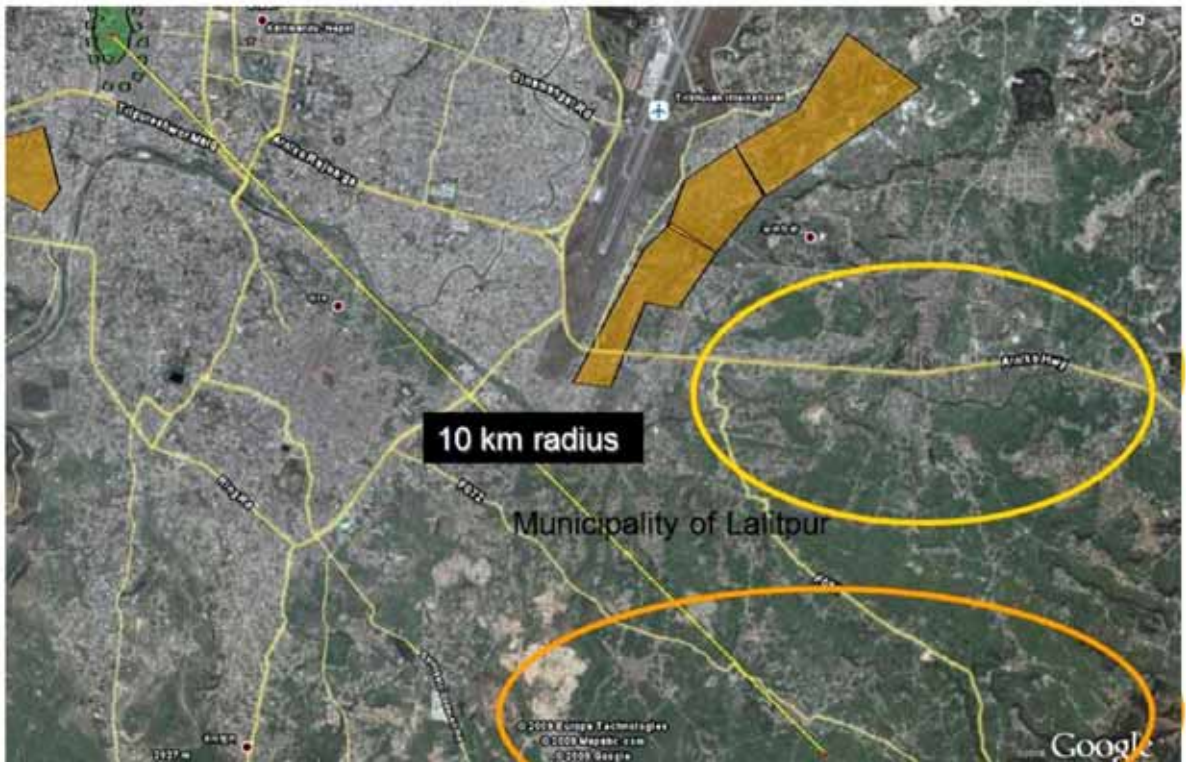



**Figure 5.11 Overview of New Settlement Areas in Kathmandu Valley**
Source: Earthquake Disaster Mitigation in the Kathmandu Valley, March 2002
Background image from Google, 2009

renewal, is a worthwhile endeavor in view of the greater potential losses, monetary and otherwise, from a very damaging earthquake.

In a wider context, a similar dilemma may be faced by other urbanizing municipalities and VDCs, and a common study may be needed (e.g. seismic vulnerability assessments, transportation) to integrate these concerns. With this in mind, the proposed strategies point to a possible phased approach of developing sites in KMC through urban renewal within the next five to seven years and locating future populations for residential purposes outside of the city towards the end of this planning period. Suggested future expansion areas outside of KMC are given in Figures 5.9, 5.10 and 5.11.

## 5.4. The Growth Areas and Corridors within Kathmandu City

### *5.4.1. The Core and Central Sector Growth Area*

As the traditional city core, this functions as the nerve center of the social, economic and political life of KMC. The heritage site in the core will be restored close to its original design and form as envisioned in the Integrated Management Framework (2007) for managing World Heritage Sites in Kathmandu Valley. With the cultural and heritage value of the monuments in mind, the structural integrity of the monuments and remaining structures shall be reviewed for possible retrofitting against ground shaking and related hazards. This may require specialized assessment and techniques for design and construction, since the restoration of structures will make use of construction materials very closely linked to the structural system of the monuments (e.g. load-bearing brick or adobe masonry with mortar comprising of earth, lime, brick dust and sand). The high degree of ornamentation consisting of wood, stucco and stone elements may necessitate additional considerations in their redesign. Recent buildings in the area may need to be rectified (Integrated Management Framework, Kathmandu Valley World Heritage Site, 2007) if the materials used, location, height and form are considered incompatible with the neighboring historical buildings. The paving materials will similarly be selected for compatibility with respect to authenticity and structural quality.

The use and function of public spaces shall be continued, but based on the understanding and appreciation of the heritage values of the site. This requirement is essential so that the site can be used sustainably, prolonging the value and economic life of the structures. The PWC has suggested that the streets and square be restored to allow for their exclusive use by pedestrians. Mercantile operations shall also be regulated; hence, private buildings shall be used only for traditional and compatible activities. Historic buildings which are no longer in use shall be conserved for adaptive re-use such as converting them into museums.

Boundaries and buffer zones identified and approved by the World Heritage Committee shall be enforced. In the Hanuman Dhoka Durbar Square, the boundary encompasses main monuments and their surrounding squares and open spaces, thereby preserving the identity of the monument zone. The buffer zone includes a strip of urban fabric surrounding the monument zone, covering an area of 6.4 hectares.

Today, the Central area is heavily built up and congested with mixed uses. Population densities in these wards range from 200 to 500 persons/hectare. The circulation network that serves the wards in this area is the Ring Road, which will be improved with the widening of its connection with the Madan Bhandari Path. At the southern portion of the Central area lies a buffer strip of commercial development radiating from Madan Bhandari Path. Medium to high density commercial and institutional uses are concentrated along this road, while dense mixed residential uses dominate the interior of the blocks. In time, urban development will radiate outwards from the road. The indicative location of this commercial strip is shown in Figures 5.12 and 5.13.

This new growth corridor extends towards the Eastern sector that defines the Business Growth

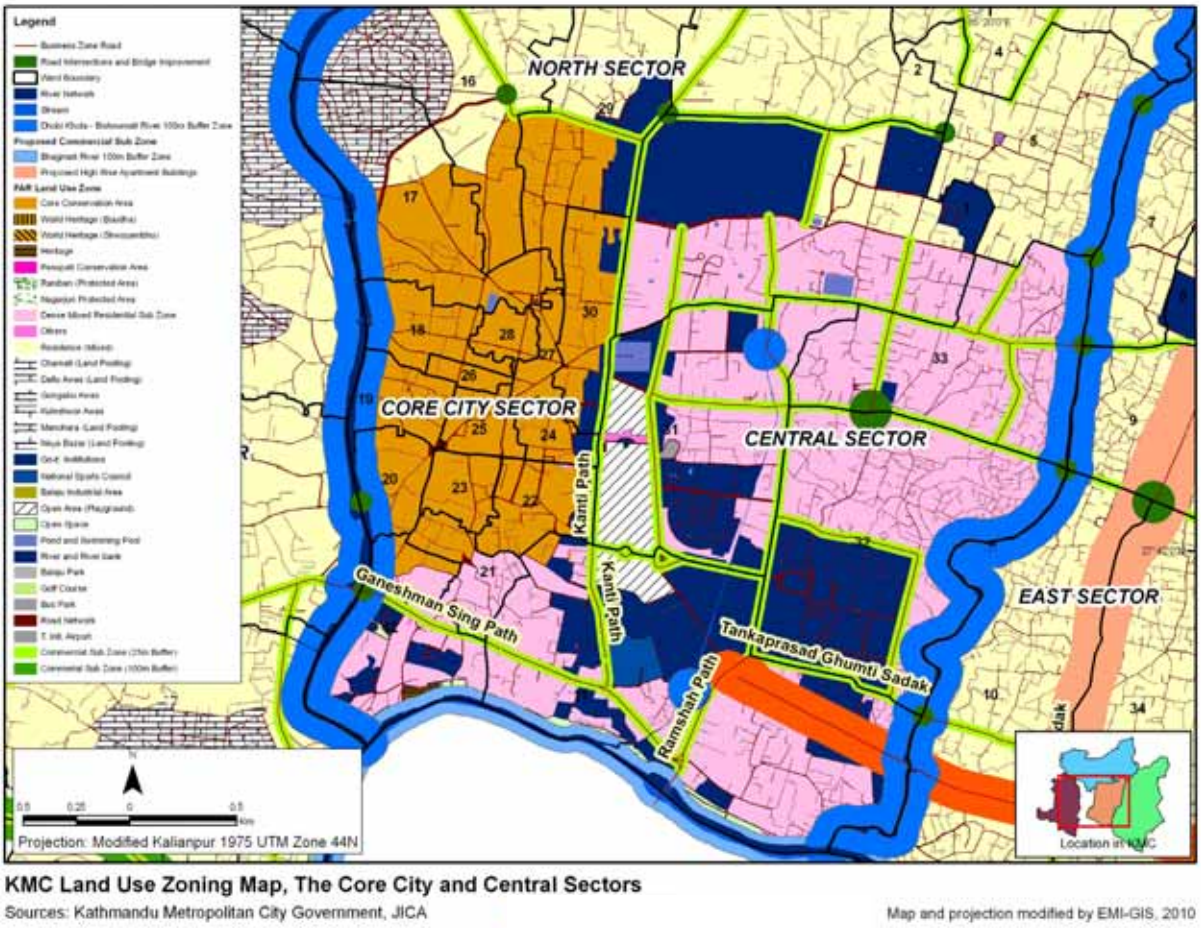



Figure 5.12 The Central and Core Areas
(An enlarged portion of the KMC land use map, indicating the concentration of development in the Core and Central areas.)

Corridor shown in red. The boundaries of this growth corridor lie within other residence zones. Strong land use policies will have to be instituted to maintain the buffer and to implement densification of these areas to its carrying capacity (i.e. FAR of 2-3). The eastern side of this growth corridor merges with the Outer Ring Road as shown in Figure 5.12.

The Central sector will maintain its function as the financial and business district of the city, while the traditional role for worship, pilgrimage and other related mercantile functions will remain in the Core. The center of social and political life will continue in the Central area but commercial functions will be slowly distributed to the designated growth corridors in the East sector. The public markets shall remain in the periphery to avoid further congestion in the Central area. Future markets to serve the needs of each growth corridor and its immediate areas will be located in this corridor.

The dominant land use within the Central area will be high density residential areas with allocations for the tertiary sector such as wholesale and retail trade, banking and finance, personal and community services, transportation and telecommunications, and tourism-related uses. Educational institutions will be allowed to remain. A similar policy will be applied to existing hospitals in the area.

On the other hand, medium-density housing (e.g. row houses, townhouses) will be encouraged in wards outside the CBD (central business district) area. The circulation network in these wards will have to be improved and upgraded in order to introduce some order and rationality into the present road hierarchy.

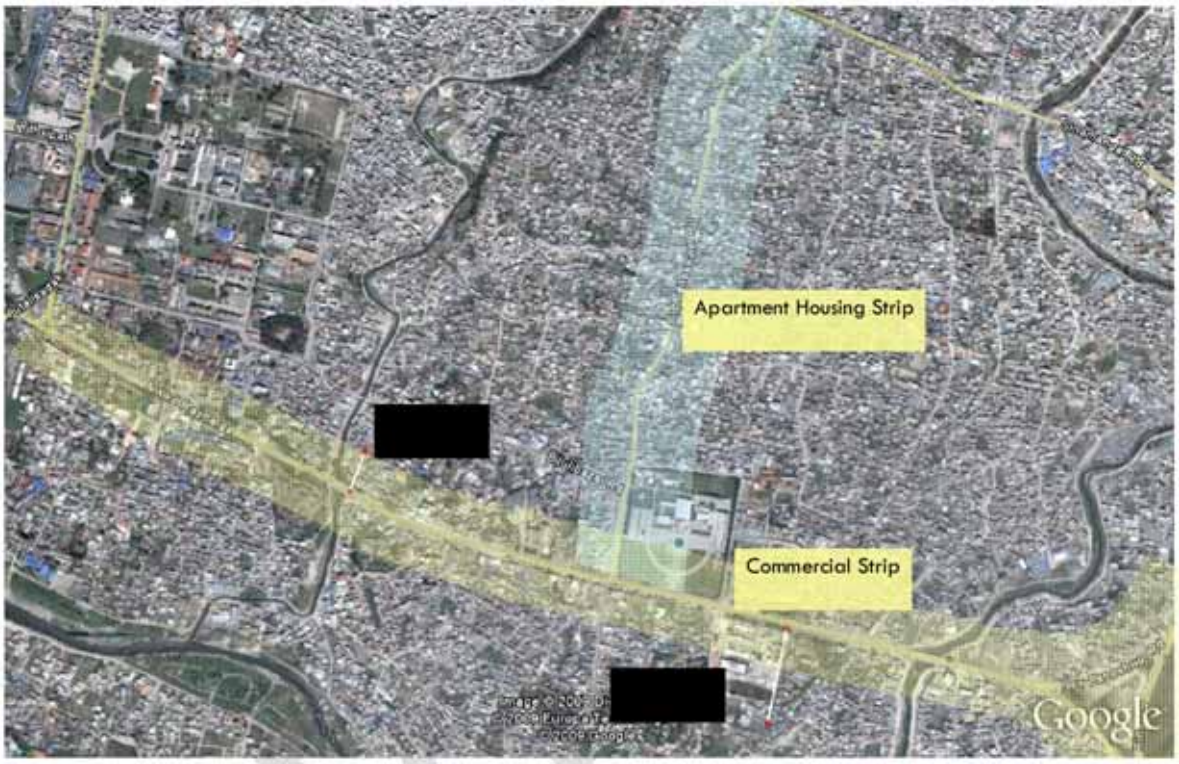



**Figure 5.13 Indicative Location of the Proposed Commercial Strip**
Source: Earthquake Disaster Mitigation in the Kathmandu Valley, March 2002
Background image from Google, 2009
(Figure shows the concentration of development (apartment strip and commercial strip) for the Core and Central sectors.)

Future development within KMC will see greater use of such limited approaches in-filling of vacant lands and densification, creation of open spaces, road widening, and improvement of riversides. The building by-laws shall guide these developments. Other important points may be considered:

- Different plots could be integrated as a single plot and the ownership provision would be the same as in the Apartment Act. The Apartment Act in Nepal concerns the ownership of different people over a single plot. But there is no clear ruling about integrating different plots into one under the ownership of the same group of people. There are some examples that a group would agree to build a building in a plot integrated from different plots owned by different people; but due to lack of relevant laws, this kind of integration is very rare. So the introduction of relevant laws necessary for integration of highly fragmented plots may need to be looked into.
- To create open space and encourage efficient use of land, the right to develop from land owners must be transferred to the government, with owners receiving just compensation and/or becoming partners in developing the site.
- Strategies may be devised to discourage new building constructions, such as taxation, close monitoring, etc.
- As most of the open spaces in the category "other residential area" are private lands and continuously being occupied by buildings at the rate of 3,000 new houses per year, introduction of 'development right transfer' becomes important. By introducing a development right transfer system, the FAR of some vacant lands could be transferred to already built-up areas.
- Some criteria need to be defined before pursuing the development of business strips

along the Ring Road and other roads, such as having a minimum requirement of three "ropani" plot (1,017 sqm), 6m wide access road, and underground parking.

- Wards in outer areas (other residential area) should be further divided into small zones so that the availability of critical facilities such as school and hospitals, recreational facilities, and open space could be further analyzed. Based on this, the building of the minimum number of required facilities should be encouraged.

- In order to increase the city's inventory of parks and open spaces within the Central sector, a number of government-owned lands may need to be converted into linear city parks.

- Government-owned lands that could be immediately developed into a city park in the short to medium term are portions of the Baghmati River, which could enhance the image and livability of the Central area growth corridors.

- In line with the city's desire to specialize in information and telecommunications technology, a Science and Technology Park may be integrated into the master plan of the Central area. The availability of information technology (IT) schools, IT-related businesses and Internet service providers makes the city a competitive site for the establishment of projects focused on IT services. Such activities may include the following:

    - » Software development and application for business, e-commerce, education and entertainment;
    - » Knowledge-based IT services, i.e. data encoding and conversion;
    - » Backroom activities; and
    - » IT-related service activities, i.e. internet service providers.

Other measures to strengthen the role of the Central sector as the financial and business district of KMC, as well as to make KMC more competitive regionally, in the short to medium term include the following:

- Improve the flow of vehicular traffic and enhance pedestrian safety and convenience by a combination of measures such as:

    - » Conducting a Valley-wide study of the transport demand and supply, with a view of the development needs, potentials and constraints (i.e. natural hazard risks);
    - » Providing off-street parking or vertical parking and strictly prohibiting curbside parking along major roads. A vacant lot within the area can be converted into a public pay parking area;
    - » Prohibiting tricycles from operating along main arteries as they slow down traffic flow;
    - » Defining the function of existing streets and providing the necessary directional signs;
    - » Recovering the sidewalks for the pedestrians by clearing away illegal encroachments, covering open side drainage canals, and requiring owners of permanent structures that had encroached on the road lots to provide arcaded walks;
    - » Constructing pedestrian overpasses at very busy intersections and properly designed crosswalks at strategic locations, as well as facilities for the handicapped and elderly such as access ramps in all public and private institutions and commercial establishments; and
    - » Limiting the use of a number of city streets within the CBD strictly to pedestrians.
    - » Developing emergency access roads with designated and restricted access to vehicles and priority for emergency

- Enforcing an anti-littering ordinance and encouraging every resident to maintain cleanliness in their premises;
- Improving the overall image of the city by acquiring land to be developed into pocket and linear parks;
- Enhancing historical landmarks (heritage

sites) and developing potential tourism sites through public-private partnerships; and

- Improving water and sanitation facilities by providing any needed expansion as well as protecting them from natural hazard risks.

### *5.4.2. East Sector Growth Corridors*

Development of the eastern and southeastern sections of the city is influenced by airport location. Providing vital link from this airport to inner areas is the same Madan Bhandari Path. This highway which links the eastern, southern and southwestern wards has contributed to the rapid transformation of this section of the city, albeit into an unplanned and unregulated type of strip development along the said highway. (See Figure 5.14)

Because of its close proximity to the Central and Core areas, and the availability of undeveloped land, the East sector growth corridor is a priority area to be developed in the short to medium term. If designated as an expansion area with a proposed buffer strip of 100m through possible land pooling, it has the capacity to absorb a significant portion of urban expansion away from the Core and Central areas. Further south, the Bagmati River development will provide another visual corridor to this strip.

The East sector, in general, will be promoted as a tourism and residential area, incorporating into its master plan two major developments -- one for road commercial strips and another for apartment housing. These two features will serve as the focal points of this growth corridor. Vegetable markets here will be expanded and modernized in order to cater to the growing population.

In line with the city's aim to further strengthen its role as the premiere center of education and health services, the possible use of vacant lands still available in the fringes of the East area (near land pooled areas) will allow for provid-

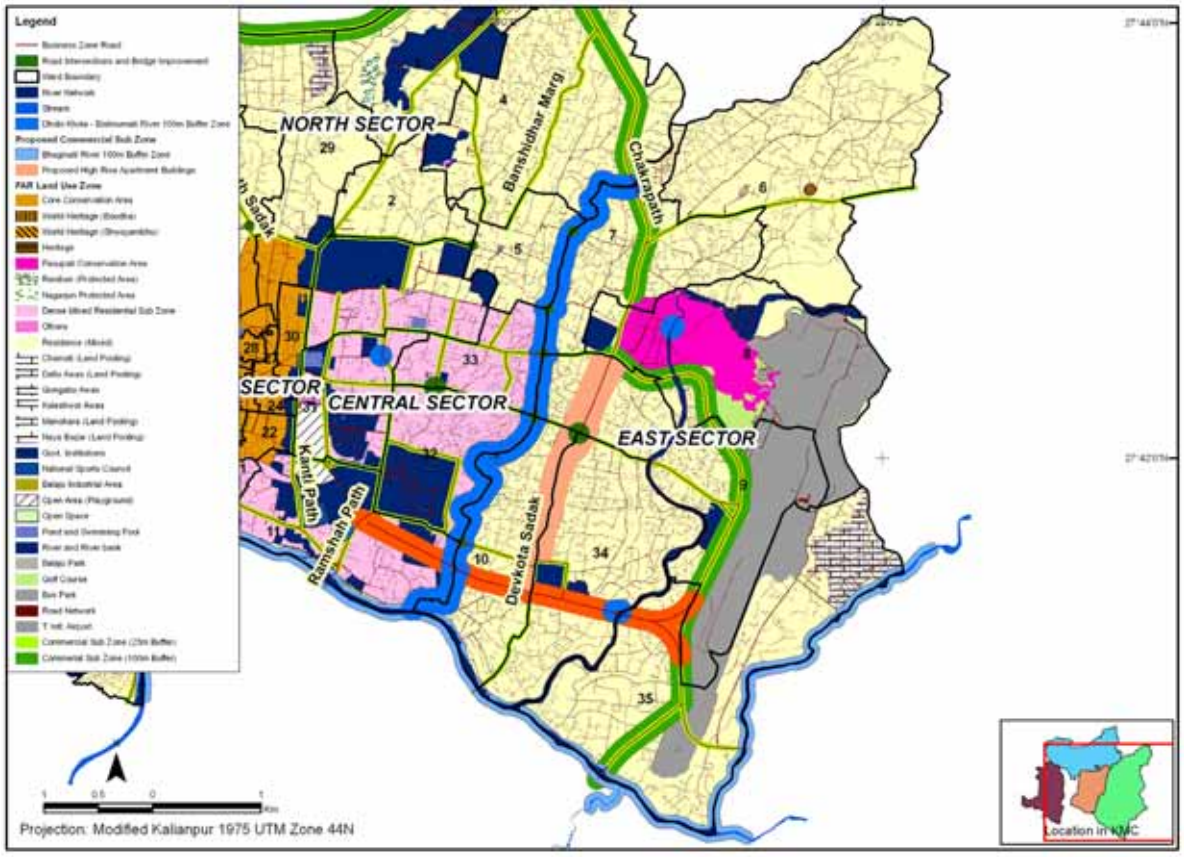



**Figure 5.14 The East Sector Growth Corridors**
(An enlarged portion of the land use map shown in Figure 5.20. Figure shows the concentration of development for the Eastern and Central sectors.)

ing a park-like setting that is conducive to learning and healing.

Between these areas will be mixed uses compatible with dominant use including retail shops, dormitories, restaurants, private clinics, miscellaneous services, and the like. A network of parks and open spaces, tree-lined roads, and pedestrian pathways will serve as the unifying elements that will link all these features into a cohesive whole.

The construction of roads and other support infrastructure is crucial to the realization of the long-term spatial development proposed for the growth center. Therefore, necessary surveys and studies shall be conducted to firm up the proposed plan. Opportunities for public-private partnerships in the implementation of the plan will be explored.

Two new growth corridors outside the core were identified namely a) Apartment Housing Strip and Group Housing within the Eastern Sector Growth Corridor intersecting the Devkota Sadak, and b) the 25m to 100 m highway corridor along the Ring Road.

Each growth corridor is envisaged to play a specialized function based on its existing, emerging and potential contribution to the realization of the long-term vision of the city. This ensures complementation and sustainability among the different centers while giving each center its unique identity. Each growth corridor is also envisioned to be a mixed-use development, hence, residential, commercial, and institutional land uses will be integrated in support of the distinct role each center has to play.

Each growth corridor is likewise envisioned to serve its own area of influence. The influence area of each center is expected to be modified from that of the present to one with a better circulation network consisting of fully developed arterial, collector and distributor roads.

### *5.4.3. North Sector Residential Growth Area*

This area, dominated by the "other residential area" category and institutional uses, shall be maintained as a tourist destination area. The highways oriented toward the north can serve as visual corridors leading to the forest areas of the North Mountains, therefore the construction of high-rise structures in this area shall be regulated. The presence of schools and hospitals lining this road has resulted in traffic jams especially during peak hours; hence, road widening or traffic management may be pursued.

This growth corridor (25m commercial strip) along the Ring Road is characterized by a strip development on both sides of the road (Figure 5.15). Priority measures to improve the form and function of this corridor include the following:

- Demolition of all structures encroaching into the road right-of-way;
- Creation of open spaces such as pocket parks to break the monotony of continuous buildings along this road and to improve its image;
- Widening of the road, to include loading and unloading bays at strategic locations along the strip;
- Introduction of traffic management schemes to reduce congestion; and
- Rationalization of the circulation network in the interior lots beyond the growth corridor to eliminate dead-end effects and improve traffic flow.

5.4.4. West Sector Growth Corridor

The proposed RSLUP identifies Urban Redevelopment Zones (along the Outer Ring Road) within the commercial buffer strips aimed to promoting further development of the city. The development of the Bagmati and Bishnumati Rivers will be pursued in this sector. The West sector will remain largely a residential area comprised of "other residential area" categories and land pooled areas (Figure 5.16).

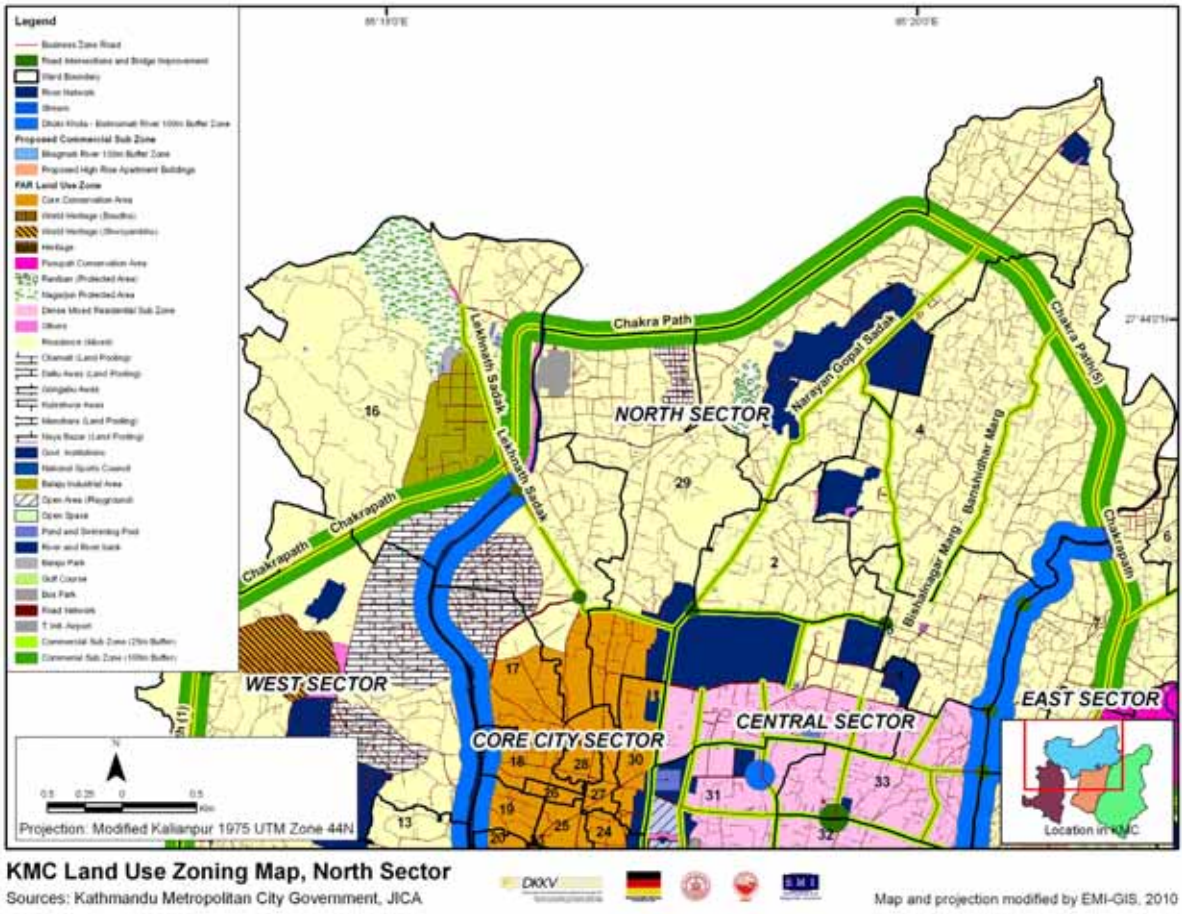



Figure 5.15 North Sector Residential Growth Area
(An enlarged portion of the land use map shown in Figure 5.20. Figure shows the concentration of development in the North sector.)

## 5.5. Built-up Areas outside the Growth Centers/Corridors

The preceding section describes the proposed development for the various growth centers and corridors. This section describes the built-up areas that are not located within the designated growth centers and corridors.

The overall strategy for these areas is to maintain them as low density and low impact developments while improving the support infrastructure and protecting environmentally-sensitive sites from encroachment. Zoning measures will be strictly enforced to regulate ribbon developments and to direct development away from environmentally-sensitive locations such as danger zones (e.g. potential liquefaction areas, flood-prone areas), river easements, urban forests and the like.

## 5.6. Protected Areas

In order to ensure sustainable development for KMC, the proposed RSLUP also strongly promotes the conservation and maintenance of identified protected areas and life-support systems. The following areas will be the subject of protection and conservation policies:

### *5.6.1. Heritage Areas*

Kathmandu City will likely absorb the increasing number of visitors and migrants from the Valley. Heritage sites must be protected and the city's image as a "Living Cultural Heritage" must be maintained. This translates to the following: a) conservation of the heritage buildings and monuments, street routes and squares, and riverside heritage; b) preservation of cultural activities such as festivals and rituals; c) prevention of further loss of heritage

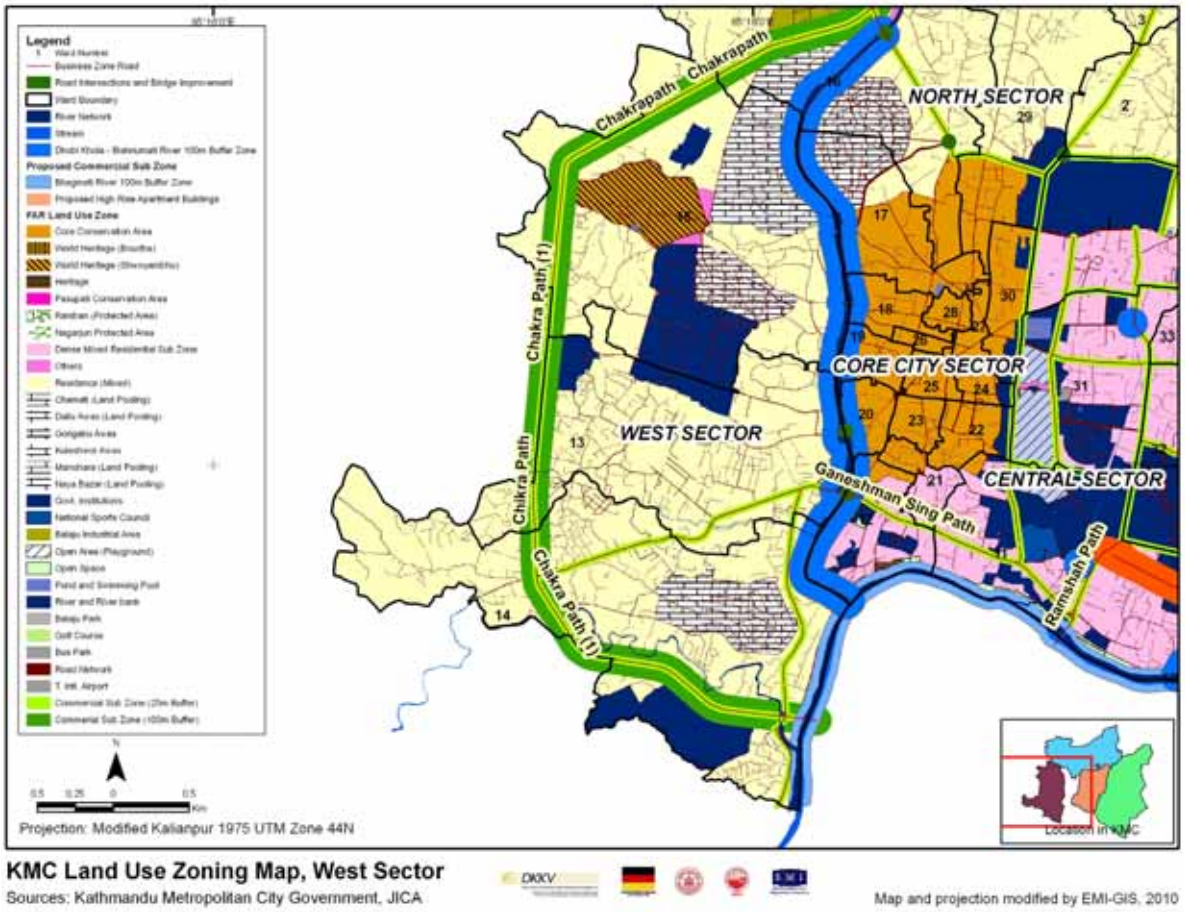



Figure 5.16 West Sector Residential Growth Area

(An enlarged portion of the land use map shown in Figure 5.20. Figure shows the concentration of development for the West and North sectors.)

from private development; d) establishment of museums; e) removal of incompatible uses; and f) diversion of mercantile economic development to outside the heritage areas of the core to aid in prolonging the replacement period of the structures.

### *5.6.2. City Square (Durbar Square/Temple)*

Owing to its historical significance, the square located right at the core of KMC has functioned over the centuries as the nerve center of the social, economic and political life of the city, influencing the city's evolution into what it is today.

### *5.6.3. Other Parks*

Parks and open spaces will serve as additions to the physical infrastructure in the form of recreational grounds, as well as sites for relocation and evacuation in times of emergency. One of the programs that can be pursued is to have a Network of Parks and Open Spaces. This program should identify and develop a hierarchy of parks and open spaces from the city level down to the ward level.

### *5.6.4. River Easements*

As required by law, the 25-meter easements along the city's seven main rivers and tributaries will be recovered and strictly enforced. A program to develop linear parks along river easements will help protect them from illegal structures. Illegal settlements lining the rivers will be resettled to safer grounds. More information can be obtained from the River Development Plan of 2007 particularly for the Bagmati river segment crossing Kathmandu City.

### *5.6.5. Environmentally-Critical Areas*

As discussed in Chapter 3, the vulnerability of most of KMC to liquefaction and ground shaking, as well as to floods and storm surges, makes it an environmentally-critical area. More proactive approaches in dealing with such inherent constraints must be pursued including requiring geo-technical studies for building construction, recovering natural waterways, de-silting and dredging waterways, conducting information dissemination campaigns, and carrying out disaster preparedness initiatives, among others.

### *5.6.6. Emergency Routes in Core Areas*

In case of a major earthquake disaster, among the expected main problems are related to the blockage of road from debris of damaged buildings affecting search and rescue, lack of open spaces for shelter, and insufficient facilities for drinking water, treating injured people, and cremating casualties. The strategies identified in this RSLUP are intended to minimize such problems.

Figures from 5.17 to 5.19 provide a picture of possible evacuation routes in the Core and nearby areas, as suggested in the 2002 JICA study. The arrows indicate safe routes and open spaces. Many of these open areas are parks, playgrounds, public squares and large privately owned lands. Access to these areas within 100meter to 500 meter stretches may still be possible, but a new inventory should be made considering that built-up areas continue to proliferate over the years, and that taller buildings along narrow streets pose dangers from sudden collapse.

## 5.7. Infrastructure Support Systems

Infrastructure systems play the same role as protected areas in that both serve as "support" for settlements and production areas, ensuring their livability, efficiency and sustainability. While protected areas are best left in a relatively natural state, infrastructure support systems necessarily form part of the built environment. These support systems are categorized into five groups, namely, social, economic, administrative support, transport and urban utilities. Social infrastructure sustains settlements by providing facilities for education, health, sports and recreation, and the like. Markets, slaughterhouses, and warehouses are examples of economic infrastructure. Administrative support infrastructure refers to facilities provided by government to facilitate provision of services. Examples include the city hall, peace and order facilities, fire protection facilities, ecological waste management facilities, among others. Transport infrastructure provides the vital link to different activity areas, while urban utilities serve the need for water supply and distribution, power supply and distribution, drainage and sewerage, and telecommunications. (Serote, 2004)

The strategy encompassing the infrastructure support systems should be consistent with the preferred urban form. Therefore, each growth center and corridor will be provided with adequate and appropriate infrastructure to support its functions. In view of the seismic risks, strategies for safer and more resilient buildings and infrastructures shall be pursued. Among them are the following:

- Reduce building and infrastructure vulnerability to earthquakes by pursuing appropriate modifications and reinforcement on highly vulnerable buildings; ensuring earthquake loads are included in the design of new buildings and other structures; regulating structural modifications done to buildings (permitting), and enforcing strict building occupancy.

- Protect critical facilities, such as hospitals, police stations and emergency shelters (e.g., pursue vulnerability assessment and appropriate mitigation), Vulnerability assessment should consider the structural, non-structural and functional aspects

- Reduce or possibly eliminate damage to infrastructure (i.e. lifelines) mainly water, wastewater and sanitation, drainage, transportation system (including airport and main bridges), power, communication, fuel supply and food supply systems


**Figure 5.17 Escape Route Planning North of Core**

Source: Earthquake Disaster Mitigation in Kathmandu Valley, March 2002

(Possible evacuation routes in the core and nearby areas, as suggested in the 2002 earthquake study by JICA. The arrows indicate safe routes and open spaces.)


**Figure 5.18 Escape Route Planning Around Core**

Source: Earthquake Disaster Mitigation in Kathmandu Valley, March 2002

(Possible evacuation routes in the core and nearby areas, as suggested in the 2002 earthquake study by JICA. The arrows indicate safe routes and open spaces.)


**Figure 5.19 Escape Route Planning South of Core**

Source: Earthquake Disaster Mitigation in Kathmandu Valley, March 2002

(Possible evacuation routes in the core and nearby areas, as suggested in the 2002 earthquake study by JICA. The arrows indicate safe routes and open spaces.)

- Reduce possible disruption of critical services.
- Reduce high potential for fire and potential for hazardous material release that could follow an earthquake due to mix uses of residential, commercial and industrial functions, through better enforcement of fire safety and hazardous material regulation, as well as basic safety requirements;
- Strengthen supporting structures related to staging relief operations, for organizing emergency response functions, for providing emergency shelter, and temporary housing due to the lack of open space in the city.
- Prepare post-event recovery and reconstruction plans for the Valley;

## 5.8. Evaluating the Preferred Urban Form

This next step in the process entails an inspection of the potential areas suitable for urban development as identified in the land use map shown in Figure 5.20. The evaluation of spatial strategies is anchored on important requirements for the built and natural environment aimed at ensuring that KMC citizens:

- Enjoy clean air, safe water, and a built environment that is relatively free and safe from risks emanating from natural and man-made hazards;
- Benefit from easy access to urban facilities and services;
- Preserve the heritage areas;
- Engage in livelihood activities and earn adequate income to support a decent and dignified lifestyle; and
- Afforded the opportunity to develop and realize their full human potentials.

A short comparison between the current land use trends and the preferred land use is presented below.

### *5.8.1. Trend Extension*

**A. General Description**

Trend extension shows the future urban development as a continuation of the pattern of growth the city has followed over the years. It is the result of individuals building anywhere according to their own preferences and convenience with minimal government intervention. Some people build on environmentally critical areas thus contributing to the degradation of the natural environment and exposing them to environmental hazards.

**B. What are the existing problematic situations in this existing urban form in KMC?**

1) Difficult to expand new roads and other infrastructure

To relieve traffic congestion, low-cost non-structural measures like improved traffic management are applied.

Increased road capacity, road widening, multi-level highways would entail higher capital costs due to possible clearance.

Vertical parking may be eyed in existing areas; horizontal parking in new areas. However fragmented lands are need to be pooled. Public transport terminals are most likely located in urban expansion areas.

2) Community adjustments to disaster risks is low

As most of the city functions are found in the Core and Central areas, exposure to earthquake risks remains high in those areas.

- New developments occur in the North, West and East areas where exposure to liquefaction is small.
- Compliance with seismic code provisions is better in the new areas; disaster preparedness measures are necessary in old built-up areas.
- Open spaces are planned to be used as evacuation sites during earthquake-induced disasters.
- Depending on the intensity and source of the earthquake, circulation and access may be difficult when linear roads are damaged. The strategic road network discussed in the Sectoral Profile reveals areas that are potentially at risk.
- Some areas eyed for expansion are developing sprawl, except in land pooled areas near the fringes.
- Seismic retrofitting of structures and re-engineering approaches are most likely needed. Given the current estimates of the damage and losses to buildings and infrastructure from a mid-Nepal earthquake, retrofitting will be costly.

3) Preservation of protected croplands

Encroachment on environmentally critical areas continues to threaten the natural environment, especially in the fringes, riversides and urban forests. Thus, strong land use policies and IEC campaigns will be required.

Existing agricultural areas will be easier to convert for urban expansion, thus requiring strong government and community interventions.

4) On government enforcement of regulations

Existing laws (e.g., water, air, environment, sanitation, and building codes) and local ordinances are difficult to enforce in already built up-areas. In new developments (i.e. new construction, rehabilitation, repairs), it is easier to enforce building bylaws and other codal provisions. However, such sites for new development may no longer be found within Kathmandu City.

5) People's compliance with regulations desired

Compliance with regulations is already difficult, especially in the Core and Central areas.
If better informed, future developers are expected to comply with regulations more easily in new expansion areas.

6) No more open space in Kathmandu City for new developments

KMC has to review the expansion of urban areas outside of Kathmandu City and such new sites in the Valley must similarly be subject to risk assessments. A properly designed transport system that will promote efficiency by providing appropriate capacities and efficiencies among old and new centers for development should link KMC, the municipalities and VDCs.

**C. Implications when this urban form is realized**

1) Access of people to city-wide services

Access to goods and services will be difficult for areas far from the city center and in unplanned interior areas, while the Core will continue to provide the widest range of goods. Other growth areas may assume a similar central function towards the later development stage depending on the type and magnitude of investment located in these areas.

2) Amount of air and water pollution produced

Trend extension will continue to aggravate air and water pollution. Traffic management schemes will help reduce air pollution. In the absence of an improved wastewater treatment facility and utilizing the present form of treatment and disposal, river water pollution will worsen.

3) Sustainable use of natural resources

Areas already encroached upon may be difficult to rehabilitate.

4) Traffic problems

Circulation within the city and movement in and out of Kathmandu City are rendered increasingly difficult as traffic builds up along already congested routes. Traffic management schemes alone without structural measures and strict land use regulation may not be sufficient to deal with traffic problems.

5) Overall attractiveness of the city

Without effective building density and design restrictions/controls, coupled with a mix of non-compatible uses, the attractiveness of the city will be low, negatively impacting the image of heritage areas.

6) Potential for increased KMC revenue

New developments will continue to generate moderate incomes/revenues for the city. The rehabilitation of existing infrastructure will reduce said incomes.

7) Prospects for more jobs and higher income

New jobs and higher incomes may result from new businesses operating in urban expansion areas because these areas may be better planned.

8) Kathmandu City's leading role in Tourism, Education and Health Services maintained

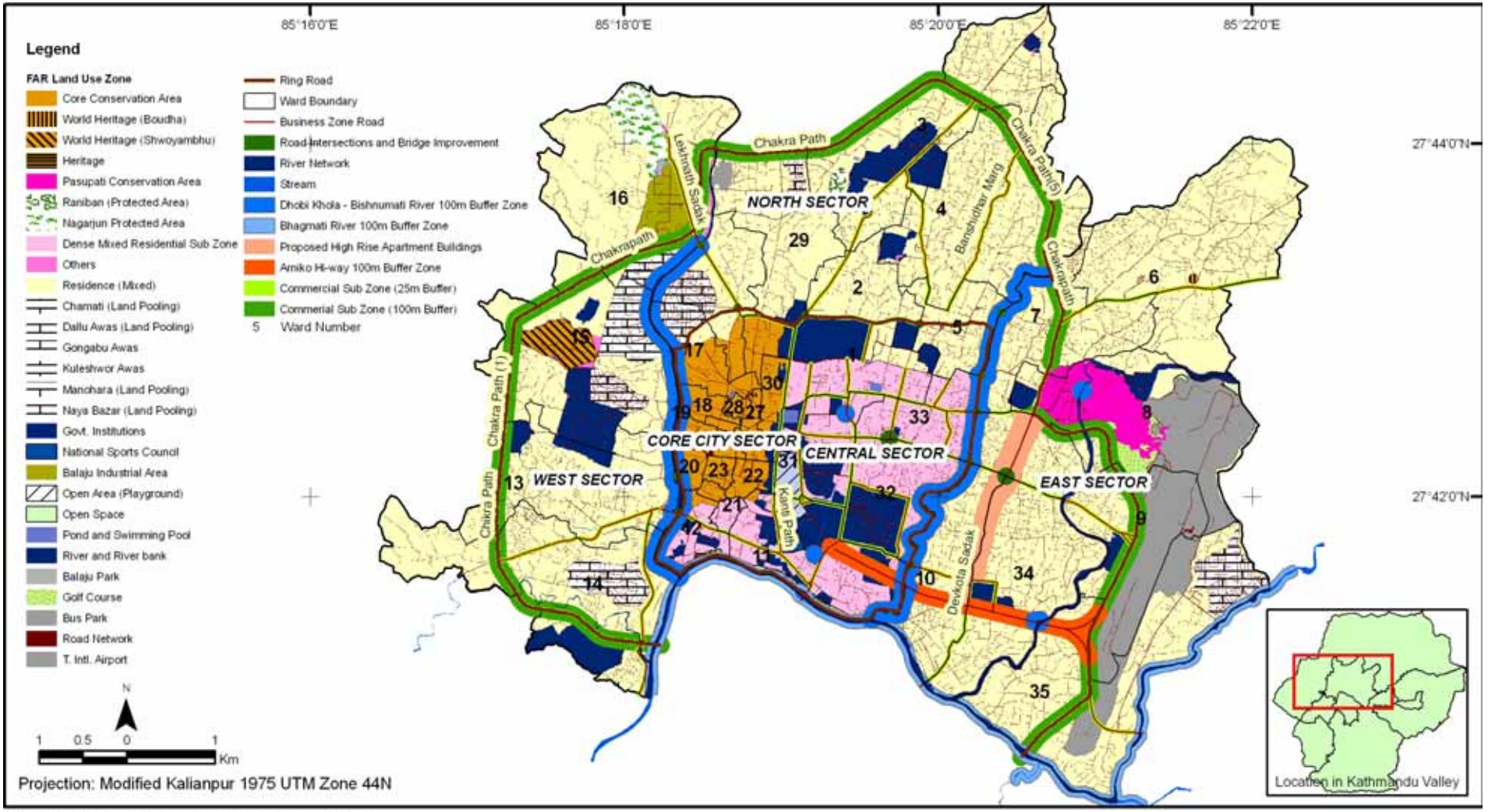
City functions in the Core and Central areas may be affected by man-made and natural hazards. More investments for improving education and health services may be needed in the face of limited space for expansion.

### *5.8.2. Preferred Land Use Plan*

**A. General Description**

The preferred land use plan will re-direct development away from the city center toward identified urban growth areas. It is characterized by clusters of development, with each cluster having its own service function

Under this alternative, four additional mixed-use growth areas will be developed outside the core area, namely: (1) Central Growth Corridor, specializing in business, high density residences and institutional services; (2) East Sector Growth Corridor, which is an extension of the present business strip; this commercial area is nearest the airport and specializes in commercial and institutional developments,




**KMC Land Use Zoning Map**

Sources: Kathmandu Metropolitan City Government, JICA

Map and projection modified by EMI-GIS, 2010

Figure 5.20 KMC Proposed Land Use Map

and is surrounded by medium to low density residences directed outwards; (3) Ring Road Commercial Strips and the adjoining buffered rivers surrounded by medium to low density residences; and (4) Apartment Housing Corridor, which is a residential strip. The preferred form will improve the riverside and possibly look into a more comprehensive transport system allowing better linkages with surrounding municipalities and VDCs within the Valley.

**B. What it takes to realize this urban form**

1) Cost of new roads and other infrastructure

Ways to overcome the high cost of public investment on roads, especially those identified as strategic, and other infrastructures (e.g. bridges, drainage systems) must be developed, as there is a need to link the identified growth centers within and outside of Kathmandu City.

2) Community adjustment to risks

Future inhabitants are relatively safe from natural and man-made disasters as a result of the transfer of service functions, and the reduction in high intensity densities from the core towards the peripheral areas, which are assumed to be safer. In the selection of areas for redevelopment, enticements or incentives must be made to achieve reduction of densities, such as the provision of affordable housing, land pooling, and modification of rental cost structures, among others. Further risk assessment studies must be pursued to reduce vulnerabilities and disaster risks in the Valley.

3) Preservation of protected areas

Heritage sites (e.g. temples, squares, monuments), tourism areas, rivers and urban forests, and remaining productive agricultural lands are taken as sensitive areas and will be preserved.

4) Strict enforcement of regulation

City-wide programs and activities (e.g. IEC) to foster acceptance of plans, social cohesion and integration among city inhabitants will be needed.

5) People's compliance with regulations desired

Political will and support by the Ministries and local chief executives to implement the proposed changes must be strong. Full people's compliance with regulations is necessary if densification, relocation, or land pooling is pursued.

**C. Implications when this urban form is realized**

1) Access of people to city-wide services

There will be greater access of people to city-wide services due to decentralized front-line offices of city hall, public markets, shopping centers, tertiary schools and hospitals

2) Air and water pollution

The areas of concentration of air and water pollution will be easily identified and therefore mitigation measures can focus on these areas.

3) Sustainable use of natural resources

More open space and forest habitats can be recovered and rehabilitated.

4) Traffic problems

New urban nodes will intercept inbound traffic from the north, southeast and southwest, relieving traffic in the city center. The city core will serve more for tourism, worship, and small scale commerce.

5) Overall attractiveness of the city

Large open spaces and visual breaks along certain road sections, riverside development will contribute to the overall attractiveness of the city.

6) Potential for increased Kathmandu City revenue

Decentralized city services will help intensify local revenue collection. The diversion of some city functions will help make the city more attractive to business, as services will be situated nearer the periphery, reducing travel time and costs.

7) Prospects for more jobs and higher income

More jobs will be generated, resulting in higher household income due to increased investments in new urban nodes.

8) Risk reduced

Proper planning will lead to the reduction of risks, as programming, approval and budgeting of the same will be ensured. New developments will be safer, compared to those without interventions.

9) Kathmandu City's leading role maintained

Heritage sites will be preserved. The new growth centers with specialized functions and more expansion areas for universities, hospitals, shopping centers, non-pollutive industrial estate, and residential subdivisions will contribute to maintaining Kathmandu City's leading role in the Valley.

# Chapter 6. KMC Risk-Sensitive Land Use Plan

This chapter pulls together the outputs of all preceding steps in the planning process, the data gathered and analyzed, the issues debated and addressed in the workshops, the impressions of participants as against their realization of the actual conditions of the city, using the chosen spatial strategy as the organizing concept, and translates these lessons and insights into a composite picture called the draft Risk-Sensitive Land Use Plan or RSLUP.

As introduced in Chapter 1, the RSLUP shall serve as the long-term guide for shaping the future physical growth of the city. It is the policy framework to be used by KMC in exercising its authority to prescribe reasonable limits and restraints on the use of property within its territorial jurisdiction, as allowed by the LSGA of 1999. Moreover, as one of its major uses, the RSLUP shall be the basis for the enactment of a revised zoning ordinance for the regulation of subdivision developments.

The RSLUP consists of four components corresponding to the major land use policy areas of settlements, production, protection, and infrastructure. These four policy areas put together shall cover KMC's entire territorial jurisdiction. The RSLUP is also aligned with the higher-level physical framework plans such as those crafted by the KTDVC and MoPPW.

A discussion of the policy areas in terms of policy/legislation is presented in this chapter, with the indicative location of each policy area identified down to the ward level. Due to time constraints, and limited resources to conduct detailed surveys, an indicative zoning ordinance has been made until a more detailed delineation of each policy area can be completed in future opportunities. Much of the material is drawn from the KVTDC Building Bylaws of 2007.

The desired intervention for each policy area was further classified into two categories: programs, projects, and activities (PPAs) and policy/legislation (see tables at the end of this chapter). The policy/legislation category indicates possible governmental measures, in addition to the zoning ordinance, that need to be enacted to support the implementation of the RSLUP. The identified PPAs, on the other hand, serve as source materials for KMC to use in preparing its annual public investment program.

## 6.1. Proposed Land Use Distribution in KMC

The proposed RSLUP classifies land in the following manner: protected land uses, production land uses, settlements, and infrastructure. Where the land use plan is realized as envisioned, the resulting mix of the four general land use types and their respective sub-types are described below. Guidance into this classification and descriptions may be referred from Dagupan City Land Use Plan of 2001 or from Serote, 2004.

### *6.1.1. Protected Areas*

Protected areas consist of resources and areas in the city that (1) enhance the proper functioning of its natural environment, (2) protect human settlements from any form of natural hazards, (3) promote biodiversity, natural beauty and physical endowments of the area, (4) promote sustainable ecotourism development, and (5) create an aesthetically-pleasing environment in the city.

In terms of the KVTDC groupings, the city's protected land uses include the Old City zone (Cultural Heritage Conservation Zone, Preserved Monument Subzone, Preserved Cultural Heritage Subzone, Mixed Old Residential Subzone, Protected zone/Recreational zone ( e.g. park, forest, greenery, open space, historical, cultural and religious areas, etc.).
It is confronted with the following major issues: (a) disaster risk reduction and (b) use of resources and its impact on protection areas

### *6.1.2. Production Areas*

Production areas are those related to industries, commerce, tourism and recreation, food production or the extraction of natural resources for their economic value.

In the context of Kathmandu City, land uses that comprise the production areas consist of the Industrial Zone, Sports Zone and Commercial Sub-zone.

### *6.1.3. Settlement Areas*

The city's settlement areas encompass primarily the residential portion of the built-up environment. These include all private subdivisions, self-built housing sites, public housing areas, and transient housing facilities. This land use category occupies the Residential Zone, Dense Mixed Residential Sub-zone, Other Residential Subzones, and the Planned Residential Sub-zone.
It is mainly concerned with the following: (a) Integration of activities within and among settlements and the efficient production and movement of people and commodities, and (b) Access of population to housing, education, health care, recreation, transportation and communication, sanitation and basic utilities such as water, power, waste disposal and other services.

### *6.1.4. Infrastructure Areas*

Under this functional category are all areas of the city that are devoted to major infrastructure and utility systems. Under this broad category are the following infrastructure types: economic, social, administrative, utilities and transport. Facilities that comprise this category include roads, institutional facilities, cemeteries, roadside developments, terminals, and the ecological waste management center. This land use category occupies the Institutional Zone, City Expansion Zone, Transport Zone and Airport Zone.
In this land use planning exercise, the process for defining the land use policy areas began with a description and understanding of the development directions and the resulting urban fabric of the city. As a series of steps, they are outlined as follows:

**Step 1.** Define, describe terminologies, approaches for land use and urban planning specific to KMC.

**Step 2.** Identify, describe, analyze and interpret the development situation (population/ settlements, economy, resources/environment and incomes/services, transport) and relate to the current spatial form (e.g., arrangements, urban fabric) and to trends in land use.

**Step 3.** Interpret implications of risk (e.g. earthquake) to population or settlement, to service functions, to building stock, revenues and the desired development strategies.

**Step 4.** List/organize the priority development issues (with risk management as a development concern) in the different sectors to be addressed within 10 years.

**Step 5.** Identify and describe the appropriate risk reduction policies (initial list against earthquake) which support development goals and objectives (based on the desired vision).
Step 6. Identify and describe the initial land use policy framework.

The total area for the proposed land use based on GIS estimates is shown in Table 6.1

Table 6.1 Land Use Distribution for the Proposed Plan by Zone

| NAME | Count | Hectares |
|---|---|---|
| FAR 100m. Commercial Sub Zone | 1 | 408.76 |
| FAR Highway Business Zone | 1 | 76.29 |
| Road Business Zone 25m. Buffer | 1 | 343.86 |
| Balaju Industrial Area | 30 | 34.01 |
| Balaju Park | 3 | 1.69 |
| Bus Park | 10 | 6.86 |
| Chamati (Land Pooling) | 203 | 63.94 |
| Core (Dense Area) | 197 | 191.43 |
| Dallu Awas (Land Pooling) | 107 | 16.84 |
| Dense Mixed | 523 | 324.96 |
| Golf Course | 9 | 17.25 |
| Gongabu Awas | 80 | 7.12 |
| Govt. Institutions | 581 | 344.47 |
| Heritage | 7 | 1.72 |
| Kuleshwor Awas | 153 | 31.65 |
| Manohara (Land Pooling) | 288 | 34.72 |
| Nagarjun Protected Area | 2 | 38.02 |
| National Sports Council | 6 | 4.98 |
| Naya Bazar (Land Pooling) | 217 | 39.96 |
| Open Area (Playground) | 4 | 20.13 |
| Open Space | 25 | 18.41 |
| Othere | 332 | 14.45 |
| Pasupati Conservation Area | 94 | 79.34 |
| Pond and Swimming Pool | 67 | 6.23 |
| Raniban (Protected Area) | 1 | 7.30 |
| Residence (Mixed) | 8019 | 2831.21 |
| River and River bank | 195 | 95.25 |
| Road Network | 1 | 276.14 |
| T. Intl. Airport | 75 | 277.06 |
| World Heritage (Boudha) | 1 | 0.83 |
| World Heritage (Shwoyambhu) | 50 | 29.41 |
| Commercial Sub Zone (25m. buffer) | 1 | 320.47 |
| Commercial Sub Zone (100m. buffer) | 1 | 76.29 |
| | | |
| PROPOSED COMMERCIAL SUB_ZONE | | |
| Bhagmati River (100m. Buffer) | 1 | 155.24 |
| Proposed High Rise Apartment. Buildings. | 1 | 62.04 |

## 6.2. Land Use Policy Framework

### *6.2.1. Policies on Protected Areas*

In this RSLUP, open space is recognized as a vital component of an orderly urban environment that serves many irreplaceable functions. In establishing and expanding the city's network of open spaces, KMC will have to adopt the following measures:

- Conduct comprehensive inventory of existing and potential open spaces covering both public and private lands;
- Develop planning parameters with emphasis on linkage and continuity;
- Consolidate past policies, plans and programs that are still relevant to the formulation and adoption of a city open space development program;
- Improve public support for open space preservation;
- Review the building code to find ways of providing and maintaining the open space system;
- Integrate open spaces into the city's proposed road system (e.g. linear parks);
- Adopt a policy of cooperation and collaboration with concerned land owners to monitor and guide future action or decision to protect, conserve or develop these resources;
- Acquire open spaces for public recreational purposes; and
- Refocus preservation on the following open spaces: natural drainage corridors and waterways, existing parks and playgrounds.

Kathmandu City recognizes the importance of open space both as an essential and life-sustaining resource and land use that enhances and improves the overall quality of the urban

environment. Through this RSLUP, it recognizes that urban and open space development must be interwoven through the formulation and adoption of an appropriate policy on open space recovery and improvement.

In KMC, protected areas are those areas requiring local legislation and/or community action as well as those covered by specific laws and administrative issuances. They include identified environmentally constrained areas that are prone to ground shaking, liquefaction, and floods. Other areas shall also include all road easements, historical buildings, monuments and heritage sites.

To preserve its functional character as a recreational public open space, policy intervention will include restrictions on the following activities:

- Dumping of any form of waste products, leaving in refuse in exposed or unsanitary conditions, or depositing them in the ground or in bodies of water;
- Mutilating, defacing or destroying objects of natural beauty, or objects of interest that enhance the area's scenic value;
- Damaging and leaving roads, trails and footpaths in a damaged condition;
- Squatting, or otherwise occupying any land; and
- Constructing or maintaining any kind of structure, fence or enclosures, establishing any business enterprise without a permit.

To effectively regulate all land using activities within the protection area, it will be grouped further into management zones based on physical or environmental considerations, among others. A strict protection zone shall be established (e.g. being off-limits to all forms of building development and certain human activities). In areas where permanent buildings already exist, any expansion will be regulated by enforcement of performance standards on building height and bulk, density, open space ratio, traffic impact, among others, to be established by local legislation.

To provide a basis for appropriate policy intervention, Local Area Plans or Master Plans (such as for heritage sites) shall be prepared to guide human activities within each sub-zone covering the entire area and, to a reasonable extent, its adjacent areas. Through a participatory and consultative process, the formulation of the Local Area Plan will include the following activities:

- Detailed technical survey, mapping and monumenting;
- Inventory of existing uses;
- Development planning; and
- Plan implementation, to include enforcement, social preparation, monitoring and evaluation.

The plan will be implemented in consonance with this RSLUP.

**Easements of Public Use**

The banks of rivers and streams throughout their entire length and within a zone of 25 meters in urban areas, agricultural areas, and in forest areas along their margins, are subject to the easement of public use. No person shall be allowed to stay in this zone longer than what is necessary or to build structures of any kind.

To prevent destructive developments along the river system, all legal easements will form part of the city's open spaces that will have equal status with other land uses. The above provision of the law is hereby adopted in this RSLUP and all non-conforming uses shall be subject to the mitigating measures to be provided in the zoning ordinance.

In line with the city's thrust to recover and rehabilitate its legal easements, policy and legislative intervention will focus on the following:

- Enforcement of the Nepal Water Code to recover legal easements;
- Reclamation of riverbanks that have been destroyed or built upon;
- Prohibition on the construction of permanent structures along the riverbank;

- Redevelopment of portions of the bank into public open spaces such as linear parks;
- Protection of the riverbank through tree planting and riverside vegetative protection;
- Ensuring construction along riverside roads should be at the side, away from the river and not on the river; and
- Preservation of visual corridors in line with the city's open space program.

**Environmentally-Constrained Areas**

These are areas prone to natural hazards either hydrologic or geologic in nature. Although settlement development has occurred and continues to occur in these locations, this can be prevented in the future through the adoption and implementation of a city open space development program, as well as improved building bylaws that will restrict certain developments or human activities in areas that pose environmental hazards or risks to human settlements.

In the city, areas exposed to seismic hazards will be surveyed and delineated on the ground. As much as possible, these areas will be zoned if built upon and restricted to approved density developments by KMC and other approving agencies (e.g. KTDVC, MoPPW).

A measure to minimize destruction and loss of lives resulting from ground shaking is for KMC to come up with a local building code. This code will be based on a review of the Nepal Building Code and on consideration of the unique geo-physical characteristics of KMC. In the future, building developers shall be required to undertake a geo-technical study as a prerequisite to securing a building permit.

In flood-prone areas, all constructions along the river or river easement will be considered as illegal and therefore subject to demolition proceedings. Also, the dumping of solid waste into the city's rivers will not be tolerated. Local legislation will focus on establishing stiffer sanctions and penalties to discourage these activities.

**National Road Easements**

National roads customarily function as arterial roads. However, this function is often jeopardized by the popular practice of building too close to the road, even to the extent of encroaching on the road right-of-way (ROW).

To allow national roads to continue to function effectively, a 14-25 meter regulatory setback as specified in the Building By-laws from the edge of the ROW shall be enforced. This will prevent encroachments along both sides of the road and contribute to the preservation of the city's open space.

**Heritage and Historic Preservation**

Kathmandu City has many historic buildings and structures that reflect the heritage of the people. To preserve the history of the city as reflected through its old buildings and structures, guidelines for the preservation and rehabilitation of heritage sites and historical buildings shall be formulated. Such guidelines will be focused on such aspects as adaptive re-use methods and design controls. KMC can tap the expertise of the Commission on World Heritage and Historic Preservation for the formulation of appropriate heritage conservation guidelines. A list of heritage sites is provided in the Annex of the Sectoral Profile.

### *6.2.2. Policies on Production Areas*

Proper management practices must accompany the utilization of production areas at all times so that their resources may continue to provide socially desired outcomes without getting degraded or depleted. The production areas in the city include the commercial area or CBD, agricultural croplands, tourism and recreational areas, and industrial area.

**Commercial Areas/Strips**

The commercial sub-zones identified in the Building Bylaws of 2007 under the mixed zone will have the following development controls

Table 6.2 Development Controls for Commercial Areas

| S.N. | Building Type according to use | Land Area | Maximum Ground Coverage | Maximum FAR | Maximum Height |
|---|---|---|---|---|---|
| 1. | Business/Residential | 79.51 sq m to 254.5 sq m | 70% | 3 | |
| 2. | -do- | More than 254.5 sq m | 50% | 3 | |
| 3. | School, College | Any size of area | 40% | 2 | |
| 4. | Government or Semi Government Office | -do- | 50% | 2.5 | |
| 5. | Movie Hall, Theatre, Conference Hall | -do- | 40% | 2.5 | |
| 6. | Star Hotel | -do - | 40% | 2.5 | |
| 7. | Business Complex e.g. Super Market | -do- | 50% | 2.5 | |

as shown in Table 6.2. Commercial Sub-zones are plots adjacent to major roads, highways (e.g. Ring Road) or roads having width 14m or higher up to the depth of 25m from road edge. Certain roads have been defined as Commercial Zones which are shown in the KVTDC Land use map.

**Central Sector Growth Area and Corridor**

This area encompasses the traditional CBD of the Central area and encompasses the city's financial and business district. Land uses within the CBD will be comprised of dense residential mixed uses such as retail trade, banking and finance, personal and community services, transportation and telecommunication, and tourism-related uses.

The policy agenda for this area will focus on its urban renewal, not only to revitalize the local economy but also to improve the quality of life within the urban fabric. The following policy objectives are proposed to strengthen the Central sector through inner city regeneration:

- Removal of blight in or near the CBD which depresses property values;
- Identification and acquisition of sites on which new developments such as office buildings and other public structures could be undertaken;
- Stronger participation of private developers or property owners within or near the CBD to invest in the redevelopment of rundown premises;
- Creation of a more favorable investment climate for development ; and
- Substantial increases to the tax base of the city through the appreciation of the assessed value of properties as a result of urban renewal.

Public intervention to modify or influence appropriate land uses within the CBD may also include a range of policy or legislative activities on the following:

- Land pooling to correct inappropriate developments;
- Integration of open spaces into the design of the built-form to enhance urban aesthetics and thus maintain property values;
- Investment in economic development activities to create new or maintain existing employment opportunities;
- Circulation system to serve different segments of the population;
- Improvement in the quality of city services;
- Historical preservation designed to restore, or make useful, facilities of aesthetic or historical merit; and
- Design or development guidelines on outdoor signages; street furniture; traffic management schemes; building height limit based on geotechnical studies; threshold capacity of utilities, traffic generation potential, among others.

**Other Growth Centers and Corridors**

For the other growth centers and corridors, specific policy interventions have already been emphasized in the previous chapter.

*Industrial Area*
Public action will focus primarily on the formulation of environmental and sanitation policies and enabling ordinances.

*Tourism and Outdoor Recreation Areas*
Policy action towards developing the city's tourism and recreational potential involves the formulation of a city-wide tourism plan that will lay down the necessary guidelines for the use and development of certain areas for tourism and recreational purposes. In line with the development of a Tourism Promotion Program, such guidelines will be used especially to influence tourism-related developments in KMC.

### *6.2.3. Policies on Settlement Areas*

Policies on producing safer communities from natural hazards may involve several or all of the following approaches:

- Enforcement of residential zoning identified in the 2007 Nepali building by-laws, supported by ground verification;
- Micro zoning of KMC and the Kathmandu Valley;
- Vulnerability and risk assessments;
- Land pooling in areas of highest risk;
- Stricter implementation of building codes/ by laws;
- Awareness campaigns for owners (old and new) and builders on hazards and risks;
- Consideration of routes for evacuation; and
- New locations for residential living outside of KMC.

Relevant development controls obtained from the Building By-laws (translated portions) applicable to residential areas are as follows:

**Dense Mixed Residential Sub-zone**

This is an area where settlement expanded beyond the core city zone. It lies in the middle of Kathmandu City. Its eastern boundary is Dhobi Khola River, the western boundary is Bishnumati River and the southern boundary is Bagmati River. The development control for dense mixed residential subzone is shown in Table 6.3.

**Other Residential Subzone**

The development control for residential subzone is shown in Table 6.4 below.

**Mixed Old Residential Sub-zone**

This is a densely populated area located in the Central Core. It surrounds the Hanuman Dhokha Durbar Square. Its urban pattern has developed since the Malla Period, with a trade centre located in Ason, which is connected by roads from six different directions. Old houses

Table 6.3 Development Controls for Dense Mixed Residential Sub-zone

| S.N. | Building Type according to use | Land Area | Maximum Ground Coverage | Maximum FAR | Maximum Height |
|---|---|---|---|---|---|
| 1. | Residential | 79.51 sq m to 254.5 sq m | 80% | 2.5 | As per light plane |
| 2. | - do - | More than 254.5 sq m | 60% | 2.5 | |
| 3. | School, College | Any size of area | 40% | 2 | |
| 4. | Government or Semi Government Office, Nursing Home | -do- | 40% | 2 | |
| 5. | Star Hotel | -do- | 40% | 3 | |
| 6. | Movie Hall, Theatre | -do - | 40% | 2 | |
| 7. | Cottage Industry, Business Complex e.g. Super Market | -do- | 50% | 2 | |

Table 6.4 Development Controls for Residential Sub-zone

| S.N. | Building Type according to use | Land Area | Maximum Ground Coverage | Maximum FAR | Maximum Height |
|---|---|---|---|---|---|
| 1. | Residential | 79.51 sq m to 254.5 sq m | 80% | 1.75 | As per light plane |
| 2. | - do - | More than 254.5 sq m | 60% | 1.75 | |
| 3. | School, College | Any size of area | 40% | 1.5 | |
| 4. | Government or Semi Government Office, Nursing Home | -do- | 40% | 1.5 | |
| 5. | Star Hotel | -do- | 40% | 3 | |
| 6. | Movie Hall, Theatre | -do- | 40% | 2 | |
| 7. | Cottage Industry, | -do- | 40% | 1.5 | |
| 8. | Business Complex e.g. Super Market | -do- | 50% | 2 | |

Table 6.5 Development Controls for Mixed Old Residential Sub-zone

| Proposed Plot | Maximum ground coverage | Maximum Height | Maximum Storey | Maximum FAR |
|---|---|---|---|---|
| Vacant Land | 80% | 45'+7' 6"(Stair cover) | 5 | 4 |
| Replacing Old building by demolishing | 100% | 45'+7' 6"(Stair cover) | 5 | 4.5 |

Table 6.6 Development Controls for Commercial Use in the Core

| Proposed Plot | Maximum ground coverage | Maximum Height | Maximum Storey | Maximum FAR |
|---|---|---|---|---|
| Vacant Land | 50% | 45' | 5 | 2.5 |

lie along the roads. Many bahals and bahils (open courts and courtyards) are also connected to the roads. The development controls for mixed old residential sub-zone is shown in Table 6.5.

Development controls for buildings with commercial use such as halls, theatres, and supermarkets are different than for residential buildings. Table 6.6 shows the development controls for commercial use in the Core sector.

a. Self-built Houses

For self-built houses, public action will focus on the enforcement of relevant provisions of the Nepal Building Code and Building By-laws. The zoning ordinance will provide supplemental guidelines on such requirements as setbacks, firewalls, open space, building height and bulk, etc.

b. Public Housing

In consonance with the city's shelter program, there is a need to formulate development guidelines in housing and site development on the following aspects: permitted uses, conditional uses, open space ratio, firewalls, setbacks, fencing, building height/bulk limits, safety requirements, access, architectural style, drainage and sanitation systems, and parking, among others. These development guidelines will direct future shelter/building developments.

c. Transient Housing

This type of housing caters to the city's population of students, sales representatives, national government functionaries, corporate executives, and other transients who seek accommodation for a limited period in the city. Guidelines will cover such aspects as minimum room size, maximum occupancy, lighting and ventilation, fire exits and safety equipment, parking and open space, gender-sensitive facilities, among others to ensure the comfort, convenience and

safety of these transients.

### *6.2.4. Policies on Infrastructure Areas*

**Economic Infrastructure**

1. Public Markets - In line with KMC's thrust to disperse economic activities from the traditional urban center, public action will focus on the selection of appropriate sites for public markets in the different growth centers.
2. Slaughterhouse - This facility will be used for the local market and will be planned in accordance with the ordinance requirements of KMC and standards set by the National Building Code.

**Social Infrastructure**

1. Public Schools - Public action will require land acquisition, preferably of adjacent lots, to accommodate future expansion activities in preparation for the integration of pre-schools into the formal educational system, and to accommodate additional increases in student population. The growth centers will also provide new sites for proposed secondary school campuses. Local legislation will ensure that planning guidelines for school building construction include the following:

    - Location should be away from all major roads.
    - Buildings should be earthquake proofed
    - Vertical development and expansion should be encouraged.
    - There should be enough space to accommodate projected student population.

    Public action will ensure that budget allocation from the Ministry of Education and KMC will augment the Special Education Fund (SEF) for the development of the new sites.

2. Private Schools - The expansion of private schools will be redirected towards identified growth centers within the city. These new sites will be planned and developed in accordance with a supplemental local ordinance to the National Building Code containing campus planning and design standards.

3. Non-Formal Educational Facilities - Legislative action will take the form of a request for the establishment of a proposed secondary trade school with the objective to prepare the graduates to engage in income-generation activities. This trade school will be established in any of the growth centers.

4. Health Centers - Additional units of these community facilities will be made available to make health care and medical services and facilities accessible to all the local residents. Likewise, new sites will be planned and developed in accordance with a supplemental local ordinance to the National Building Code containing planning and design standards for safe hospitals.

5. Day Care Centers - Public action will focus on land acquisition or rental of space for such a service. Policy agenda will encourage the private sector and other public offices to set up a child-minding facility within their premises.

6. Public Libraries and Archives - The establishment of such facilities in the growth areas will be a priority. A program to put up and modernize existing public libraries in the city will be adopted.

7. Reading Centers - These will be established in all wards.

8. Sports and Recreational Facilities - This community facility will be established in all growth centers through public-private partnership. They can be managed by KMC. Public action will require public schools to open their sports facilities for use by the residents outside of school hours.

9. Public Assembly Areas and Open Areas-Public action will focus on rationalizing their

utilization so that they could be used for various purposes. They should be integrated into a network of open spaces.

10. Memorial Parks and Cemeteries -Legislative action will generate development guidelines for the establishment and maintenance of cemeteries and memorial parks. Electric crematorium sites are suggested.

11. Public Order and Safety Offices - These will include fire protection and peace and order facilities to support the disaster management and traffic management systems. Also as important is the enactment of an ordinance prohibiting the obstruction of identified fire truck access lanes, and requiring new buildings to be designed and constructed based on environmental considerations unique to the city.

12. Ecological Waste Management System Facility - Legislative action will require the enactment of an ordinance requiring segregation and composting at the household level and the setting up of such a system that will include the following: Ecological Waste Management Center, with a sanitary landfill, Materials Recovery Facility (MRF) and composting areas. In this connection, legislative action will look into the prohibition of backyard burning anywhere in the city.

**Utilities and Transportation**

1. Power Supply and Distribution - Legislative intervention will focus on restoring the power generation, to ensure reliable and uninterrupted power supply throughout the city. It will also formulate regulations (based on industry standards) on joint use of distribution facilities and explore alternative sources of power supply such as bio-gas, solar, and wind.

2. Telecommunication - Regulation will focus on ensuring that public health and safety aspects are considered in determining the location of cell sites.

3. Sewerage System - Legislative action will entail the enactment of a local sanitation ordinance and increase penalties for violators. It will also include the creation of an office position for a sanitary engineer who will serve as a member of the staff of the building official.

4. Water Supply and Distribution System - Public action will entail joint regulation with the National agencies of the development of public and private wells.

5. Arterial Roads - Public action will focus on the recovery of road rights-of-way and to develop them into additional lanes. To minimize traffic congestion within the city, the "no on-street parking" policy will be strictly enforced especially within the central business district. A minimum lateral access to arterial roads shall be determined and will also be enforced.

6. Collector Roads -A minimum lateral access along proposed collector roads of not less than 250 meters will be enforced and only collector roads will connect to arterial roads.

7. Distributor Roads - The development of dead-end roads will be discouraged and all roads must form part of a loop or series of loops.

8. Subdivision Roads -Subdivision developers will be compelled to connect their main subdivision road only to collector and distributor roads. The KMC Road design standards will be used as a basis for improving existing local roads. These standards and guidelines will be imposed on new road construction and will include provisions on sidewalks, ramps, planting strips, street lighting, waiting sheds, and others.

9. Street Furniture - Standards for street furniture, traffic signages, and overpass design will be formulated. Traffic signals on on-grade pedestrian crossings will also be put up.

10. Parking Facilities - KMC will formulate its own local standards on the provision of parking and open space requirements. These will be made part of the Local Building Code.

11. Bus Terminals - Appropriate sites within the growth center for multi-modal bus terminals will be identified.

12. The following table provides details on proposed land use interventions, policies and possible legislations

Following the development issues and problems that involved subjecting the disaster management issues identified in the DRA to a problem-solving process resulted in the proposed programs, projects, and actions as discussed below. Table 6.7 shows the proposed PPAs linked with the risk-sensitive land use planning goals. The reduction of disaster risk is an explicit goal of the proposed interventions. At the same time, they also meet the goals set at land use policy areas i.e., protection, production, infrastructure, transport, and economic. Implementing these PPAs promises improvement in the quality of life of the residents in terms of access to better and disaster-resilient living spaces and economic opportunities.

Table 6.7 Proposed Land Use Interventions

| LAND USE POLICY AREA | LOCATION | PROPOSED INTERVENTIONS | |
|---|---|---|---|
| | | PROGRAMS/PROJECTS/ ACTIVITIES | POLICY/LEGISLATION |
| **I. PROTECTED AREAS** | | | |
| Parks | | | |
| •Public (People's) Park<br>•Other Parks | Tundikhel, Ratan Park, Shankha Park, Pasupati Bhandarkhal, Bankali Pasupati etc.<br><br>Ratna Park, Rani Ban, Balaju, | Park Beautification and Maintenance Program | Landscaping to improve visual amenities should be a priority.<br><br>All public parks should be part of protected areas.<br><br>Innovative approaches should be integrated into the local building code so that open spaces in building developments also become essential/compatible components of the city's open space system.<br><br>Development of public open spaces should be encouraged for the benefit of the majority. |
| •Riverside | Bagmati, Bishnumati, Dhobi Khola and Balkhu | City Open Space Planning and Development Program<br><br>Air pollution-free zone in the river corridor system<br><br>Riverside rehabilitation and development must be in line with the city's open space program to develop visual corridors, urban forests, and linear parks. | Redevelopment of river bank portions into public open spaces (e.g. linear parks.)<br><br>Riverbank protection through tree planting and riverside vegetative protection<br><br>Future road constructions should not constrict the river sections nor be built on top of it.<br><br>Emphasis must be placed on preserving visual corridors. |
| •Twenty meter legal easement<br><br>Nine meter legal easement | Bagmati, Bishnumati,<br><br>Dobi Khola and Balkhu | Recovery program for 20-meter easements along the Bagmati and Bishnulati Rivers<br><br>Recovery program for 9-meter easement along the Dobikhola River Strong prohibition in connecting outfalls/ sewerage line towards river bed<br><br>Preserve the river side heritage and historical amenities. | In line with the city's open space program, strictly enforce the water quality regulations and develop the water quality management policy at national and local levels.<br><br>Riverside rehabilitation and development must be in line with the city's open space program to develop visual corridors, urban forests, and linear parks.<br><br>Review and follow standard operating procedures of archaeological rules and regulatory policy |

| LAND USE POLICY AREA | LOCATION | PROPOSED INTERVENTIONS | |
|---|---|---|---|
| | | PROGRAMS/PROJECTS/ ACTIVITIES | POLICY/LEGISLATION |
| Environmentally Constrained Areas | | | |
| •Liquefaction areas | All areas | Information dissemination program<br><br>Disaster preparedness program<br><br>Detailed geo-technical investigation (long-term) | Review Nepali Building Code.<br><br>Require geo-technical study as prerequisite for issuance of building permit/location clearance |
| •Flood-prone areas | River portions (low-lying areas) | Identification and recovery of natural waterways<br><br>Desilting and dredging of natural waterways<br><br>Upgrading of existing drainage system<br><br>Construction of drainage system along river side | Increase penalties for illegal construction<br><br>Demolition of existing illegal structures<br><br>Increase penalties for dumping of wastes into rivers<br><br>Better coordination between national and local agencies in maintaining/ improving the storm drainage system |
| •Strong ground shaking impact areas | All areas under Intensity MMI VIII (Mid Nepal earthquake) | | Review Building By-laws to consider groundshaking intensities in formulation of building development policies such as FAR, open space, new constructions, repairs, partitions, access widths and arrangements, reconstruction permitting, etc.<br><br>Rehabilitation of substandard buildings by screening of critical facilities and structures for possible retrofit.<br><br>Preservation/conservation of central core and its periphery. Redevelopment of central areas and preservation of core (include possible retrofitting/strengthening of structures/monuments)<br><br>Access to be incorporated into the open space program<br><br>Deconcentration of urban core (reduce density) through transfer of future population to areas outside of core.<br><br>Reduce fragmentation ( vertical/horizontal) of buildings/land parcels |

| LAND USE POLICY AREA | LOCATION | PROPOSED INTERVENTIONS | |
|---|---|---|---|
| | | PROGRAMS/PROJECTS/ ACTIVITIES | POLICY/LEGISLATION |
| • Protected Croplands (rice lands/croplands) | Northeastern , northwestern and eastern parts of KMC (Manohara river side) | Soil suitability studies<br><br>Technical assistance on conversion to high value crops (cut flower, vegetables, fruit trees) | Zoning Ordinance to protect areas highly suitable for agricultural production |
| Other easements<br><br>•National road easement | National Highway (Ganesh Man Singh Path, Arniko Highway and District-level high way Nuwakot) | Right of way recovery according to the by-laws | Enforce the setback from the edge of the right of way |
| Heritage and Historic Preservation | | | |
| •World heritage sites, national heritage and local heritage sites | Showambhu, Pasupati, Hanuman dhoka, Baudha<br><br>Kalamochan, Baha and Bahi of the core area/ courtyards and Bihar/Chaityas | Official listing and adoption<br><br>Rehabilitation and restoration | Allow sustainable use<br><br>Prevent squatting<br><br>Set guidelines for architectural design (follow original designs, layouts)<br><br>Create an office for the City Architect<br><br>Formulate development guidelines for these areas in consultation with the Heritage and Historic Preservation Authority |
| •Stone spouts, wells and ponds | Mostly at the city core area and historical places | Official listing and adoption<br><br>Rehabilitation and restoration<br><br>Detailed planning and programming for their restoration, preservation, and rehabilitation | Allow adaptive re-use<br><br>Prevent squatting<br><br>Set guidelines for architectural/landscape design<br><br>Formulate development guidelines in consultation with the Heritage and Historic Preservation Authority |
| •Old residential houses | Mostly at the city core area and historical places | Official listing and adoption<br><br>Rehabilitation and restoration<br><br>Detailed planning and programming for the restoration, preservation, and rehabilitation | Prevent squatting<br><br>Set guidelines for architectural design<br><br>Formulate development guidelines for these areas and adopt these in building by laws. |

| LAND USE POLICY AREA | LOCATION | PROPOSED INTERVENTIONS | |
|---|---|---|---|
| | | PROGRAMS/PROJECTS/ ACTIVITIES | POLICY/LEGISLATION |
| •Public cemeteries | Bishnumati (Shova Bhagabati), Bagamati (Pasupati area) and Teku Dovan | Official listing and adoption<br><br>Rehabilitation/ restoration and scientific management of heritage sites | Allow adaptive re-use<br><br>Prevent squatting<br><br>Set guidelines for architectural design<br><br>Create an office for the City Architect Formulate development guidelines in consultation with the Commission of Heritage and Historic Preservation |
| **II. PRODUCTION AREAS** | | | |
| 1. Commercial | | | |
| Business Growth Center (central area growth area and corridor) | Central sector of KMC (Ward 35, 6, 7, 4, 3, 16, 13, 14, 15) | Identify areas for small-scale land pooling<br><br>Urban renewal program<br><br>Sidewalk recovery<br><br>Development of public landmarks<br><br>Study of alternate route to the center<br><br>Identify streets to open to pedestrians<br><br>Identify streets for arcaded sidewalks<br><br>Construct pedestrian overpass<br><br>Development of public landmarks<br><br>Network of parks and open spaces<br><br>Bridge beautification and improvement | Formulate development guidelines for:<br><br>1) Areas for small scale land pooling<br>2) Areas for conservation/restoration<br>3) Areas for redevelopment/renewal<br>4) Areas for tourism/recreation<br>5) Areas for controlled urban development<br><br>Regulation of outdoor signages<br><br>Develop mechanisms to guide the construction of limited building complexes<br><br>.Formulate guidelines to restrict site area limitations.<br><br>Guidelines regulating setbacks<br><br>Traffic management schemes<br><br>Review applicable National Bldg. Code provisions and enactment of a supplemental code compliant with local conditions<br><br>Building height limitations to be guided by geotechnical studies. Threshold capacity of utilities, traffic generation potential, among others shall guide building development<br><br>Review/integrate applicable local development plans consistent with urban renewal strategies and urban design of the core area |

| LAND USE POLICY AREA | LOCATION | PROPOSED INTERVENTIONS | |
|---|---|---|---|
| | | PROGRAMS/PROJECTS/ ACTIVITIES | POLICY/LEGISLATION |
| •Eastern Growth Center and corridors | | Master Development Plan (MDP) for urban expansion areas<br><br>Feasibility Studies (for what?)<br><br>Development Guidelines<br><br>Site Development of different components | Resolution approving the MDP and other Local Development plans<br><br>Formulate policy/development guidelines on Mixed use Developments especially in maintaining medium to low density residential areas.<br><br>Adopt similar guidelines to heritage sites in this area and develop specific sites as tourism areas<br><br>Commercial strip to provide another growth area and supported by medium density residences<br><br>Building height limitations to be guided by geotechnical studies and other restrictions; (e.g. airport). Threshold capacity of utilities, traffic generation potential, among others shall guide building development |
| •North Sector and north corridor | | Master Development Plan (MDP) of urban expansion areas<br><br>Feasibility Studies<br><br>Development Guidelines<br><br>Site Development of different components | North areas near periphery/ Ring road to develop as residential sites ( medium to low density areas<br><br>Building height, visual landscape to complement forest areas, natural landscape<br><br>Area to be developed as natural tourism area |
| 2. Industrial | | | |
| •Non-pollutive, non- hazardous and non-pollutive and hazardous (This subclassification isn't clear. What are these referring to?) | Balaju Industrial Area | Social vulnerability assessment project<br><br>Handicraft and Tourism Promotion Centre | Environment and sanitation policies and enabling laws/ordinances<br><br>Review of handicraft policy in local level plans and programs |
| •Pollutive, non hazardous and pollutive, hazardous and air pollution and garbage (Same comment as above) | All major riversides with sewerage connections and adjacent to waste dumping sites, some road corners and muddy, dusty areas | Social impact assessment project<br><br>Proper pollution management plan | Environment and sanitation policies, and enabling laws/ordinances |

| LAND USE POLICY AREA | LOCATION | PROPOSED INTERVENTIONS | |
|---|---|---|---|
| | | PROGRAMS/PROJECTS/ ACTIVITIES | POLICY/LEGISLATION |
| **III. INFRASTRUCTURE AREAS** | | | |
| 1.Public Schools<br><br>a. Pre-primary Schools<br><br>b. Primary Schools<br><br>c. Secondary Schools<br><br>Special education for physically challenged children | 1.Boudha/Jorpati-ward 6, Bansbari ward no.3, Balaju-Nepaltar-ward no-16, Kalanki Syuchatar ward no. 14, Kuleswor residential area ward no-14, Koteswor 35.<br><br>2.Wardnos. 12,19,20,21,22,26, 24,23,25, 28,29<br><br>1. Boudha-6, Gangapu-3, Syuchatar-14, koteswor-35 | Safe Schools Program in Nepal (structural, non-structural and functional aspects)<br><br>Sites for both public and private secondary schools in peripheral and less hazard-prone areas.<br><br>Rehabilitation, upgrading and maintenance of existing school buildings in coordination with District Education Office (DEO)<br><br>Special schools for physically/mentally challenged children and/or dedicated classrooms for visually impaired pupils and more classrooms for SPED pupils<br><br>IEC program | Promotion and implementation of safe schools guidelines<br><br>Land acquisition, preferably in growth centers, as new sites for the proposed pre-primary, elementary and secondary schools<br><br>Formulate development guidelines for safe school building construction such as:<br><br>- Locating schools away from major roads<br><br>- Situating school buildings in flood-free sites and providing them with efficient drainage systems<br><br>- Encouraging vertical development Buildings should be able to accommodate the projected student population.<br><br>- Factors such as ground shaking and liquefaction should be considered in site identification and construction of school buildings.<br><br>Allocate budget from DEO and KMC to establish Special Education Fund (SEF) for the new sites<br><br>Allocate budget for special education for physically/mentally challenged children |
| 2. Private Schools | 1.Boudha/Jorpati-ward 6, Bansbari ward no.3, Balaju-Nepaltar-ward no-16, Kalanki Syuchatar ward no. 14, Kuleswor residential area ward no-14, Koteswor 35. | Inspection program for facilities<br><br>Safe Schools Program in Nepal (structural, non-structural and functional aspects) | Promotion of growth centers as sites for expansion of existing and new private schools<br><br>Supplemental code to the National Building Code containing campus planning and design standards<br><br>Promotion and implementation of safe schools guidelines |

| LAND USE POLICY AREA | LOCATION | PROPOSED INTERVENTIONS | |
|---|---|---|---|
| | | PROGRAMS/PROJECTS/ ACTIVITIES | POLICY/LEGISLATION |
| 3.Non-Formal Education<br><br>a.Tech/Vocational Secondary Schools<br><br>b. Non-Formal Educ. (for Out of School Youth & unemployed adults) | 1 in each core, central, east, west and north sector in KMC | Study the set-up of a Technical and Vocational School in coordination with the Centre for Technical Education and Vocational Training (CTEVT)<br><br>Safe Schools Program in Nepal (structural, non-structural and functional aspects) | Establish a secondary technical and vocational school to prepare the graduates to engage in income-generation activities<br><br>Budget allocation for such facilities |
| 4. Urban Health Clinics(UHC) | In remaining 14 wards. | Decentralization and development of health services at the ward and community levels.<br><br>Safe Hospitals Program in Nepal (structural, non-structural and functional aspects) | Ensure access by local residents to health care and medical services<br><br>Request to allocate budget for decentralization and institutional strengthening of urban health clinics |
| 5. Day Care Centers | All wards. | Establishment of day care centers and provision of support grant for promoting their use<br><br>Safe Day Care Center Program in Nepal (structural, non-structural and functional aspects) | Land acquisition or rental of buildings<br><br>Encourage private sector and other public offices to put up child-minding facilities<br><br>Regular monitor and regulation of the day care centers<br><br>Coordination between the with DEO, Social Welfare Council, and Child Welfare Committee on the operation and continued development of day care centers. |
| 6. Public Libraries & Archives | KMC Head office and in all 35 wards. | Public Library Modernization Program<br><br>Construction of a Main City Library.<br><br>Development of archiving facilities<br><br>Diversification of services in electronic storage/retrieval and multi-media services | Establishment of libraries in each ward.<br><br>Provision of funds from collected revenue for establishing and running the ward-level libraries<br><br>Development of libraries as local archives to conserve the local culture, history and heritage<br><br>Development of the libraries as reading and research centers |

| LAND USE POLICY AREA | LOCATION | PROPOSED INTERVENTIONS | |
|---|---|---|---|
| | | PROGRAMS/PROJECTS/ ACTIVITIES | POLICY/LEGISLATION |
| 7. Museum | Hanuman Dhoka, Swayambhu Chhauni, Pashupati, | Hanuman Dhoka Basantapur Darbar Square Museum Development Program consisting of aLibrary-Museum.<br><br>Swayambhu Chhauni Museum Development Program. | Budget allocation by Department of Archaeology, Nepal Government and Hanuman Dhoka Darbar Square Conservation Program.<br><br>Updating and upgrading of the museum. |
| 8. Sports Facilities | Recreational -Bhrikuti Mandap, Balaju Baisdhara park, Ratnapark Ranipokhari, Shankhapark, Tinkune park.<br><br>Sports- Tundikhel, Sanogoucharan, Siphal Chour, Lainchour ground, Naxal Narayan chour(private land) , Narephant(supposed to be protect) | Identification of sites for both indoor and outdoor sports and recreational facilities in Janta Sadak, ward no 35, and Gothatar<br><br>Signing of a Memorandum of Agreement between the Ministry of Youth and Sports, the Sports Council, and KMC for the management of the sports facilities<br><br>Construction of multi-purpose grounds for cricket, football, volleyball, tennis, dandi biyo, kabadi, swimming, taekwondo, shooting, and athletics.<br><br>Provision of roofs for all remaining uncovered courts in identified wards. | Public-private partnership initiatives<br><br>Co-management between Ministry of Youth and Sports, National Sports Council, KMC sports and youth clubs<br><br>Allow the public use of sports facilities within public schools during periods outside of school hours, such as weekends.<br><br>Create basket funds for enhancing sports activities.<br><br>Establishment of a metropolitan level sports council involving local youth and sports club, the National Sports Council, the Federation of Industry and Commerce, and KMC.<br><br>Formulation of the guidelines to regulate the Metropolitan Sports Council. |
| 9. Fishing Park | Balaju, Ranipokhari, Sankhapark. | Promotion of alternative uses of aquaculture resources.<br><br>Conduct of a pilot study by KMC, in cooperation with property owners, on a designated site for the establishment of a fishing park | Public-private partnership initiatives<br><br>Effective monitoring and regulation |
| 10. Recreational Facilities | Balaju, Ranipokhari, Sankhapark. | Provision of facilities such as musical fountains and areas for boating. | Water-use zonation<br><br>Public-private partnership initiatives |

| LAND USE POLICY AREA | LOCATION | PROPOSED INTERVENTIONS | |
|---|---|---|---|
| | | PROGRAMS/PROJECTS/ ACTIVITIES | POLICY/LEGISLATION |
| 11. Private Recreational Facilities such as:<br><br>theme parks, bowling alleys, billiard halls, music lounges, discos/bars, computer gaming centers | All commercial buildings and shopping malls. | Regular inspection for compliance with fire safety standards<br><br>Promotion of potential recreational facilities: orchidarium, aviary, mini-zoo, camping grounds, botanical garden<br><br>Promotion of potential sports facilities: race tracks, golf courses, shooting range, marina | Increase in sanctions and penalties for violations the building by-laws<br><br>Amendment of building by-laws to incorporate regulations for recreational facilities in commercial buildings (excluding the recreational area in FAR.) |
| 12. Public Assembly Areas<br><br>c. Rastriya Sava Griha City Hall<br>d. National Academy Hall,<br>e. Rastriya Nach Ghar Hall.<br>f. International Conference Hall.<br>g. Brikuti Mandap Exhibition Hall,<br>h. Judo Hall Naya bajar<br>i. House of Representatives, Singha Darbar<br>j. Dasarth Rangashala (National Stadium)<br>k. Khulamanch, Sainik. Manch, Tundikhel | Ward-31<br>Ward 31<br>Ward 30<br>Ward 34<br>Ward 31<br>Ward 16<br>Ward 32<br>Ward 11,30,31 | Improvement of existing facilities (e.g., fountain, piped-in music, children's playground, movable planters, parking slots)<br><br>Improvement and rehabilitation of the amphitheater to serve as a multi-purpose facility: (i.e., daytime parking facility)<br><br>Construction of fences, fountains, and other furnitures | Addition of greenery and service facilities (e.g., day care centers, fast food and restaurants, restrooms, entertainment, cyber café)<br><br>Rationalization of the use of the Astrodome<br><br>Consider use of private sector resources as one of the policy options |
| 13. National Government Agencies (NGAs) without permanent office buildings, future locators | | Transfer of non-conforming uses<br><br>Transfer of NGAs without permanent office buildings to locate near existing structures of other agencies with associated functions in the Central growth area<br><br>Identification and acquisition of potential building sites in cooperation with the Ministry | Clustering according to function:<br><br>Banks<br><br>Legislative and executive<br><br>Labor and professional regulations<br><br>National ministries<br><br>Property and Land Use |

| LAND USE POLICY AREA | LOCATION | PROPOSED INTERVENTIONS | |
|---|---|---|---|
| | | PROGRAMS/PROJECTS/ ACTIVITIES | POLICY/LEGISLATION |
| 14. Public Order and Safety Offices<br><br>a. Fire Protection Facilities<br><br>b. Peace & Order Facilities<br><br>c. Disaster Management System (critical for NSET)<br><br>d. Traffic Management System | | Provision of a fire station in each growth center<br><br>Provision of fire hydrants at strategic locations throughout the city<br><br>Provision of a police sub-station for each growth center<br><br>For emergency management<br><br>Provision of communication systems for the wards<br><br>Identification and acquisition of fire truck access lanes to be kept open at all times, in accordance with building by-laws)<br><br>Conduct of research on environment-sensitive building design (i.e., specifically for earthquakes)<br><br>IEC program for evacuation plan (courtesy of NSET) | Establishment of a disaster risk reduction/ emergency management unit as a regular office under KMC or Ministry, with specific functions, structure and working relationships with related local and national government agencies<br><br>Enactment of an ordinance prohibiting the obstruction of identified fire truck access lanes<br><br>Enactment of an ordinance requiring environment-sensitive building designs in earthquake-prone areas |
| 15. Integrated Waste Management System<br><br>a. Waste Mgt. Center with a sanitary landfill<br><br>b. Material Recovery Facility (MRF)<br><br>c. Composting areas | North Area (with JICA)<br><br>Every ward or cluster of wards (with GTZ)<br><br>Every ward or cluster of wards, central composting area | Negotiations for the establishment of the Waste Management Center<br><br>Conduct of further studies on site suitability<br><br>Provision of an MRF in every ward | Enactment of an ordinance requiring segregation and composting at the household level<br><br>Enactment an ordinance prohibiting backyard burning |

| LAND USE POLICY AREA | LOCATION | PROPOSED INTERVENTIONS | |
|---|---|---|---|
| | | PROGRAMS/PROJECTS/ ACTIVITIES | POLICY/LEGISLATION |
| **IV. TRANSPORT AND INFRASTRUCTURE** | | | |
| 1. Power Supply and Distribution | | (For KMC to fill up for future analysis) | Ensure reliable and uninterrupted power supply<br><br>Explore alternative sources of power supply i.e., bio-gas, solar, windmill<br><br>Promotion of safe electrical construction/installation |
| 2. Telecommunication (internet, cable TV, etc.) | | (For KMC to fill up for future analysis) | (For KMC to fill up for future analysis) |
| 3. Sewerage System | | Inventory of all sewerage and sanitation facilities and their compliance with the sanitation, plumbing and water codes<br><br>Preparation of sewerage plans for priority development areas e.g., growth centers, light industrial park, recreational/leisure zone<br><br>Review of study conducted on the proposed sewerage system | Enact a local sanitation ordinance and increase penalty for violators |
| 4. Drainage System and Flood Control Facilities | | (For KMC to fill up for future analysis) | (For KMC to fill up for future analysis) |
| 5. Water Supply and Distribution | | Conduct of study on alternative sources of water to ensure sustainability | Regulation of the development of public and private wells by KMC and the Ministry (Which ministry?) |

| LAND USE POLICY AREA | LOCATION | PROPOSED INTERVENTIONS | |
|---|---|---|---|
| | | PROGRAMS/PROJECTS/ ACTIVITIES | POLICY/LEGISLATION |
| 6. Arterial Roads<br><br>a. Existing:<br><br>b. Proposed: | | Upgrading of existing arterial roads to comply with construction standards<br><br>Widening of arterial roads to lane roads<br><br>Conduct of a comprehensive traffic management study for the whole city | Review of ground shaking and liquefaction impacts on existing roads and bridges and prioritizing reconstruction of segments identified in the ADPC, JICA study<br><br>Recovery of ROW and development into additional lane utilizing the shoulder<br><br>Enforcement of "no on-street parking policy"<br><br>Conduct of priority study on construction of inner ring road, subject to feasibility study<br><br>Identification of possible alternative funding schemes for construction of proposed roads<br><br>Designation of the minimum lateral access along proposed arterial roads at every 500 m |
| 7. Collector Roads | | | Designation of minimum lateral access along proposed collector roads of not less than 250 meters<br><br>Stipulation that only collector roads will connect to arterial roads |
| 8. Distributor Roads | | | Avoid construction of dead-end streets |
| 9. Private land roads | | | A Stipulation that no subdivision road should connect to arterial roads<br><br>A Stipulation that no subdivision road should connect to arterial roads<br><br>Proponents must secure clearance for any excavation works from the City Engineer's Office<br><br>Development of road design standard as basis for improving existing local roads, to be enforced in new road construction; includes provision of sidewalks and planting strips, street lights, waiting sheds, etc. |

| LAND USE POLICY AREA | LOCATION | PROPOSED INTERVENTIONS | |
|---|---|---|---|
| | | PROGRAMS/PROJECTS/ ACTIVITIES | POLICY/LEGISLATION |
| 10. Street furniture (sidewalks, planting strips, street lighting, pedestrian crossing, side ditch, waiting sheds, traffic lights, signages, etc.) | | Sidewalk recovery project<br><br>Provide overhead directional signs and convex mirrors along blind curves<br><br>Provide on-grade and above-grade pedestrian crossing facilities | Incorporation of aesthetic and functional elements in design of street furniture<br><br>Provision of traffic signals for on-grade pedestrian crossing<br><br>Adoption of user-friendly design for overpasses |
| 11.Parking facilities | | Identification of road sections where on-street parking may be allowed<br><br>Imposition of on-street pay parking | Enactment of supplemental code to include standards on parking provision and other open space requirements i.e., green space<br><br>Offering of incentives to private investors to construct multi-level parking facilities<br><br>Enforcement of penalties for reckless driving |
| 12. Bus terminals | Growth centers | Identification of sites within the growth centers for multi-modal bus terminals | (For KMC to fill up for future analysis) |
| V. ECONOMIC INFRASTRUCTURE | | | |
| 1. Public Markets | | (For KMC to fill up for future analysis) | Rehabilitation and modernization of public markets outside of the ring road |
| 2. Self-built | | Building Mason Training Program<br><br>Building Construction Training Program | Instituting the training of builders and masons on safe building construction<br><br>Formulation of supplemental by-laws to contain requirements on setbacks, firewalls, open space, building heights, building bulk, etc. for non-engineered houses |
| 3. Public housing | | Land Pooling /Housing and Resettlement Program<br><br>Inclusion of land use/site development plan with public facilities, employment areas<br><br>Conduct of feasibility studies for structural improvement of all types of housing | Formulation of guidelines supporting the building by-laws on city shelter and resettlement program to include permitted uses, conditioned uses, open space, firewalls, setbacks, fencing, building height, safety requirements, access, building bulk, preferred architectural style, drainage and sanitation, parking, etc. |
| 4.Transient housing (for students, transients) | | Survey of structure/building conditions of existing transient housing facilities | Formulation of guidelines for transient housing supporting the building by-Laws to cover minimum requirements on room size and maximum number of occupants, lighting and ventilation, fire exits and fire safety equipment, parking and open spaces, gender-sensitive facilities, etc. |

# Chapter 7. Zoning Ordinance

**7.1. Kathmandu Metropolitan City: An Ordinance Adopting a Risk-Sensitive Land Use Plan, Zoning and Building By-Laws**

**INTRODUCTION**

The Local Self-Governance Act, 2055 (1999), in its Preamble, has stated that:

"...it is expedient to:

"Make provisions conducive to the enjoyment of the fruits of democracy through the utmost participation of the sovereign people in the process of governance by way of decentralization.

"Institutionalize the process of development by enhancing the participation of all the people including the ethnic communities, indigenous people and down-trodden as well as socially and economically backward groups in bringing out social equality in mobilizing and allocating means for the development of their own region and in the balanced and equal distribution of the fruits of development.

"Have institutional development of local bodies capable of bearing responsibility, by providing such responsibility and power at the local level as in necessary to formulate and carry out plans, and

"Constitute local bodies for the development of the local self-governance system in a manner that they are able to make decisions on the matters affecting the day-to-day needs and lives of the people by developing local leadership"

The LSGA in strengthening the role of the Municipality has, in Section 3, set to pursue the following principles and policies for the development of local self-governance system:

a. Devolution of such powers, responsibilities and means and resources and are required to make the local bodies capable and efficient in local self-governance.
b. Building and development of institutional mechanism and functional structure in Local Bodies capable of considering for local people and bearing responsibilities.
c. Devolution of powers to collect and mobilize such means and resources as are required to discharge the functions, duties, responsibility and accountability conferred to the Local Bodies.
d. Having the Local Bodies oriented towards establishing the civil society based on democratic process, transparent practice, public accountability and peoples participation in carrying out the functions devolved on them.
e. For the purpose of developing local leadership, arrangement of effective mechanism to make the local body accountable to the people in its own areas.
f. Encouraging the private sector to participate in local self-governance in the task of providing basic services for sustainable development.

The LSGA, in Section 96, then goes on to outline the mandatory functions and duties to be performed by the Municipality as follows:

1. "(b) Relating to Physical Development:

   (1) To frame land use map of the Municipality area and specify and implement or cause to be implemented, the industrial, residential

agricultural, recreational areas etc.
(2) To prepare housing plan in the area of Municipality and implement or cause to be implemented the same.
(3) To carry out plans on drinking water and drainage in the areas of Municipality and operate, maintain and repair or cause to be operated, maintained and repaired the same.
(4) To develop, or cause to be developed, green zones, parks and recreational areas in various places in the Municipality area.
(5) To approved or cause to be approved designs of houses, buildings etc. to be constructed in the areas of the Municipality.

2. "...the Municipality may also perform the following optional functions in the Municipality area:

(a) To control unplanned settlement within the Municipality area.
(b) To make the structure and development of the town well-planned through the functions such as guided land development and land use.
(c) To arrange for the supply of electricity and communications facilities.
(d) To arrange for recreational parks, playing grounds, museums, zoos, parks etc. in the Municipality area.
(e) In order to reduce unemployment, to collect the data of unemployed person and launch employment generating programmes.
(f) To carry out preventive and relief works to lessen the loss of life and properly caused from natural calamity.

Section 3 of the LSGA further mandates municipalities to formulate their own plans, viz:

(1) Each Municipality shall have to formulate periodical and annual development plans for the development of the municipal area.

(2) In formulating the plans, the Municipality shall, as per necessity, have to launch plans such as land-use, land-pulling, and guided land development for making the development of the municipal area balanced and planned.

(3) In formulating plans pursuant to sub-sections (1) and (2), the Municipality may, as per necessity, obtain external consultancy service.

(4) In formulating the plans, Municipality shall have to give priority to the following projects:

(a) Projects which are income-generating and from which consideration may be obtained sooner.
(b) Projects raising living standard, income and employment of, and giving direct benefits to, the people of the Municipality, and contributing to poverty alleviation.
(c) Projects which can be operated with low cost and larger people's participation.
(d) Project to be operated through local means, resources and skills.
(e) Projects providing direct benefits to the women as well as backward class and children.
(f) Projects that can contribute to protect and promote the environment.

(7) In formulating annual plans, the following matters have to be taken as the basis.

(a) Directives received from the National Planning Commission and the District Development Committee on national development policy.
(b) Overall necessities indicated by periodical plans.
(c) Suggestions received from the Ward Committee.

The LSGA likewise provided for the Process of Implementation as embodied in the following Sections:

Section 112. Preparation of Resource Map

Section 113. Feasibility Study of the Projects to be Carried Out

Section 114. Selection of the Project

Section 115. Coordination among Municipality, Governmental and Non=governmental Agencies

Section 116. Operation of Municipal Level Project

Section 117. Implementation and Management of Project

Section 118. Appraisal and Evaluation of Projects

Section 119. Consumer's Group to be Formed

Section 121. Non-Governmental Organization to be Encouraged

Section 122. Directives to be abided by: The Municipality shall have to abide by the directives given by the National Planning Commission, His Majesty's Government of Nepal and the District Development Committee in respect of the formulation and operation of the town development plan.

Section 124. Repair, Maintenance and Management of the Project:

(1) The Municipality may collect service charge from the beneficiaries of a project for the repair and maintenance of the project.
(2) The repair, maintenance and necessary management of the project shall be dome with the amount of the service charge collected pursuant to sub-section (1).
(3) The Municipality shall have to maintain an up-to-date account of incomes and expenditures as referred to in sub-sections (1) and (2).

In the matter of Building Constitution, the LSGA has provided the following pertinent provisions:

Section 149. Prohibition on Construction of Building without Obtaining Approval: No person shall, without obtaining construction approval from the Mayor, do construction of a building in the municipal area.

*Explanation: In this section, "construction of building" means the act to construct a new building, to reconstruct by demolishing the old building, to add a storey or to alter the faÁade, or to construct a window, door verandah, attic, porch, shed, stable or garage or erecting a compound wall in alternation of the existing design.*

Section 150. Application for Approval: Any person or governmental office desiring to construct a building shall have to make an application, in the prescribed format, along with the design of the building to the Municipality for the approval to construct the building.

*Explanation: In this section, "governmental office" means and includes all governmental offices and courts as well including the offices of the Supreme Court, Parliament, Raj Parishad (Royal Council), commission for the Investigation of the Abuse of Authority, Auditor General, Public Service Commission and other constitutional bodies, and Royal Nepal Army as well as Nepal Police.*

(2) Notwithstanding anything contained in sub-section (1), in making application for approval to construct a building, if any public body is not allowed to submit the design of the building on account of national security, it may mention only the length, breadth, height and storey of the building and its total area in the application.

Section 152. Submission of Document of Ownership and Possession or Deed of Consent: In making application pursuant to Section 150 for approval to construct a building, if construction is to be done in the land of one's own ownership and possession, the document showing the ownership and possession of the land, and if the construction is to be done in the land of any other person's ownership and possession, the document showing the ownership and possession of such person as well as a deed of consent shall have to be submitted.

Section 156. Approval of Design:

(1) In giving the approval to construct any building pursuant to Section 155, the Mayor shall also have to approve the design of such a building.

(2) In approving the design of any building

pursuant to sub-section (1), the Mayor may approve it by making necessary alteration in the design in a manner to be conformity with the physical development plan and the standards set pursuant to the prevailing law

Section 157. Alteration in Design: If any alteration has to be made subsequently in the design approved pursuant to Section 156, the Mayor may permit for such alteration in the design, without being prejudicial to the standards set under the prevailing law, to do other acts expecting the addition of storey, change of faÁade of increasing its length, breadth.

Section 160. Period of Construction of Building:

(1) If the approval to construct a building has been given according to this Act, such a building shall have to construct within two years from the date of such approval.

(2) In the event of failure to construct the building within the time-limit specified under sub-section (1), an application shall have to be made to the Municipality for extension of the time-limit.
(3) If any application is made pursuant to sub-section (2), the Mayor may extend the time-limit for up to two years by collecting an additional fee at the rate of five percent of the previously paid fee.

Section 161. Inquiry and Proceedings:

(4) In case it is held, as per the report submitted pursuant to sub-section (2), that anyone has constructed or is constructing a building without obtaining approval pursuant to this Act or by encroaching upon any public land, road, temple, courtyard sewerage, canal, pond, etc,. Mayor shall have to order to demolish the building or any portion thereof.

Section 163. Demolition of Building and Recovery of Expenditures Incurred

The above provisions having been provided for in the LSGA, the Kathmandu Metropolitan City hereby adopts and promulgates the following Ordinance and in accordance therewith and in support thereof.

## RISK SENSITIVE LAND USE PLAN AND BUILDING REGULATION, 2009

This section describes the Zoning Ordinance of the KMC made under the provision of the Local Self-Governance Act of 1999, specifically, Sections 96- Functions, Duties and Power of Municipality, and Section 111- Formulation of Plans of Municipality, among others.

### PART I: GENERAL GUIDELINES/ PRINCIPLES/PROCEDURES

#### 1.1 Introduction

1. This Ordinance may be cited as the Kathmandu Metropolitan City Land Use, Zoning and Building Ordinance. (This may alternatively be cited as the Kathmandu Risk-Sensitive Land Use Plan and Policies and its Implementing Zoning Ordinance and Building Regulations.)

It is applicable to the physical area located within the geographical and administrative boundaries of the Kathmandu Metropolitan City, pursuant to Section 76 of the LSGA.

2. This Ordinance includes the following documents

a. The Risk-Sensitive Land Use Plan of KMC;
b. The Land Use Policies Framework in relation to the Land Use Plan;
c. The Zoning Ordinance that would serve as the Implementing Guidelines for the Land Use Plan and its underlying policies; and
d. The Building Regulations for the permissible uses designated in the Land Use Plan;

All of these documents have statutory status and the same legally binding power.

3. This ordinance shall take effect upon its approval by the KMC Council and publication in the official Gazette and shall be implemented

by KMC itself in coordination with other appropriate agencies of Government as may be appropriate. Where required, KMC must abide with the by-laws that require prior approval by higher authorities such as KVTDC and concerned Ministries - Local Development, Planning and Physical Works, among others.

**1.2 Purpose and coverage of the Ordinance**

4. The provisions of this Ordinance aim to assist KMC, its Council, and its various instrumentalities, offices and staff, in realizing a Risk-Sensitive Land Use Plan that fully integrates DRR provisions in the spatial and physical development strategies, regulatory planning tools, and related by-laws and procedures, with the full vision of transforming KMC into "A tourism center based on heritage and culture with healthy responsible and economically active citizens, living in a clean, safe and disaster resilient environment." (KMC Vision statement)

5. This Ordinance, likewise, intends to provide implementing guidelines in order to achieve an orderly, efficient and environmentally sustainable development for KMC by prescribing a general policy framework plan, norms and standards for land use planning and control, and regulatory devices for building and structure design and construction.

6. This Ordinance shall cover four general land use areas, namely, protected areas, settlements, production areas and infrastructure support areas; with disaster risks in mind in order to develop safe forms and patterns of land uses that will integrate the built into the un-built space in order to fulfill the right of every constituent to a clean, safe and disaster resilient place to live in.

7. This Ordinance shall, as judged to be feasible, address the concepts of DRM and DRR through appropriate risk assessments and commitment to enforce the provisions of this ordinance and considering the benefits and costs for a safe place and sustainable environment to live in.

**1.3 Basic Principles Addressed**

- Natural hazards are causing greater harm to communities, existing facilities, and socio-economic institutions and are threatening the future of sustainable development. Major disaster can wipe out any progress in physical development and economic growth.

- Disasters are largely preventable. The city and its communities that recognize the causes and processes of natural disasters and provide mitigation measures and regulations can best protect themselves.

- The key to risk-sensitive land use planning is the involvement and commitment of all individuals and organizations accepting clearly-defined responsibilities and duties in the implementation of this Ordinance.

**1.4 Definitions (Taken in full from KMC Urban Planning and Building Ordinance, Final Draft 2001, Sec.1.2)**

For the purpose of this Ordinance the words, names and acronyms listed below and wherever occurring in any text of this ordinance, Planning Permit, Building Permit or any other planning or building instructions given by KMC, are explicitly defined to mean the following (in alphabetical order):

**Accessory building:** a subordinate building located on the same plot with the main building, occupied by or devoted to an accessory use. Where an accessory building is attached to the main building in a substantial manner, as by a wall or roof, such accessory building shall be considered part of the main building.

**Accessory use:** a use customarily incidental and subordinate to the principal land use or to the main building(s) located on the same plot herewith. In no case shall such accessory use substitute or dominate in area, extent or purpose, the principal lawful land use or main building(s).

Alteration: any change made, or proposed to be made, to the use, size, form, structural elements and external appearance of a building or structure.

**Apartment:** a dwelling unit within an apartment building.

**Apartment building:** a building containing two (2) or more apartments and designed or used, with or without accessory use, for occupancy by two (2) or more households living independently of each other.

**Apartment hotel:** a residential building, or part thereof, designed or arranged and used as a hotel but differing from a hotel in that no food maybe offered and all guest rooms are rented out for generally longer period and have facilities for self cooking by the guests.

**Arcade:** a continuously covered parts of a ground floor area of a building which opens onto a road or other public way.

**Attic:** a habitable space between the roof and the top floor of a building with an average room height of min. 2.4m.

**Authorized person/organization:** any official or organization to whom a specific task in the execution of this Ordinance is delegated by the KMC.

**Authority:** if not described otherwise, KMC.

**Basement semi-:** any accessible and usable part of a building of which, at least, half of its room height is located below finished ground level.

**Block:** a tract of land bounded by Collector roads and/or ROW's of higher order.

**Block sub-:** a tract of land being part of a block, only bounded, and not further subdivided by Access roads or roads of a higher order.

**Building:** a man-made construction, permanently fixed in or on the ground, enclosed by one or more walls and a roof, for the housing or enclosure of people or animals, the growing or storage of plants or the production, processing, storage or protection of any kind of movable property; when a building is divided into separate parts by one or more un-pierced walls, extending from the ground up, each such part shall be deemed to be a separate building.

**Building main-:** the building, or group of buildings, on a plot, not being any accessory building, serving the principal and actual use of that plot.

**Buildings attached:** two or more buildings which are mutually connected by each sharing one or two party walls wither in part or in full, with another building.

**Building detached:** two or more adjoining free standing buildings not having any mutual connection.

**Building, semi-detached:** two adjoining buildings sideways attached.

**Building height:** the vertical distance measured from the highest level of the ROW adjoining a building to the highest external part of its roof: in case of a sloping roof the highest part of the roof shall be the mean height level between the eaves and ridge of such roof; provided that, where a building is set back more than one (1) meter from the plot front boundary, the height of such building shall be measured from the average elevation of the finished ground level along the front wall of the building; structures on the roof of a building such as water tanks, lift overruns, solar panels and antennas are not taken into account in determining the highest point of a building.

**Building line:** generally used in closed frontage development, a line in which the faÁade of a building shall be placed as prescribed on the Development Control Map and/or in a Local Area Plan.

**Building, residential:** a building being either a dwelling or an apartment building that is arranged, designed, used, and intended or built

to be used for residential occupancy by one or more households or lodgers.

**Construction:** the act of either erecting a new building or structure, with or without the wholly or partly prior destruction of an existing buildings or structures in the same location, or adding a storey to, or altering the facades and roof of a building, and constructing a window, door, veranda, attic, porch, shed, garage, or other, similar additions to, or modifications of the present building or structure.

**Closed frontage:** the sideways attached construction of facades of adjoining buildings in one vertical plane.

**Density:** the number of buildings, dwellings, households, people or the amount of floor space per unit of land area (e.g. per hectare) as the case may be and expressed as a numerical value.

**Designated area:** a united part of a use zone bounded by other use zones.

**Development:** the process of changing or intensifying the use of land through means of earthworks and/or construction works in, on, or above land or water.

**Development comprehensive:** a project planned, designed and implemented for integrated, mixed use development of a single tract of land or a number of contiguous plots, such as land pooling project.

**Development Control Map:** the map being an appurtenant document of this Ordinance as prescribed in Part I, Section 2?

**District:** one of KMC's five (5) urban planning areas into which Kathmandu city has been divided.

**Drainage:** the natural or artificial evacuation of excess water from a tract of land.

**Dwelling:** one or more rooms in a building for the permanent habitation by a single family or household.

**Easement:** linear tract of land for the existing or future installation and use of public utility services, such as drains, water mains, sewers and cables, regardless of ownership of the land and of these utility services.

**Facade:** the exterior wall of a building abutting a ROW.

**Floor area:** the sum of the gross horizontal areas of all floors, except floors entirely located below ground level, of any building, measured from the exterior faces of the external walls or from the centre line of common walls separating two buildings. The floor area of a building shall exclude elevator shafts and stairwells at each floor, floor space used for mechanical equipment -, but shall include attics, interior balconies, enclosed porches and floor area devoted to accessory uses. However, any area constructed and used for vehicle parking or loading of vehicles shall not be included as floor area.

**Floor area ratio (FAR):** the quotient of the total built or planned floor area on a plot or parcel and the total area of that plot or panel expressed in the formula below:

$$\text{FAR} = \frac{\text{Total floor area in m2}}{\text{Total plot or parcel area in m2}}$$

**Front:** that side of plot or wall of the main building(s) on that plot facing a ROW.

**Garage, private:** a building or a section of a building uniquely designed, built and used primarily for the overnight parking of private automobiles.

**Garage, public:** a building or a section of a building, uniquely designed, built and used primarily for temporary, daytime parking of automobiles, regardless whether these are parked for remuneration or not.

**Hotel:** a building designed and used as a temporary residing place for individuals with a permanently staffed reception desk, offering meals and having at least six (6) guest rooms without provision for cooking.

**Housing:** dwelling units of any type, mixture and density.

**HMG:** His Majesty's Government of Nepal?

**Industry:** facilities for the manufacturing, processing, production, assembly, disassembly, recycling, repair, storage or distribution of goods.

**KMC:** Kathmandu Metropolitan City, the local government body responsible for governing the city of Kathmandu.

**KMC area:** the area of land within boundaries prescribed by the Ministry of Local Government and administered by KMC.

**KMC Board:** The executive board of the KMC Council pursuant to Section 80 of the LSG Act.

**KMC Council:** The elected governing body of KMC pursuant to Section 76 of the Local Self-Governance Act.

**KMC Office:** The executive office of the KMC Council pursuant to Section 248 of the Local Self-Governance Act.

**KMC Secretary:** pursuant to Art. 253 of the LSGA, the Secretary of KMC, appointed by HMG for carrying out the day-to-day functions of the KMC office.

**KUPBR:** the Kathmandu Urban Planning and Building Regulations, being the regulations contained in this Ordinance.

**Land Use Map:** the map being an appurtnenant document of this Ordinance as prescribed in Part 1, Section 2?

**Land use:** see use, land-

**LSG Act:** the Local Self-Governance Act, 1999

**LSG Regulations:** the Local Self-Governance Regulations, 2000

**Level city-:** denotes urban facilities and services:

- » Serving the entire population of Kathmandu and to some extent that of Kathmandu Valley and Nepal,
- » Satisfying occasional needs for a wide variety of unique or specialty goods and services,
- » Requiring a central location in the city,
- » Requiring in general large and/or prestigious establishments and plots,
- » Generating large volumes of vehicular and pedestrian traffic and the need for wider roads and parking facilities.

**Level, district:** denotes urban facilities and services:

- » Serving a district population of 150,000 to 250,000.
- » Satisfying frequent needs for a wide variety of household goods and services,
- » requiring good access, and a desirably a central location in the district,
- » Generating relative large volumes of traffic, primarily pedestrian and motorcycles and trucks, the latter for the supply of food commodities and other goods.

**Level, local:** denotes urban facilities and services:

- » Serving a resident population of 2,500 a 50,000 households,
- » Satisfying basic, daily needs for food commodities and household services, preferably requiring a central location with good access,
- » Requiring only small size establishments and plots,
- » Generating primarily pedestrian traffic.

**Local area plan:** a statutory plan, at least including a detailed land use plan and regulations, for a part of the KMC area, either being a district, ward, city centre, conservation, industry or land pooling area, prepared on the basis of, and complementing the provisions and regulations of this Ordinance.

**Mayor:** the Mayor of KMC

**Mayor, Deputy:** the Deputy Mayor of KMC

**Parcel:** tract of land to be either subdivided

into plots, or to be comprehensively developed.

**Physical Planning Committee:** the committee to be established as prescribed in Part 1 of this Ordinance

**Plinth:** the section of the perimeter wall of a building between the ground level and the first floor of a building located above the ground.

**Plinth area:** the total area covered by the ground floor of a building, including its perimeter wall. Plinth area is also commonly referred to as "footprint".

**Plot:** a surveyed and demarcated tract of land resulting from the subdivision of a parcel, duly registered by ownership and under single title in the Cadaster and the Revenue Department of KMC, not containing any part that is leased by the land owner to or from a third party and developed or intended to be developed for the land use designated in the area.

**Plot area:** the total area, measured in a horizontal plane, within the plot boundaries.

**Plot boundary, front:** the boundary of a plot fronting an existing or planned access road or any other ROW. In case of a corner plot, both plot boundaries adjoining a ROW are considered front plot boundaries.

**Plot boundary, rear:** the boundary of a plot that is most distant from and most nearly parallel to the front plot boundary.

P**lot Coverage Ratio (PCR):** the percentage of the area of a plot or parcel covered by all building(s), including accessory buildings on that plot or parcel, but excluding private garages, as expressed in the formula below.

PCR (%) = Built-up area of a plot at ground level in m2 x 100/Total plot or parcel area in m2

**Plot depth:** the mean horizontal distance between front and rear plot boundaries.

**Plot line, side-:** any remaining boundary of a plot that is not a front plot boundary or a rear plot boundary.

**Plot width:** the horizontal distance between the side plot boundaries, measured at right angles to the plot depth at a point midway between the front and rear plot boundaries.

**Plot, corner-:** a plot situated at the intersection of two or more roads having an angle of intersection of less than 135 degrees.

**Pollution:** contamination (make impure or unclean), especially by gaseous, organic or chemical wastes that contaminate air, water or soil.

**Porch:** the part of a building projecting at ground level built and roofed so as to provide cover to the entrance of such building.

**Project:** the planned and budgeted undertaking of the development of a tract of land or of any kind of construction on that land.

**Property:** a unified piece of land in public or private ownership.

**ROW (right-of-way):** a land corridor designated or constructed for the use of public access, vehicular traffic circulation and the location of public utilities, such as pathways, easements, roads, and highways, regardless of the ownership of the land and utilities in the ROW.

**Road, access-or "Marg":** a ROW serving the pedestrian and vehicular access to one or more plots and having a width as prescribed in this Ordinance.

**Road, Collector-or "Sadak":** a ROW of greater width and capacity than an access road, having a footpath on both sides, providing the intermediate linkage between access roads and higher order roads and having a width as prescribed in this Ordinance.

**Road, arterial-or "Path":** a ROW of greater width and capacity than a collector road that provides an intermediate linkage between collec-

tor roads and a Ring road/Highway and having a width as prescribed in this Ordinance.

**Road, Ring/Highway:** a ROW with, at least, four traffic lanes, serving intra-and inter city traffic and having a width prescribed in this Ordinance.

**Room height:** the distance between the finished surface of the floor of a room and the lowest part of the ceiling or lowest surface of exposed floor beams or, in case of a sloping ceiling, the average height between the highest and lowest part of the ceiling or such beams.

**Row housing:** residential buildings sideways attached.

**Setback:** the minimum distance that the outside wall of any building shall be located inside from a plot boundary; for calculating his minimum distance, the outside wall shall be measured from the outer face of any structure, such as roof overhangs, eaves, balconies, that is projecting most outward from this wall.

**Sign:** any writing (including letter, word, or numeral), pictorial presentation (including illustration or decoration), emblem (including devices, symbol, or trademark), flag (including banner or pennant), or any other device, figure or similar character, including its structure and component parts, which is used or intended to be used to announce or direct attention for advertising purposes that is visible from the outside of a building or structure and includes subject matter attached to, painted on, or in any other manner represented on a building or other structure or device. However, except as otherwise specified in these regulations and subject to regulations for the location of signs with reference to roads, the following shall not be deemed to be included within the definition of "Sign"

a. Signs or flags of a governmental agency, including traffic or similar regulatory or legal devices,
b. Memorial tablets or signs,
c. Signs required to be maintained by law or governmental order, rule, or regulation, and street names and address numbers,
d. Signs within a private area that cannot be seen from a road or adjacent properties,
e. Flags or emblems of a civic, philanthropic, educational or religious organization,
f. Small signs displayed for the direction of public or convenience of the public, including signs that identify rest rooms, location of public telephones, freight entrances, or the like, with a total sign area not exceeding 2 square meter per sign,
g. Signs attached to and showing the use of a building,
h. Any temporary sign: constructed of paper, light fabric, plastic, or other light material, with or without frames, when such signs are intended to be displayed for a short period of time only, in no event for longer than 35 days.

**Sign are:** the net geometric area of a sign computed as including the entire area within one or more parallelograms, triangles, circles, or semi-circles comprising all the display, including boarders and solid background. One face of a double faced sign shall be considered in determining the sign area, provided both faces are parallel and of the same size.

**Storey:** the spatial portion of a building located between the surface of any floor above ground level and the surface of the floor next above it or, in case there is no floor above it, than the space between such floor and the ceiling next above it.

**Structural alterations:** any change in the supporting members of a building or structure such as bearing walls, columns, beams or girders.

**Structure:** anything else constructed or erected than a building which requires permanent location on the ground, or an attachment to something having such location.

**Subdivision plan:** a map showing the detailed and measured division of a tract of land, either into two or more parcels and/or plots, serving as the basic layout for a proposed single or multiple plot development.

**Use, land:** the purpose for which a tract of land, and any building or structure located thereon, is occupied and used, or is intended to be developed, occupied and used.

**UDD:** The Urban Development Department of KMC Office.

**Utilities:** the technical and logistical provisions for the supply and distribution of water, electricity, gas, telephone, radio and TV signals, etc. and for the drainage, collection and disposal of rain water and fluid and solid waste.

**Yard, court:** an uncovered space that is, apart from one or more access ways, fully enclosed by one or more buildings.

**Yard:** the open-air part of a plot not occupied by buildings and structures

**Zone, land use:** an area designated for one or more land uses.

**Zone, mixed use:** an area designated for two or more land uses.

### 1.5 THE PHYSICAL PLANNING COMMITTEE (PPC)

8. The KMC Board shall constitute a Physical Planning Committee to advise the Board on all aspects related to the issue of Planning Permits and Building Permits, and appoint its members. The seven (7) members of the PPC will comprise:

» the Deputy Mayor of KMC, Chairman
» the KMC Secretary as representative of HMG?
» the Head of the UDD, acting as secretary of the Committee, hereinafter referred to as the Secretary
» one (1) representative of the KMC Council
» one (1) representative of Kathmandu's business community, and
» two (2) professional advisors.

9. Apart from the Deputy Mayor, the KMC Secretary and the PPC Secretary being permanent members, all other members of the PPC shall be appointed for a term of two years but can be re-appointed.

10. The PPC shall meet every two weeks but at least once a month. The agenda for the meetings shall be prepared jointly by the Chairman and Secretary and communicated to the members, together with the minutes of the previous meeting, at least one week in advance of each meeting. The Secretary will prepare the minutes of the meetings.

11. Decisions shall be made by open voting and simple majority. For taking a vote on major planning decisions a quorum of four (4) Committee members shall be present at the meeting. When the votes ties, the Chairman's vote shall be decisive.

12. In the absence of the Chairman, the Council representative shall replace and represent him/her during and outside PPC meetings. In the absence of the Secretary, the Deputy Head of UDD shall act in his or her place.

13. The physical Planning Committee shall be responsible for initiating all necessary actions for the due implementation of the provisions of this Ordinance. Its tasks include, but are not limited to,

» Advising the Mayor on all matters related to the physical conditions and development of the City.
» Initiating, supervising and approving amendments and revisions of the Ordinance, subject to endorsement by the Council,
» Considering planning applications and issuing Planning Permits for all development projects, except residential projects - not located in conservation areas - having an assessed total construction value of less than five million Rupees (Rs 5,000,000).
» Initiating and identifying the most appropriate city location and sites for proposed major new developments such as government buildings, hospitals, schools, shopping malls, new roads and bridges, power plants and other major utility plants and city parks,

» Supervising the operations, performance and staffing of KMC's UDD and the selection and appointment of the Department's senior staff.

### 1.6 Amendments and Revision of the KUPBR

14. The KUPBR shall be amended whenever deemed necessary but shall be reviewed and revised, at least, once every five years.

15. Amendments and revision of the KUPBR shall be initiated by the PPC and, after consultation of the KMC Board, it shall instruct the UDD to undertake the necessary tasks for their preparation within a time period to be specified by the PPC.

16. Upon completion, the PPC shall consider the draft amendments or revision of the KUPBR and may invite for advice during its meetings any person or organization it considers useful. After its approval in principal (principle) of the draft proposals, the PPC shall release all relevant documents for inspection by the general public.

17. To inform the general public about proposed amendments or revisions of KUPBR, KMC shall make appropriate and timely announcement on its public boards, bulletins, local newspapers and other usual media channels. The information in the announcement shall, at least comprise:

a. The location and period where the documents can be viewed and inspected
b. The period during which eligible persons can submit their reasoned objections in writing, which period should not be less than four (4) weeks for any amendments and six (6) weeks for revisions of the KUPBR.

18. After the closing date of public inspection, the PPC shall consider all written objections received and arrange for those alterations to be made to the draft documents as it sees fit and justified.

19. The PPC shall document the preparation and review process in a report, clearly stating its reasons why objections from the general public were accepted or rejected as ground for altering or adjusting the draft documents.

20. Upon their completion, the PPC shall submit and present the final documents, together with the above review report, to the Mayor for formal KMC Board approval, gazettal and publication of the revised KUPBR or its amendments.

21. Before approving a full revision of the KUPBR, the KMC Board may decide for a second public viewing to allow any person or organization to raise objections to any aspect of the revision as contained in the final documents. The procedure shall then be repeated as described in Section 15 to 20.

### 1.7 Planning Districts

22. For the purpose of giving adequate response to the provisions of the Local Self Governance Law with regard to the effective execution of urban planning, the KMC are shall be divided in five urban Planning District. They are named and encompass the following ward:

» City Core District, ward nos. 12, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30
» Central City District, wards nos. 1, 5, 1, 21, 32, 33
» District West, wards nos. 6, 7, 8, 9, 10, 34, 35
» District North, wards nos. 2, 3, 4, 29
» District East, wards nos. 13, 14, 15, 16.

23. In the event of an extension of the KMC boundary, the formation of new wards, or the redistribution of existing wards, the KMC Council shall decide on the revision of the boundaries of the Planning Districts concerned.

### 1.8 The District Planning Committee (DPC)

24. For each of the Planning Districts, KMC will establish a District Planning Committee, consisting of the Ward Chairmen of all the

wards constituting the District A representative of KMC will attend the meetings of this committee as advisor and non-voting advisor

25. The principal task of the DPC is to assist KMC with the preparation of, and to formally endorse Local Area Plans as referred to in Section 27, and to give appropriate guidance and support to KMC for the effective implementation of these plans in manner and with the instruments as prescribed by KMC order.
26. Detailed instructions about the functioning and procedures to be followed for decision making by the DPC's will be prescribed by the KMC Board in a special order.

### 1.9 Local Area Plans

27. Local Area Plans shall be prepared for all such parts of the KMC area that require an integrated planning approach to ensure that the aims set and agreed for the type and extent of development for these areas can be more securely and effectively attained.

28. A Local Area plan that is disaster risk resilient shall be prepared by KMC, at least, for the following types of areas:

- for each of the five Districts a District Development Plan, at least containing a land use development map at a scale of min. 1:5,000, appurtenant land use and development regulations and a 5-year investment programme.
- for areas designated as a conservation zone on the Development Control Map
- for areas designated as a Land Pooling or Guided Land Development Project,
- for any other designated or proposed to be developed as a comprehensive land development project.

### 1.10 Area Improvement Projects (AIP's)

29. Any group of legal persons being land and/or building owners in an area that is already substantially developed but lacking adequate provision of technical infrastructure, and such User Group having expressed its intent to improve these conditions with a maximum of their own means and organization, shall be encouraged by KMC in this initiative and, fulfilling certain requirements to be prescribed by special order, shall be technically and/or financially supported by KMC.

30. Annual Investment Plan (IAP) will be encouraged by KMC in terms of financial support and implementation priority depending on the overall structural and sustainable improvement of the area being proposed.

31. AIP's will qualify for support by KMC if the basic principle of equity sharing is accepted and adhered to. This means that the User Group shall invest in the project, at least, to the extent of the assessed improved land value that will accrue from the AIP. Investment would include such cost as the compensation for any private land and property to be acquired for implementation of the project, for instance, in the case of creating a right of way or for the necessary widening of a road. After deduction of the agreed share to be paid by the collective owners, the remainder of the project cost will be borne by KMC.

### 1.11 The Planning Permit

32. Before implementing comprehensive development projects, parcels or plots, either in public or private ownership, shall not be subdivided or assembled without a Planning Permit issued by KMC.

33. Existing buildings or structures, either in public or private ownership, comprising a total floor area of more than 660 sq m (7,500 sq ft), shall not be redeveloped, changed of use, enlarged, such as raised in height, or otherwise structurally modified without the issue of a Planning Permit by KMC.

34. For requesting KMC to issue a Planning Permit, the applicant shall submit the following documents:

A. For the subdivision or assembly of land with the intent of land development.

a. A complete application form
b. Receipt of payment of the Planning Permit fee,
c. Proof of his ownership of the subject land or a letter from the owner of the land stating his agreement to surrender land to the applicant, conditional upon the issue of a Planning Permit for the intended development.
d. Certificate of KMC Revenue section confirming that all land an property tax and other local taxes due by the owner have been remitted.
e. A certified copy of the cadastral map showing the plots and/or parcels proposed to be subdivided or assembled, as well as the adjoining parcels and/or plots with description of their actual land uses.
f. One or more drawings, at appropriate scale within the range of 1:1000 to 1:100, showing:

(1) The proposed land assembly and/or subdivision and the development layout with resulting plot(s) and giving all relevant dimensions shown in meters,
(2) Height variations of land by 0.5 m contour lines and a detailed indication of the measures proposed for draining the land and disposal of drain water.
(3) The vertical projection and the height of buildings) and structures proposed to be constructed on the plot(s) and indicating the proposed use of (each of) the building(s) by area of floor space in square meters.
(4) The surveyed or otherwise certified documentation of the vertical projection on the ground and the height of all buildings and structures located on the abutting parcels and plots.
(5) The location and width of the ROW(s), either existing, or firmly committed to be constructed to serve access to the plot(s),
(6) The location and connection points of water mains and sewers and other standard utilities as mains and cables, and of any easements required for their installation beyond the boundaries of the subject plot(s),
(7) The location and capacity of septic tanks proposed to be constructed, if any, and the method proposed to dispose of the septic tanks' effluent.
(8) An indicative landscape design for integrated development projects.

g. A "letter of no objection", addressed to KMC and signed by those owners of the parcels and/or plots who can reasonably expected to be affected by the project, confirming their agreement with the development proposed to be realized on the subject plot(s). If one or more of the above owners do not agree and make any objections to the proposed development that could not be resolved in plan modification or by amicable settlement, the reasons for these objections shall be stated in a letter for consideration by KMC prior to approval of the Building Permit.

B. For structural alteration of buildings and structures, change of land use or redevelopment of a site.

a. The completed application form.
b. Receipt of payment of the Planning Permit fee.
c. Proof of his ownership of the subject plot(s) and/or building(s), or a letter by the owner of the land and/or building(s) stating his agreement with the development or the works for which the Planning Permit is requested.
d. Certificate of KMC Revenue Section stating that all land and property tax and other local taxes due by the owner have been remitted.
e. A certified copy of the cadastral map showing the subject plot and all abutting parcels and/or plots and their actual land uses,
f. The (latest) Building Permit issued for the existing development
g. One or more drawings, at appropriate scale within the range of 1;500 and 1;50, showing:

(1) The layout of development showing location and height of all buildings and structures on the subject plot and those on the

abutting plots, all as existing at the time the application for the Planning Permit is made.
(2) All changes and modifications proposed to be made to the existing land use, buildings, structures and plot layout, and any new, additional or substituting buildings proposed to be constructed on the plot(s),
(3) If applicable, any variation to the existing vehicular access to the plot(s) and to the number of vehicles proposed to be parked on the plot(s).

8. A "letter of no objection" as described in Section 34A, g above.

35. Upon receipt of the application for a Planning Permit, KMC shall verify if the proposed development and/or construction agree with the provisions and standards laid down in this Ordinance and will submit the application for approval to the Physical Planning Committee. For projects located in areas of particular concern such as cultural and heritage sites and buildings, roads, water and sewerage and solid waste among others advice may be sought from other agencies such as the Department of Archaeology, Ministry of Environment, the Traffic Department. Where deemed appropriate and necessary the applicant may be required to present a feasibility study showing among others things how the proposed project would affect the immediate surrounding area in terms of inducing or causing hazard risk into a disaster.

36. A decision by KMC on the application of a Planning Permit shall be made and confirmed in writing to the applicant within two (2) months from the date of registration of the application. KMC may extend this period by one (1) month. When no decision is made within three (3) months, approval is automatically granted and the Planning Permit shall be issued accordingly.

37. When a Planning Permit is refused, KMC shall give the reasons for its refusal in writing. After having made the appropriate modifications to the project design, the applicant shall be entitled to make a second request for a Planning Permit at no further cost.

38. The Planning Permit does not entitle the applicant, or any other person through this order, to commence or carry out any development or construction activity until a Building Permit for the same project has been applied for, and been issued by KMC.

39. The Planning Permit is valid for one (1) year from the date of issue and expires at the date and for that part of the project for which a Building Permit has been issued. In case of particular and unforeseen circumstances and upon the owner(s) written request, KMC may, conditionally, extend the validity of the Planning Permit by one (1) more year.

### 1.12 The Building Permit

40. No building or structure, either in private or in public ownership, shall be constructed, extended, altered or demolished, nor any construction or site works commenced, without a Building Permit.

41. Upon application of a Building Permit for the construction of any new building or structure with a total amount of floor space in excess 660 sq m (7500 sq ft), such application shall first be submitted to the Physical Planning Committee for planning approval. No Building Permit shall be issued before this Committee has considered the implication of the proposed building or structure for the surrounding areas and/or the city as a whole, and, based on its findings, has approved the project.

42. For requesting KMC to issue a Building Permit, an application shall be made by the owner(s) of the land concerned by submitting the following documents:

a. The completed application form,
b. Receipt of payment of the Building Permit fee,
c. Proof of his ownership of the subject land and/or building or a letter by the owner(s) of the land/and or building stating his agreement with the development and/or works for which the Building Permit is applied for,

d. Certificate of KMC Revenue Section stating that all land and property tax and other local taxes due by the owner have been remitted,
e. A certified copy of the cadastral map showing the subject plot(s) and all abutting parcels and/or plots, also indicating their actual uses,
f. The Building Permit(s) previously issued for any buildings existing on the plot(s) at present or that existed in the past,
g. The Planning Permit, if applicable and issued,
h. A "letter of no objection" as described in Section 34 A.g.
i. Drawings, appropriate scale within the range of 1:500 and 1:50 and other documents presenting:

(1) The layout of development, including all buildings and structures and their height on the subject plot(s) and on the abutting plots, as existing at the time the application for the Building Permit is made,
(2) Architectural and structural design and technical specifications for all new construction works proposed and for all changes and modifications to be made to existing buildings and structures,
(3) Any variation to the existing vehicular access and to the number and location of vehicles proposed to be parked on the plot(s),
(4) A cost estimate of all works of the project prepared and signed by a KMC licensed building engineer or registered building contractor

43. Upon receipt of the application for a Building Permit, KMC shall verify if the proposed development and all constructions agree with the provisions and standards laid down in:
a. this ordinance,
b. the Nepal Building Code,
c. any previously issued Building Permit(s)
d. the Planning Permit, if applicable and issued, for the development or construction for which the Building Permit is requested.

44. For projects located in areas where particular development restrictions apply, before issuing a Building Permit KMC shall seek advice from the competent agencies that have the lawful right to impose such restrictions.
45. A decision on the application of a Building Permit shall be made by KMC and confirmed to the applicant in writing within two (2) months from the date of registration of the application. KMC may extend this period by one (1) month. When no decision is made within three (3) months from the date of application, approval is automatically granted and the Building Permit shall be issued accordingly.

46. When a Building Permit is refused, KMC shall give the reasons for its refusal in writing. After having made the appropriate modifications to the project design, the applicant shall be entitled to make a second request for a Building Permit at no further cost.

47. The Building Permit requires the applicant to execute the approved works in such stages as shall be written as a condition of approval in the Building Permit. No subsequent stage shall commence before the works executed in the previous stage have been inspected and approved by KMC.

48. Execution of the Construction works shall commence within one (1) year from the date of issue of a Building Permit. In case of particular and unforeseen circumstances, upon the owner(s) written request, KMC may, conditionally, extend the validity of the Building Permit by one (1) more year.

49. In the event construction works are interrupted for more than 6 months, the Building Permit issued for such works automatically expires. The works shall not be resumed before a new Building Permit has been applied for and been issued, or the existing Permit has been extended at the discretion of KMC.

**1.13 The Completion Certificate**

50. Upon request by the applicant, KMC shall issue a Completion Certificate only after its inspectors have inspected all works after their completion and have found these to have been executed in full conformity with the conditions of the Building Permit.

51. No building or structure shall be occupied or used by the owner, or by any other persons, before a Completion Certificate for such building or structure has been issued by KMC.

52. The owner of a building or structure will not be permitted to sell the appurtenant land or to make any future change in the use or physical form and contents of such buildings or structure before a Completion Certificate for the erection or any subsequent modification of that building or structure has been issued by KMC.

**1.14 Transition Rule**

53. Land, developed and permanently used at the time of promulgation of this Ordinance, but since then in contravention of any of the regulations of this Ordinance, shall be allowed to continue to be used for existing and ongoing activities under the following restrictions:

a. non-compliant use of land or buildings shall not in any way be expanded, intensified or changed into other non-compliant use,
b. existing buildings and structures shall not be changed or expanded and no works shall be executed other than serving their upkeep and regular maintenance.
c. no new buildings or structures shall be constructed for non-compliant uses,
d. non-compliant use(s) will become illegal and shall be terminated upon deceased of the owner or tenant of the land or upon the change of ownership of the legal or physical person making non-compliant use of the subject land, building or structures,
e. from the date a non-compliant use has become illegal, for whatever reason, such use shall be terminated within maximum 6 months, upon which all those measures shall be taken necessary to convert the land, buildings and structures to legal use.

**1.15 Sanctions and Penalties**

54. The Building Permit may be revoked by KMC if there is:

a. a breach of a term or condition of the Planning Permit or the Building Permit,
b. a contravention of the provision of this Ordinance.
c. a misrepresentation of facts in any of the application forms, plans or other documents submitted by the applicant when applying for a Planning or a Building Permit,
d. failure to submit structural plans, design, calculations and other particulars as requested by KMC to demonstrate full compliance with the provisions of the Building Code.

55. Any person that takes, without permission of KMC any action of development or construction that is contravening the provisions of this Ordinance or the Building Permit, KMC may impose on such person a penalty or imprisonment, or both, not exceeding:

a. penalty of Rs 100,000 and/or imprisonment for a term of one(1) year of for any development or the construction of any building without a valid Planning Permit or Building Permit,
b. a penalty of Rs 100,000 and/or imprisonment for a term of one (1) year for exceeding the maximum permitted FAR, PCR, and building height.
c. a penalty of Rs 50, 000 and/or imprisonment for a term of six (6) months for using land or a building for a non-permitted land use,
d. a penalty of Rs 100,000 and/or imprisonment for a term of one year for infringing the Building Code,
e. a penalty of Rs 50,000 and/or imprisonment for a term of six (6) months for obstructing action taken by KMC to undo or rectify any illegal development or construction.
f. a penalty of Rs 50,000 and/or imprisonment for a term of six (6) months for infringing any other provisions of this Ordinance.

56. The owner of any building or structure that is being constructed or altered, or has been constructed or altered without a Building Permit or in contravention of the provisions of this Permit or this Ordinance, may be instructed by order of KMC to demolish part or the whole of that building or structure at his/her own expense, to be commenced within 35 days. By defaulting to obey this order, KMC will have this order executed by its Public Works Department on

behalf of, and at the expense of the owner.

57. Any building or structure that is found to be in a condition or being used for an activity not in compliance with the Building Permit issued for that building or structure, or is in the opinion of KMC's building experts unsafe for public use, may be ordered:

» to be disconnected from public water and electricity supply or
» no longer to be used or inhabited and be closed up until such date that return to the approved use or alterations and/or repairs have been carried out to the satisfaction of KMC, or
» to be demolished if such buildings or structure is found to be in state beyond repair.

**1.16 Appeal (As outlined in the draft KUPBR, Sec. 1.14)**

58. An appeal to an order issued by KMC regarding any sanctions imposed under Section 55, 56 and 57, shall be filed with the Appellate Committee as prescribed in Section 20 of the Town Planning Act, 1998, within 35 days from the date of receiving such order.

## PART 2: RISK-SENSITIVE LAND USE PLAN

Note: With Reference to Chapter 5 of the RS-LUP report

2.1 Expected Impact of the Land Use Plan

This Ordinance aims to realize a risk-sensitive land use plan that can provide among others:

a. Access of people to city-wide services due to decentralized front-line offices of city hall, public markets, shopping centers, tertiary schools and hospitals, police and fire protection offices.

b. Reduced traffic congestion in the Core Area as the new urban nodes intercept inbound traffic from the north, south east and south-west thereby relieving traffic in the city center.

c. Sustainable use of natural resources as more open spaces forest habitats and production areas are recovered and preserved.

d. Reduced air and water pollution as mitigation measures through land use regulation takes effect

e. Enhancement of the overall physical and aesthetic attractiveness of the city to the residents and visitors because of orderly defined land uses and the integration of disaster risk management, reduction and mitigation measures resulting to personal safety and protection of property from the risk posed by natural hazards that may occurs.

f. Acceptance, strengthening and maintenance of KMC's leading role in the Kathmandu Valley area and in the national scene and as the focal point of global attention.

g. Increased investments, from local and foreign investors as they see and follow the orderly physical growth within Kathmandu, which would result in more job opportunities generated.

h. Increased revenue for KMC, as more economic, social, cultural and physical growth is induced thereby creating more opportunities to provide adequate services and facilities for the KMC communities and its constituents.

i. Capability and capacity to be resilient in the face of risk and events brought about by natural hazards.

2.2 The Risk-Sensitive Land Use Map
The Risk-Sensitive Land Use Map, herein attached as Figure 2.1, is hereby formally adopted by the City Council to guide KMC's growth and development over the next ten years (2010-2020). The same map may be reviewed and

updated every three or five years) in accordance with the provisions of the LSGA and this Ordinance.

## PART 3: RISK-SENSITIVE LAND USE POLICY FRAMEWORK

Note: With Reference to Chapter 5 of the RS-LUP report

### 3.1 Introduction

3.1.1 This Ordinance recognizes the need to chart a course of action for the sustainable growth of KMC in pursuit of its vision as a "A tourism center based on heritage and culture with healthy, responsible and economically active citizens living in a clean safe and disaster-resilient environment." To this end, the KMC has decided to manage and take public control over the direction and pattern of development in the city through the Risk-Sensitive Land Use Plan that has been adopted and approved by the City Council.

### 3.2 Policy Statements

3.2.1 That within the territorial jurisdiction of KMC, the city has the authority to prescribe and that the citizens have the duty to follow reasonable limits and restrain on the use of land and appurtenant structures built upon such land so that:

- Protected areas are respected and preserved for the benefit of all.
- Production areas are used sustainably so that the needs of the present and future generations will continue to be adequately met;
- Settlement areas are made livable and worthy of human dignity, and
- Infrastructure is adequate, efficient and befitting of a modern city.

3.2.2 That it is the responsibility of KMC to ensure the safety and security of its citizenry, its resources and the environment against the effects of natural hazards and, by all means, shall prepare the necessary measures to prevent, mitigate or reduce the effects of disasters.

3.2.3 That in its disaster risk management program and action plans, the involvement and commitment of all in the community -- individuals, families, neighborhood, ward, institutions and non-government organizations-- is a must for risk reduction and mitigation, and therefore, every effort shall be made to encourage participation and require compliance for the fulfillment of the provisions of this Ordinance in order to prevent hazards, natural or otherwise, from causing emergencies and ultimately disasters.

3.2.4 That this Risk-Sensitive Land Use Plan and its accompanying zoning ordinance and regulations on the use of land and construction of buildings are to be disseminated to all sectors of the KMC through trainings and workshop, and to the communities and wards through information and education campaign, and that these disaster risk reduction measures are to be regularly monitored, evaluated, and modified as the need arises to lessen the likely effects of emergencies.

## PART 4: LAND SUBDIVISION AND ASSEMBLY REGULATIONS

### Introduction

This part of the Ordinance contains general regulations for the subdivision of land into two or more plots, and for the amalgamation of land of different owners into a single holding (land pooling), both action with the intent of subsequent development of such land. The land subdivision regulations as contained in the existing Building Bylaws have been completely revised and updated. The need for land assembly regulations only emerged after a number of experimental land pooling projects in Kathmandu Valley were successfully implemented. The 3rd Amendment of 17 April 1998 of the Town Planning Act, once published in the gazette, provides the legal framework for land assembly projects. Similarly, the Apartment Ownership Act of 1997 deals with joint ownership of real

estate and is a helpful instrument for disallowing further subdivision and fragmentation of land and existing buildings.

## PART 4: LAND USUBDIVISION AND ASSEMBLY REGULATIONS

Note: With reference to PART 5 (4): LAND SUBDIVISION AND ASSEMBLY REGULATIONS

As outlined in the draft KUPBR, Part 4.

### 4.1 Means and Standards of Plot Access

4.1.1 No land shall be subdivided or developed without each plot having access provided by a public or private ROW of prescribed minimum standards.

4.1.2 No building or structure shall be constructed on any plot in such a manner and location as to obstruct or foreclose the construction and effective use of an existing or future ROW of required standards to provide access to existing and future plots uniquely served by this ROW.

4.1.3 For reasons of vehicular access and circulation and public convenience and security, the minimum width and maximum length to which an access road shall be constructed depends on:

a. the type of land use served
b. the type of road: dead-end, single-way or two-way road
c. the number of plots or dwellings served by a single access road.

The minimum standards that shall be adhered to for ROWs serving access to residential and non-residential plots are prescribed in Table 4.1 and 4.2 and Sections 85 to 88.

4.1.4 For the siting of building which will attract large numbers of people and vehicles, such as schools, hospitals, cinemas, theaters, conference halls, exhibitions centres and shopping centres, KMC may require, particularly depending on local traffic and parking conditions, higher or additional standards of access than

Table 4.1 Minimum with of ROWs serving access to residential plots and parcels

| Type of ROW | Max. number of dwellings served | Length of ROW | Min. width of ROW |
|---|---|---|---|
| Pathway | 4 | Max. 25 m | 3.0 m |
| "Dead-end" road | 20 | Max. 50 m | 4.5 m |
| "Dead-end" road | 40 | Max. 100 m | 6.0 m |
| Access road with entry and exit | 80 | Max. 100 m | 6.0 m |
| Access road with entry and exit | 200 | Max. 250 | 8.0 m |

Table 4.2 Standard ROW's for access to non-residential plots and parcels

| Type of Use | Plot/Floor Area | Length of ROW | Min. width of ROW |
|---|---|---|---|
| Local (work) shops | Plot<100 sqm<br>Floor<50 sqm | 6 m | 100 m |
| Other local level uses | Plot<500 sqm<br>Floor<250 sqm | 8 m | 250 m |
| District level uses and gen. industries | Plot<2500 sqm<br>Floor<1000 sqm | 14 m | 500 m |
| Manufacture industries<br>All other district and city level uses | | 14 m<br>14 m<br>>20 m | 500 m<br>500 m<br>n.a. |

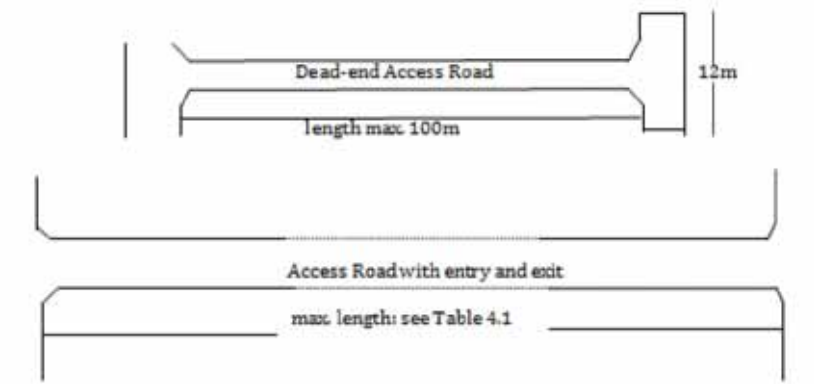



Figure 4.1 Min. standards for Access Roads

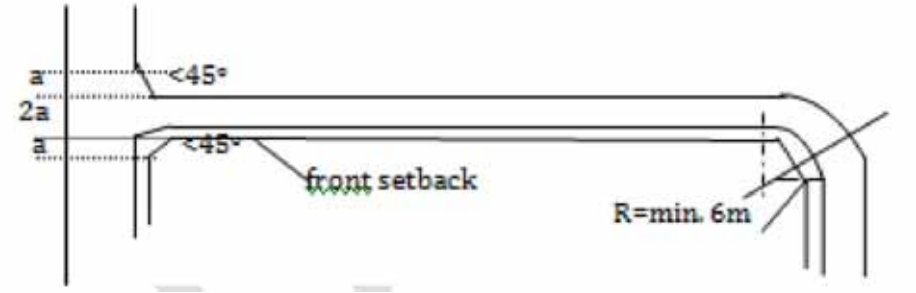



Figure 4.2 Design standards for access roads

prescribed in Table 4.2

4.1.5 For the purpose of drainage, a dead-end road shall be designed and constructed so that the road surface at the dead end is at higher level than that of the intersection with the drainage of the area served by such road, subject to approval by KMC.

4.1.6 Dead-end roads with a length of more than 25m shall at the end be provided with a turning circle with a diameter of min. 9m, or with a "hammer head" of minimum 12m wide as shown in the Figure 4.1.

4.1.7 Access roads shall further meet the following design requirements:

a. at intersection with other roads, both the edges of the access road and the adjoining from setback lines shall be played using the prescribed angle and dimension as shown in Figure 4.2. Only the curve of the road may be rounded, instead of splayed, not the setback line.
b. Curves in the alignment of an access road shall have a radius, measured from the inside edge of the ROW, of not less than 6 m, while the adjoining setback line should be splayed as a straight line over the full length of the arc as shown in Figure 4.2

## 4.2 Plot Development

4.2.1 No land shall be subdivided and developed:

a. in areas subject to flooding
b. on slopes steeper than thirty (30) degrees,
c. of which surface water cannot be naturally drained to an existing drain, to the ROW giving access to such plot, or when this water will, or can be expected to flow into neighboring plots,
d. if the soil is unsuitable for building construction due to contamination, insufficient bearing capacity or other pertinent reason as determined by KMC experts.

4.2.2 Minimum plot size. No development is permitted of plots with a size of less than 80 square meters for whatever land use, except with special permission by KMC for low-cost housing realized through a comprehensive development project.

4.2.3 Any plot that has been developed, with or without a Building Permit, shall not be further subdivided and changed of ownership unless all development conditions and standards as applicable for the original plot can also be met and maintained for each of the plots resulting from this subdivision.

4.2.4 When through inheritance, or for any other reason, the ownership of a developed plot needs to be transferred and shared by more than one owner and, as a result, any part of the land to be owned is becoming smaller than the minimum permissible size for plot development, such plot can be legally subdivided and shall, pursuant to the provisions of the Apartment Ownership Act, be registered as land and building(s) held and managed as undivided estate in multiple ownership.

4.2.5 Plot width. The minimum width of the front of a plot shall not be less than five (6) meter for closed frontage development and eight (9) meter for detached buildings. KMC may grant permission for lesser widths in comprehensive development project.

4.2.6 Plot depth. For small plots, within the range of 80 to 125 sq m, the depth of the plot should not be less than 1.5 times the width of the front of such plot, while for any plot the depth should not exceed three (3) times the front width.

4.2.7 No plots shall be permitted to discharge surface water or sewerage into a public sewer or public drain without permission of KMC.

4.2.8 In areas for which closed frontage development exists or is prescribed, the external face of the side wall(s) of a building to be attached to the side wall(s) of the adjoining building(s) shall be placed on the plot side boundary and be constructed in one plane without containing any windows or other permanent openings.

4.2.9 Accessory buildings, such as private garages and garden sheds of a height not exceeding three (3) meters, shall be allowed to be constructed up to the side and rear boundaries of the plot, provided the owner(s) of the plot(s) abutting such building(s) agree to such building(s) and have stated their consent in writing addressed to KMC.

**4.3 Boundary walls**

4.3.1 Unless otherwise prescribed by KMC any boundary wall facing a public road shall be constructed of brick, stone or plastered concrete and not exceed a height of 2 m. All other boundary walls may be constructed to a height of max. 3 m of which the lower part shall be constructed in brick, stone or plastered concrete from the ground upwards to a height of min. 0.8 m while the upper part may e made as an open fence, exclusively constructed of metal. To maintain adequate sight distance, KMC may require for corner plots that only an open wire fence be constructed from a height of 0.8 m above the adjoining road level.

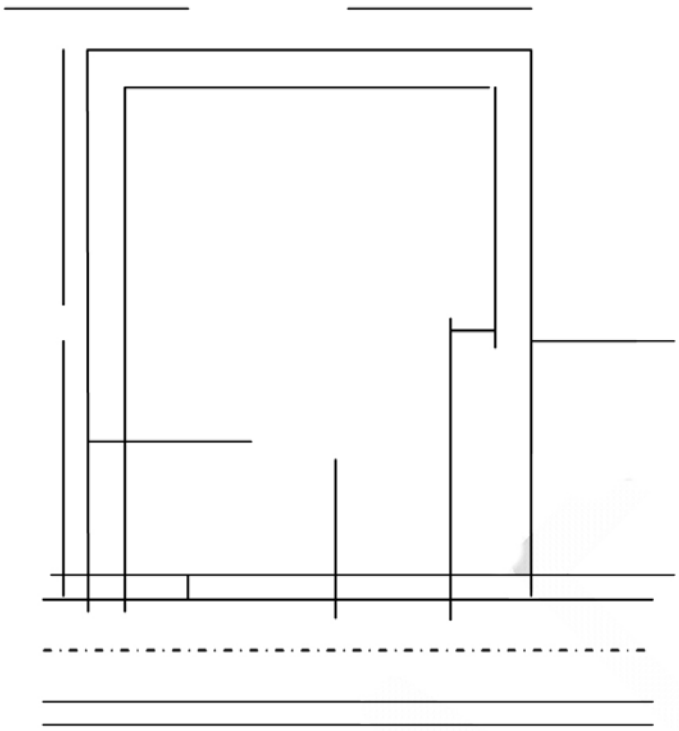
**4.4 On-site parking requirements**

4.4.1 Unless otherwise instructed on the Development Control Map for specific areas, the uniform minimum standard for car parking on any plot is 1 car space per 250 sq m plot area.

**4.5 Comprehensive development**

4.5.1 When properly and serving multiple land owner or users, comprehensive development projects, either initiated and developed by the private sector or the public sector, are favored and shall be encouraged by KMC through providing as much technical, administrative and financial support as such projects may reasonably require.

4.5.2 Whenever a comprehensive development project results in simultaneous development of ten (10) or more plots, or the simultaneous construction of at least 10 dwellings, while maintaining the prescribed minimum standards of access, parking and open space, KMC shall encourage such a project by favorably considering an increase in the FAR, PCR, and/or building height of maximum 30%



| | |
|---|---|
| Plot size: | Min. 80m2 |
| Min. plot frontage | |
| -detached | 8.0 m |
| -semi-detached | 6.5 m |
| -attached | 5.0 m |
| Plot depth | |
| Min. building setbacks | |
| - Front | A= 1.0 m |
| - Front centerline Of ROW: | B= 4.0 m |
| - From sides: | C= 1.5 m |
| - From rear: | D= 1.5 m |
| - From any building: | E=3.0 m<br>E=0 m |
| Max. building height. See development Control map and Section 100 | |
| Max. plot coverage. See Development Control Map and Section 64 | |
| Max. FAR. See Development Control Map | |
| On-site car parking. See Section 103 | |

Fig. 4.3 Design standards for plot development

whatever desired, provided the conditions of the area and exiting development adjoining such project do permit so.

4.5.3 In projects for comprehensive residential development land should be set aside for landscaped open space and community services, primarily benefiting the residents of such project area, at the following rates:

| Open space: | Community uses: |
|---|---|
| Up to 5 ha | 5.0% |
| more than 5 ha | 1.5% |
| More than 5 ha | 3.5% |

These community services and open space, for which land will be provided at no cost, shall be selected and approved by the beneficiaries of the project area in consultation with KMC. These shall comprise facilities and services such as kindergarten, primary school, temple, pati, children playground or community centre.

4.5.4 For each comprehensive development project a planning study will be carried out that will result in a development plan (on one or more maps) at a scale of not less than 1:500 showing the road, drainage and utility networks, plot subdivision, proposed land use for each land unit, architectural designs or guidelines and a landscaping concept. This plan, to be submitted to KMC for approval, should be associated with a report that provides:

a. relevant planning information and development standards (i.e. density, min. plot size, plot coverage and floor area ratios, building heights, parking standards, etc.) and design principles for buildings and open spaces,
b. information on the cost, financing, management and staging of implementation of the project
c. a programme and time schedule of works to be carried out by the project and those to be carried out by public agencies, i.e. KMC, line agencies, utility boards, etc.
d. justification of any proposed deviation in the project from prevailing development conditions and standards applicable for the project area.

4.5.4 No legal land transaction shall take place for the purpose of subdivision or assembly of

land and with the aim of undertaking a comprehensive development project before KMC has issued a Planning Permit for such a project.

**PART 5(5): BUILDING REGULATIONS**

Introduction

Each type of construction should be in compliance with the Building Regulations and, in principle, requires a Building Permit before any construction can be undertaken. A number of standards in the existing Building Bylaws have been maintained while others have been altered and new ones added. The Building Regulations do not substitute but complement the Building Code.

**5.1 General**

5.1.1 In these Building Regulations the word building shall also mean to include any structure, unless otherwise stated.

5.1.2 Notwithstanding the provisions of Section 40, no building shall be constructed, expanded, structurally altered or any changes made to its faÁade(s) and roof without a Building Permit or be constructed in defiance thereof.

5.1.3 Buildings should be designed, constructed and used in conformity with the Land Use Regulations of this Ordinance.

5.1.4 Buildings shall be located, designed and constructed in conformity with the Development Regulations of Part 3 and the Land Subdivision and Assembly Regulations of Part 4 of this Ordinance.

5.1.5 Notwithstanding the provisions of these Building Regulation, for any Listed Building or buildings located in a Protected Monument Zone or a Conservation Area as referred to in Section 68 to 70 additional development conditions apply as contained in the "KMC Development Controls and Design Standards for Conservation Areas and Listed Buildings."

**5.2 National Building Code**

5.2.1 Every building to be constructed by an individual, body or governmental agency shall be designed and executed in accordance with the regulations and standards prescribed in the Building Code with particular regard to structural stability, earthquake resistance and fire safety

5.2.2 Pursuant to Section 5.2.1 above, for Group A and Group B buildings as defined in Article 8 of the Buildings Act, no Building Permit will be issued before the structural design calculations and drawings have been approved by the Building Construction Arrangements Consolidation Committee, or by the authority to which the power to grant such approval has been delegated.

5.2.3 Pursuant to Section 5.2.1 above, for Group C and Group D buildings as defined in Article 8 of the Buildings Act, no Building Permit will be issued unless the applicant has demonstrated to KMC that the structural design of the building(s) proposed to be constructed meets the standards and requirements of the Building Code.

5.2.4 Pursuant to Section 5.2.1 above, structures such temples, chimneys, water towers, viewing and clock towers, bridges and pedestrian overpasses shall be designed in conformity with the provisions of the Building Code, or, if no adequate standards exist, in conformity with international standards regarding earthquake resistance and fire safety.

**5.3 Suitability and land for Construction**

5.3.1 No development shall be undertaken on land that has been filled with any material that contains organic (fecal matter, animal or vegetable) matter unless such substance has been removed and the plot or site cleared completely, or the whole ground surface has been rendered innocuous and covered with a layer of earth or any other suitable material which is at least thirty (30) centimeters thick.

## 5.4 Foundations

5.4.1 Buildings to be constructed on land that has been filled in the past, with whatever material, shall have their foundations placed at or below the level of the original, undisturbed soil.

5.4.2 The foundations of any building shall not extend beyond the boundary lines of the building site except in the case of the foundation of a party wall which is being built with the mutual consent of the owners of the sites on which such party wall stands.

5.4.3 Every building shall be supported by foundations that safety sustain and transmit to the ground to combined dead load and imposed load of the building in such a manner so as not to cause any settlement or other movement which may impair the stability of, or cause damage to the whole or any part of the building or to any adjoining building or structure.

5.4.4 If the ground adjacent to any proposed building exerts pressure upon or causes the application of an undue load to any part of the building, that building or part thereof shall be so constructed as to be capable of safety sustaining and transmitting the pressure or load without exceeding the appropriate limitations of permissible stresses.

5.4.5 Where appropriate and necessary, the applicant must provide a structural analysis of the building and the result of geotechnical studies done or required to be done.

## 5.5. Damp proofing

5.5.1 To protect any building from absorbing moist from the soil, all walls rising from the foundation shall be provided with a damp proof layer of polythene or tarfelt, bitumen panting or any other protective treatment of approved quality and application. This damp proof layer shall be placed at a height between the finished ground level of the site and the lowest surface of the ground level floor structure.

## 5.6 Drainage

5.6.1 Paved areas of a plot or parcel and paved courtyards should be graded so as to drain surface water towards the nearest ROW. To ensure natural drainage at all times, hard paving of these areas should be constructed at a level of minimum 15 cm above the level of the centre line of that ROW

5.6.2 Every building shall be provided with adequate drainage facilities to drain off and convey the rain water from the roof to a street drain or other approved outlet without causing dampness or damage to the walls or foundation of the building or those of adjacent buildings. In no case water shall be permitted to drop directly from the roof, or from any other part of the building, on any area other than the plot on which this building stands.

5.6.3 No rain water from any plot shall be discharged into the public sewerage system without permission from the complete sewerage authority.

5.6.4 The finished floor level of the ground floor of any main building should be elevated a minimum of 30 cm above the highest point of the finished ground level along the outside perimeter wall of such building, or above the centerline of ROW adjoining the plot at the point of access to the plot, whichever of the two measurements requires the higher floor level.

## 5.7 Water supply

5.7.1 Every building shall be provided with a piped water distribution system based on public supply of water. The connection of any building to the public water supply system shall, upon request and approval, be exclusively made by the competent water authority.

5.7.2 In the event that a building cannot be connected to the public water supply system or its connection is delayed, the sustained supply of water may be secured from a private source at standards to be approved by the competent

water authority as a condition of issue of a Building Permit.

5.7.3 No any well for the collection of ground water shall be dug or drilled without permission from the competent water authority. No well used for the supply of drinking water shall be closer than fifteen (15) meter from a latrine, septic tank, soak pit, refuse dump or from any other place that may cause pollution of the drinking water.

5.7.4 Wells used for the supply of drinking water should be constructed and maintained in such a manner that the well water is not polluted by the inflow of surface water or any other potential pollutant.

5.7.5 Every building shall be provided with water shortage tanks and pumps of such capacity as prescribed by the competent water authority.

### 5.8 Sanitary Provisions

5.8.1 Every dwelling shall have at least one water closet. Buildings for public assembly shall be provided with toilets and wash basins at a ratio of one each for men and women for every

25 seats in cinema's, theatres and auditoriums,
50 seats in restaurants, cafes and clubs,
200 sq m or part thereof in offices.

5.8.2 All waste water shall be discharged into the existing public sewerage system. The connection of any waste water outlet to the public sewer shall, upon request and approval, be undertaken exclusively by the competent sewerage authority.

5.8.3 Where no public sewerage system exists, or in other cases where the competent authority is of the opinion that the outlets cannot be connected to the public sewerage system. Sewage shall be disposed of through a septic tank and household water through a soakpit.

5.8.4 Septic tanks and other on-site waste water disposal structures shall be designed in accordance with standards as laid down by the competent sewerage authority.

### 5.9 Waste Disposal

5.9.1 Waste generated within any building or on any plot or parcel shall be collected and disposed off in a manner as prescribed by KMC's Solid Waste Department.

### 5.10 Building Material

5.10.1 For the construction of buildings only those materials shall be used that meet the norms and standards as laid down by the Nepal Bureau of Standards and Metrology.

### 5.11 Size and Height of Rooms

5.11.1 The minimum area and height of rooms and other enclosed spaces for human occupation or use shall not be less than the dimension shown in Table 5.1.

### 5.12 Light and Ventilation

5.12.1 No any basement shall be designed, constructed and used as a dwelling.

5.12.2 Every room in a building, except sore rooms, shall be provided with natural light and ventilation by means of windows, doors or any other approved openings that shall face and open upon uninterrupted air space.

5.12.3 To secure adequate access of day light, the maximum distance of a window or glass paneled door to the opposite wall and to any side wall of a room should not be more than 7.5m and 3.0m respectively. The maximum depth of a such room shall include the depth of a covered balcony, veranda or porch as shown in Fig. 5.1 below.

5.12.4 The total area of glass or other translucent material for the provision of day light to any room, either in a dwelling, office, shop, industrial building and any other room used predominantly during day time, shall not be less than 15 percent of the net floor area of

Table 5.1 The Minimum Height, Area and Dimensions of Rooms

| Type of Room | Min. area in sqm | Min. height in m | Other min. dimension |
|---|---|---|---|
| Basement | | 2.1 | |
| Garaga | 12.5 | 2.1 | Depth/width: 5 x 2.5 m |
| A. Dwellings | | | |
| Store room per dwelling | 2.0 | 2.1 | |
| Bathroom | 1.3 | 2.1 | |
| Toilet | 1.1 | 2.1 | |
| Bathroom + toilet | 2.6 | 2.1 | |
| Kitchen (inc. storage) | 6.0 | 2.4 | Min. width: 1.8 m |
| Kitchen + dining | 7.5 | 2.4 | Min. width: 2.1 m |
| Living room | 7.5 | 2.6 | Min. width: 2.4 m |
| 2nd rooms, e.g. bedroom | 7.0 | 2.4 | Min. width: 1.8 m |
| Attic, average height | | 2.3 | |
| B. Other uses | | | |
| Offices | | 2.7 | |
| School class rooms | | 2.7 | |
| Industrial buildings and warehouses | | 3.5 | |

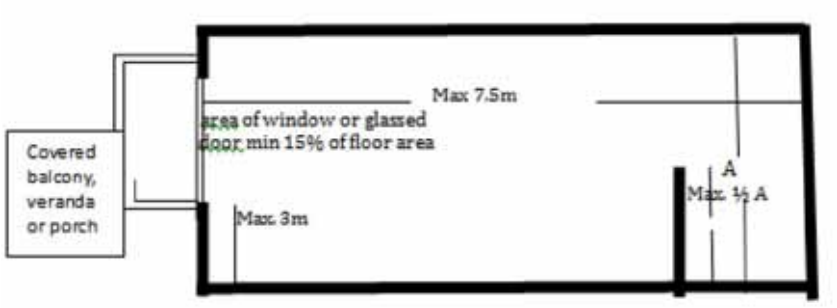



Figure 5.1 Dimensional standards for provision of day light in a room

such room.

5.12.5 For the purpose of ventilation, in any room - except kitchens, toilets and bathrooms - the total area of openings to external air provided by windows, doors and vents shall not be less than 3 percent of the volume of such room expressed in cubic meter and the resulting valued expressed in square meter, with the exception of industrial buildings of which this ventilation ratio should not be less than 5 percent.

5.12.6 The minimum natural ventilation area provided by openings to external air for a toilet and/or bedroom shall not be less than 0.3 square meter and for kitchen 0.5 square meter.

5.12.7 Toilets and bathrooms of which windows do not open out to external open space may open out to a ventilation shaft of such internal dimensions as to permit adequate air flow. The appropriate dimensions shall be calculated, fully taking into account such factors as the height of the building, the number of toilets and bathrooms served by the shaft and the number and capacity of exhaust fans to be installed, if any.

## 5.13 Staircases and Balustrades

5.13.1 The minimum width of stairs and the minimum dimensions of treads and risers of stairs shall be as prescribed in Table 5.2. In case

of curved or circular stairs the width of the treads measuring at the middle shall not less than the widths specified in Table 5.2. Riser height and tread width shall be constant in any flight of stairs from story to storey. The minimum headroom of any stair, measured from the front edge of the risers, shall not be less than two meters and ten centimeters (2.1m).

5.13.2 Every staircase, staircase landing, balcony, veranda and any other place overlooking an internal or external void below shall be protected by a handrail, balustrade or parapet with a height of not less than 0.9 m and shall be suitable design and safe construction.

## 5.14 Electrical Installation and Plumbing Work

5.14.1 All buildings shall be provide with electricity to be exclusively supplied by the compe-

Table 5.2 Minimum dimension of stairs in centimeter

| Type | Width of stair | Riser | Tread |
|---|---|---|---|
| Internal stairs serving one upper floor only | 75 | 19 | 22 |
| Stairs in building used by general public | 105 | 17 | 22 |
| All other stairs, internal and external | 90 | 17 | 222 |

tent electricity authority. In particular circumstances this authority may grant approval, upon certain conditions, the supply of electricity from other sources

5.14.2No building or premises shall be connected to the public electricity network other than by the competent electricity authority. Electricity connection to any building shall only be made and maintained by this authority when the owner of such building is in possession of a valid Completion Certificate for that building.

5.14.3 All electrical and plumbing work in any building or premises shall be carried out by competent technicians and these works shall conform to such standards and specifications as the competent authorities may require.

## 5.15 Fire and Lighting Safety

5.15.1 Every building shall conform to the safety requirements applicable to the area or type of building as specified by KMC or the Chief Officer of the KMC Fire Brigade with a view to providing a greater measure of safety to the inhabitants of such building and/or its adjoining building(s)

5.15.2 All buildings of more than three storeys, public assembly buildings, factories, warehouses and workshops with more than 400 sq m of floor area conform to additional fire and lighting safety requirements, such

5.15.3 With regard to earthquake safety, KMC and other public agencies may impose specific conditions and designs standards for the installation on buildings and structures of water tanks, solar panels, antennas, billboards and similar provisions.

## 5.16 Public Safety and Limiting Nuisance during Construction

5.16.1 The entire construction site, including foundation excavation and temporary retaining works, shall be separated from any adjoining road or property by a suitable fence or enclosure as to be approved by KMC.

5.16.2 The owner of the land on which a building is being constructed or modified shall at all times, during and after construction, and at his/her own expense, take all necessary measures to prevent any damage to any adjoining building or property.

## 5.17 Unsafe Buildings

5.17.1 KMC may direct the owner of any building that may constitute a danger to its occupants or to public safety to repair, demolish or deal with the building otherwise to remove such danger.

## 7.2 LEGAL AND INSTITUTIONAL ARRANGEMENTS

For the Review, Approval and Implementation of a Kathmandu Risk-Sensitive Land Use Plan, Zoning and Building Bylaws

**Introduction**
This section discusses possible activities and required legal steps to lead KMC towards adopting a Comprehensive Risk-Sensitive Land Use Plan, as well as the Zoning and Building Ordinance that will implement it. Part of the activities overlap with tasks and activities indicated in Section 6 of the main report (Conclusions and Future Work).

**Adoption, Implementation, Enforcement**
For the preliminary RSLUP to be useful at this point, KMC needs to endorse it and take the appropriate steps for its adoption and implementation. While refinements, updates and additional studies are warranted as mentioned in the core of the report (refer to Section 6), KMC can initiate actions that will seek endorsement from GoN through the various agencies (i.e. KVTDC, MOLD, MOHA and MoPPW) and continue with its advocacy (e.g. IEC) for acceptance, support and implementation with stakeholders. While various programs, projects and activities are implemented by different agencies, the role of KMC, MOHA and MoPPW in the project development and implementation should be explicitly clarified along with the role of donors. The latter is necessary so that KMC and the higher authorities/ministries within the GoN establish a clearer role and function, thereby enhancing synergy and accountability in the succeeding planning and project implementation.

The KMC, KVTDC and various Ministry agencies, and other relevant groups can review and discuss internally the current provisions of the plan, future refinements, proposals and recommended strategies provided in this RSLUP. An inter-institutional Steering Committee may be formed to structure such a review and evaluation, with technical support and membership from the PWC. The Steering Committee can also review and recommend on the proposed future work and liaise with various development partners and other stakeholders, under the premise of participation and collective contribution.

A validation of the RSLUP with national agencies should be made to ensure consistency with national developmental and environmental strategies and regulations. This shall include consultations and workshops. The output of this activity shall be the identification and development of integrated policies (existing and proposed) that shall be consistent with national and valley-wide development goals and with a physical framework supportive of the sustainable development in KMC and the Kathmandu Valley.

Together with the development of comprehensive plans and supporting development policies and frameworks, related regulation, ordinances and by-laws in conformity with national laws, regulation and practices shall similarly be prepared. This necessarily includes the development of inter-institutional coordination procedures and protocols. These procedures and protocols for example may include the following: data management and information system, protocols for preparation of resource maps for hazard assessment and risk assessment, monitoring and evaluation among others.

Once the plans, programs, policies and supporting implementation strategies are developed, a legal adoption of the plan within KMC (or possibly within the Valley) and by the relevant national agencies should be included. Operationalization of the plan within KMC shall include trainings and competency building.

The results of these activities can serve as a basis for establishing a risk sensitive physical framework planning or land use planning model for the country. This shall allow for a possible replication in other cities, municipalities, wards VDCs of Nepal

# Chapter 8. Conclusions and Future Works

The RSLUP represents a sensible and rational framework for KMC's sustainable and disaster-resilient development. It is based on solid planning parameters which took a significant effort to collect, analyze and integrate. The Sectoral Profile assembles the relevant planning data in a structured document that can serve as a useful reference to planners and policy-makers. The hazard, vulnerability and risk information are fully integrated in the RSLUP, serving as driving parameters in building the vision, strategies, programs, project and activities contained therein. Moving forward with the adoption, implementation and enforcement of the RSLUP will undoubtedly curb the risk to Kathmandu and build the discipline in development decisions and approaches that has been lacking to date. It is a benchmark document that hopes to fill an important gap in directing and controlling sensible development within Kathmandu.

It must be emphasized that this preliminary RSLUP should be treated as a working document. Some underlying data needs to be qualified, completed and refined. Its biggest limitation is that it is limited geographically to Kathmandu City. Kathmandu City is physically, socially, politically and economically fully enclosed within the Kathmandu Valley. The link between Kathmandu City and Kathmandu Valley are vital in terms of its demographics, economy, living and livelihood conditions. The RSLUP for Kathmandu City leads to the realization that proposed strategies and approaches for future development are dependent on looking beyond the boundaries of Kathmandu City proper. Key elements such as transport and housing require a Valley-wide analysis in order to be understood, assessed and incorporated adequately. Further, the hazards and their consequences do not stop at the Kathmandu boundary, and thus approaches for disaster risk reduction and for effective emergency management must take a Valley-wide perspective. Thus, the comprehensiveness and completeness of a risk-sensitive land use plan is only possible in the context of the entire Valley. Finally, this RSLUP has dealt only with earthquake hazards. Other hazards including the long-term effects of climate change need to be incorporated. Emergency management approaches must be framed in the context of the Valley in order to organize essential emergency management elements such as fire fighting, search and rescue, evacuation, shelter, water, health, sanitation, etc. At the same time, the efforts to extend the RSLUP to the Kathmandu Valley will lend themselves to improving and completing the current Kathmandu City RSLUP.

In view of the above, an initial scope of future work can be structured in the following tasks:

**Task 1: Adoption, Implementation and Enforcement of Kathmandu City RSLUP**

(a) Legal and Institutional Framework - For this RSLUP to be useful at this point, KMC needs to endorse and formally introduce it to the relevant agencies of the government for adoption and implementation. This action does not need to wait for the RSLUP to be fully refined. Engaging into the process of adoption, implementation and enforcement is crucial as it would constitute the mechanism to strengthen the legal and institutional frameworks, which are currently weak in certain governance areas. Much could be learned and significant progress can be made by looking at these critical components in the immediate terms. KMC can

initiate actions that will seek endorsement from GoN through the various agencies (i.e. KVTDC, MOLD, MOHA and MoPPW). This task can be structured around a special inter-governmental committee that involved relevant agencies with support from the PWC. While various programs, projects and activities are implemented by different agencies, the role of KMC, KVTDC, MOHA and MoPPW in the project development, implementation and enforcement would be explicitly clarified along with the roles of donors and development partners.
(b) Advocacy Campaign - KMC, with the support of the national agencies and other relevant stakeholders, should continue its advocacy for acceptance, support to and implementation of the strategies and provisions of the RSLUP. Unless the value of the RSLUP is collectively discussed, understood and accepted, its implementation will be difficult. The advocacy campaign should be based on a participatory approach where the interests of the relevant stakeholders can be merged into a consensus and ownership is adequately shared.
(c) Capacity Building - Training of professionals, including planners, engineers, architects, developers and others should be carried out to build the skilled resources for ownership and competent implementation of the RSLUP, and for future refinements and updates.
(d) Development of Performance Indicators - To benchmark current status and measure performance in implementation of the RSLUP, performance indicators should be developed and pilot tested in KMC.

**Task 2: Valley-Wide Data Collection and Completion of the Kathmandu City RSLUP**

This task will involve four core activities:

(a) Extension and Synthesis of the Sectoral Profile to the entire Kathmandu Valley - Data that need to be collected include geography, land area, topography, geology, climate, demography, distribution and density of population, household characteristics, migration, special needs, education, health, nutrition, family planning, and others. It also includes land use characteristics (existing and trends), land use practices and tools, urban housing development, heritage conservation, heritage and cultural site, as well as data on infrastructure, transport, traffic, utilities, water, drainage, and critical facilities. Further, information on environmental parameters such as waste management and pollution, and administrative management of land and governance structures, would be needed.
(b) Collection and Updating of Resource Maps. These include maps representing geologic hazards, climate and metrological hazards, soil and geotechnical, natural drainage, elevation, and other. The collection and possible update of these maps at the Valley level should provide a strong basis for the identification of protected areas, areas of high risk, areas suitable for post-event shelter, areas fit for building structures, and gross carrying capacity for development.
(c) Collection of On-Going and Planned Development Activities. This activity will collect and analyze the implications of the current and planned development projects on the RSLUP. These can be undertaken by various national or international agencies as well as the private sector. Such data will help complete the RSLUP.
(d) Completion of Kathmandu City RSLUP. The data collected in the three activities above will be segregated into a subset that is relevant to the RSLUP and will be analyzed to complete and refine the current RSLUP into a comprehensive one. This plan can serve as a basis for other cities within the Valley to develop their own RSLUP.

**Task 3: Valley-wide Multi-Hazard Analysis and Emergency Management**

(a) Multi-Hazards Extension: - The elements of hazards, vulnerability and risks, as well as elements of emergency response and management, should be reviewed in the context of the entire Valley. Further studies must be undertaken to improve resolution of the earthquake hazard (e.g., through microzonation), update building inventories, and bring the risk assessment of the Kathmandu Valley up to date. Other hazards such as floods, landslides, and the effects of climate change should be evaluated and integrated.

(b) Emergency Management Considerations - As a support to emergency management, this RSLUP only indicates possible evacuation routes and open areas. Their suitability and availability must be ascertained by observations on the ground and further developed to cover the entire Valley. Other elements related to emergency management such as fire fighting, shelter, critical facilities will also need to be addressed.

**Task 4. Valley-Wide Risk Sensitive Transport Analysis**

The future development of an RSLUP for KMC and the Kathmandu Valley should be integrated with the development of an efficient and similarly risk-sensitive public transportation system. Since the JICA study conducted in 1993, no other systematic study on vehicular traffic in the Valley has been carried out. However, ground realities have changed significantly since 1991, as many dramatic changes in urban transportation have taken place within the last decade. It is therefore recommended that a strategic public transportation plan be developed for the Valley that will provide a roadmap in the development of an efficient public transportation system. Such a study will constitute the backbone of a Valley-wide RSLUP. Various studies and activities will need to be undertaken to formulate a risk-sensitive transport master plan (RSTMP).

(a) The initial activities would include a review of existing studies, compiling data and preliminary field investigations to assess gaps in information to provide a situational analysis.
(b) The conduct of land use and inventory surveys shall complete the information on the character, condition, and capacity, importance of the elements of the road network and the needed information for understanding the interaction between land use and transport system. This shall include the inclusion of the hazard and risk information into the traffic scenarios to be developed later.
(c) Detailed Traffic Surveys (e.g. home interview surveys, roadside OD surveys, traffic counts, public transportation surveys) for calibrating existing or proposed traffic demand and capacity models.
(d) Consultation Workshops and stakeholder meetings shall be held to validate the information and traffic scenarios generated and identify, understand the implications of the outputs generated.
(e) Development of Strategies for an integrated transport and land use plan will ensure that transport systems are sustainable for the Valley in the future.
(f) The latter activities shall include the formulation and evaluation of the valley wide risk sensitive transport master plan.
(g) Investment programming of road development projects and the preparation of feasibility studies shall complete the RSTMP. This activity shall identify priority road projects for feasibility studies and determine their sources of funding.

**Task 5. Special Studies**

Various special studies will need to be undertaken to confirm some key considerations of the RSLUP. These include, but are not limited to, the following:

(a) To address the housing shortage, especially for families with lower incomes, it is suggested that the government pursue the recommendations for multi-storey housing for KMC. Given the limited amount of areas for residential development expansion in KMC, the RSLUP suggests pursuing socialized housing. Possible locations and arrangements for these housing sites should be reflected in the RSLUP.
(b) On-going river development plans (e.g. Dobikhola, Bishnumati, Bagmati) should be reviewed and incorporated as they provide for visual corridors as well as vital links to the network of parks and open spaces in KMC. These river areas can serve as possible evacuation sites or routes during emergencies.
(c) Historical and Cultural Heritage Preservation. Initially this study will focus on the "core" area to determine the constraints and parameters of the historical and cultural heritage in order to refine the RSLUP.
(d) There is a need to review and refine building codes and by-laws in order that urban forms and structures are fully supportive of increased safety.

Local area plans or master plans should follow zoning and land use policies, and future development should be guided by these plans and ordinances. Implementation and enforcement are weak governance functions in Nepal. A full effort to develop the structures and capacity for enforcement should be undertaken. Without enforcement, the plan will just remain a document that sits on the shelves and makes no impact.

**Task 6. Development of the Kathmandu Valley Risk-Sensitive Planning Framework Plan (RSPFP)**

The development of the Kathmandu Valley-Risk Sensitive Physical Framework Plan shall follow a similar process as the risk-sensitive land use planning conducted in Kathmandu City. However, the difference is that the basic elements of planning analysis shall be the municipalities and VDCs of the Valley. It shall provide for the synchronization and harmonization of development programs and projects proposed from within municipalities up to the higher level agencies, and shall guide the overall physical development and land use planning of the municipalities and VDCs in Kathmandu Valley. It shall reinforce the current KVTDC land use plan and zoning by making the land uses risk sensitive to inherent hazards such as earthquakes, floods and other emerging challenges like climate change. The RSPFP shall integrate the outputs of the proposed RSTMP, along with other spatial plans from various sectors such as production, infrastructure, and environment in a single physical framework. Towards the end of the planning process, the experiences learned, the framework developed and methodologies used shall be documented and guidelines shall be prepared for planning the development and land use plans for municipalities, as well as the development and physical framework for the Valley. These guidelines shall supplement existing planning process in the Valley and may be used for the next cycle of planning.

The proposed sequencing for the six tasks above is presented in Table 8. A three-year project is proposed. However, the proposed work can also be undertaken in phases, with task 1 taking priority, followed by the completion of the Kathmandu-City RSLUP and its transformation into a Comprehensive RSLUP.

It has to be emphasized that the mainstreaming process should continue towards further refining and updating this land use plan up until the implementation stages. Hence, other stages of planning such as local financial planning, project programming and budgeting, monitoring and evaluation programs need to be included in succeeding planning activities.

**Concluding Statements**

The decision to manage the city according to the mandates of the LSGA provides local governments such as KMC the authority to take public control over the direction and pattern of development in their territories. Through a rigorous risk-sensitive planning process, the local governments such as KMC can be proactive in prescribing the use of land, with the guidance and support of higher government offices to achieve the following results:

- Hazards such as earthquakes, floods and others are accounted for and their impacts reduced with time;
- Settlement areas are made livable and safe;
- Communities and institutions are prepared for disasters as they understand what they should do before, during and after a disaster
- Protected areas are respected and preserved for the benefit of all;
- Infrastructure support is adequately and efficiently provided to help a modern city become a model in the management of planned change; and
- Production areas are used sustainably so that the needs of the present and future generations will continue to be adequately met.

Performance indicators of accomplishments in DRM by KMC and other national agencies responsible for land use planning, urban development and DRM should be used to benchmark the current situation and measure future progress. While being a first step, the framework for mainstreaming introduced in this RSLUP could similarly be used to guide development and allocation of land. The replication of the approach towards the Kathmandu Valley can provide lessons in managing risks common to cities and municipalities arising from natural hazards and from climate change-related effects in Nepal and beyond.

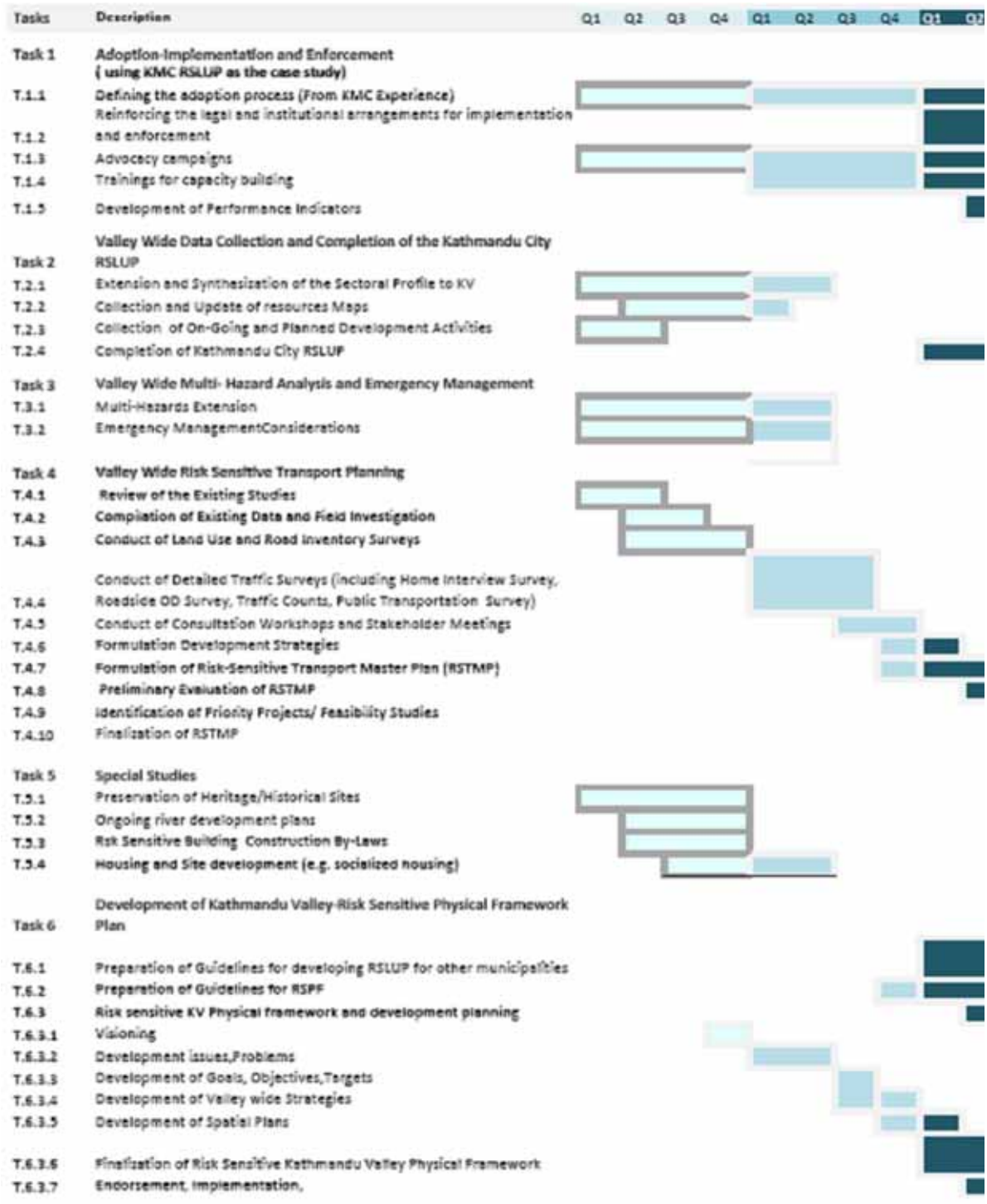



Figure 8. Suggested Tasks and Timeline for Future Work

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3. Bijaya Subedi ,Section Officer of the Ministry of Local Development (MOLD)
4. DEPARTMENT OF ROADS (MoPPW ) By Dr, Noriel TIglao

Director General Tulasi Sitaula, Senior Divisional Engineer Bal Ram Mishra, Roads and Traffic Unit, Sunip Poudyal, Senior Div. Engineer, Saroj Kumari Pradhan, Unit Chief

Project Working Committee (PWC) Members

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# Annexes

## Annex A. Peer Review

"Mainstreaming Disaster Risk Reduction in Megacities: A Pilot Application in Kathmandu, Nepal, Phase 2 Report"

Dec 2009 Draft

Kenneth C. Topping, FAICP
Topping Associates International
December 6, 2009

### Introduction and Approach

This is one of several external review reports on the second phase of the project titled "Mainstreaming Disaster Risk Reduction in Megacities: A Pilot Application in Metro Manila, Philippines and Kathmandu, Nepal, to undertake specific disaster reduction endeavors and to strengthen their disaster management capabilities. Under a contract executed in July 2009, Section 2.1-A2 of the contract scope of services calls for the following task requirements regarding external review of Kathmandu- Development of Risk-sensitive physical land-use plan:

(f) Review the conceptual frame on Risk sensitive land use planning process and provide comments to operationalize the framework in context of KMC based on the situational analysis done by the team.

(g) Review the KMC updated profile in order to identify the gaps in the data that may have significant impact on the land use planning of the KMC.

(h) Review the goals and objectives of the KMC risk sensitive land use planning vis-‡-vis alternative spatial strategies to check if the strategies are align[ed] with goals and objectives of the planning.

(i) Review the evaluation and selection process in determining the preferred spatial strategy
(j) Review KMC Risk Sensitive Land Use Plan document and corresponding model zoning ordinance to:

i. Evaluate the overall relevancy of the data used, methodology applied, and conceptual frame work implemented.
ii. Review the applicability in term of the document's ease of use by KMC planners.
iii. Review the overall content to insure that the content is in line [with] acceptable land use planning practice.

### Overview

The Phase 2 Report generally continues the same general level of excellence established in the Phase 1 report in 2008. It provides an insightful overview of governmental land use planning in Kathmandu Municipal City (KMC) under the Local Self Government Act (LSGA) of 1999, By-Laws for Construction in Kathmandu Valley of 2007, and Kathmandu Valley Town Development Act of 1976.

### General Comments

Overall, this is a very professional planning report with substantial depth of thought, given inherent limitations in the situation (see Phase 1 External Review, dated February 24, 2008). It lays a useful foundation for continued risk sensitive land use planning, regulation, and community improvement by KMC, and establishes a potential model for use by other jurisdictions in the Kathmandu Valley, including KVTDC and the VDCs. The following general comments and recommendations are related to the preceding contract task requirements.

1. The conceptual framework on risk sensitive land use planning process is sound. However, the situational analysis raises questions about the adequacy of available data by which to operationalize risk reduction strategies within this framework because of the general absence of adequate mapping of seismic, flood, landslide, mudslide, and fire hazards mapping, (a.k.a. microzonation). The report mentions but does not include a Resource Map showing natural hazards information.

   Recommendation: The Phase 2 RSLUP Report should make clear the need for various levels of government, including KMC, to undertake systematic natural hazards mapping in order to strengthen risk sensitive land use planning over time.

2. The KMC updated profile helps to clarify many elements of the Kathmandu social, economic, physical, environment, and governance treated more generally in the Phase 1 Report. Data gaps impacting risk sensitive land use planning include need for better hazard mapping, mentioned previously. Additionally, informal building and poor construction practices are mentioned, and attention is given to the risk reduction strategies and land use interventions dealing with proper enforcement of building by-laws.

   Recommendation: Although reference is made in Chapter 5 to the need for adoption of a KMC land use and building by-law system, particularly in relation to seismic risk, consideration should be given to also placing greater emphasis on this need in other chapters of the report. The report should generally emphasize the importance of modernization of land use, building, and construction regulations and administration as an essential element supporting risk sensitive land use planning.

3. Alternative spatial strategies of the KMC risk sensitive land use planning appear to be well aligned with the goals and objectives of the plan.

4. The selection process in determining the preferred spatial strategy appears to be sound.

5. A review of the KMC draft Risk Sensitive Land Use Plan document generally reveals that: the overall data used, methodology applied, and conceptual frame work implemented are relevant and sound; the document appears to be generally applicable and useful for KMC planner; and the content is in line with acceptable land use planning practice. However, its utility could be enhanced by inclusion of the following changes: a) Maps and map legends should be made more legible within this report through enlargement to full page size in landscape mode. b) Layout of Tables 3.5 - 3.9 risk reduction strategies and Table 5.7, Proposed Land Use Interventions, should be reformatted for greater utility. c) Also needed is a thorough edit to correct small grammatical and spelling errors.

**Chapter 1 Comments**

Chapter 1, Planning Mandates and Approach, provides an introduction to the RSLUP and other related plans. It contains a helpful summary of overlapping national, regional and municipal planning authorities, and emphasizes the KMC responsibility to include top-down directives from various ministries and independent development authorities and bottom-up suggestions from the wards. Chapter 1 notes that risk sensitive land use planning can be effective when local authorities mainstream disaster risk reduction into ongoing activity, noting also, however, that this is a working document and not a detailed and comprehensive plan.

Chapter 1 includes a description of the overall process for mainstreaming disaster risk reduction concepts into the land use planning (especially Figures 1.4 and 1.5) through integration of available risk information with formulation of a vision, goals, objectives, targets, and strategies, including alternate spatial strategies and approaches to selection of a preferred strategy.

These products are subject to public consultation to gain consensus for the final RSLUP product.

A major difficulty is the need to rely largely on the JICA seismic risk assessment of 2001 which focused on earthquakes. Data on flood and fire hazards appears to be minimal. Another difficulty is absence of information regarding potential sources of funding for various projects. However, this is less of an impediment in a document of such broad scope and long duration (10 years), because cost estimates can be added over time.

**Recommendation 1.1:** Boundaries of KMC and other subunits of government in the Kathmandu Valley should be made clear in Chapter 1.

### Chapter 2 Comments

Chapter 2, Vision, contains a brief vision statement prepared by various groups during the visioning exercise held in July 2009, together with descriptions of ideal measures of success for various vision elements. The vision statement emphasizes beauty, safety, tourism, health, green living, robust economy, and resilient local governance. Elaborating the vision statement are a series of vision elements and indicators of success for evaluating progress, consisting of a series of ideal social, economic, and physical development and environmental protection conditions against which progress can be measured. Notable among these are conditions of a self-sustaining KMC empowered to become a self-reliant, effective partner in attainment of national goals, using effective management, citizen involvement, and land use planning and other modern tools of local governance to build and sustain disaster resilience.

**Recommendation 2.1:** Vision statements are useful in identifying ideal values by which progress can be assessed over the long term in relation to pursuit of intermediate activities. Although it is implied, it might be helpful to state more clearly that conditions envisioned are well beyond the plan's 10-year time horizon, probably taking decades to attain.

### Chapter 3 Comments

Chapter 3, Development Issues and Problems, summarizes the constraints which must be overcome and opportunities for bringing KMC closer to realization of its vision. Constraints include unplanned land use, inadequate housing and urban facilities, industrial and residential expansion, sprawling development due to the influx of population, increased incomes, and ethnic concentrations in the core area and its surroundings (Figure 3.6. Social Issues and Concerns).

A major hazard emphasized in Chapter 3 is seismicity, represented by a potential M8.0 Mid-Nepal Earthquake which would produce MMI VII damages in Kathmandu Valley. Such an event is expected to heavily damage 53,000 buildings, and result in 18,000 deaths and 53,000 injured persons. More common and frequent hazards are flooding, landslides and debris flows associated with the many rivers and streams in the KMC area, along with fires occurring largely in hilly regions where poor people tend to live. Also of concern is insufficient water supply and quality.

Figure 3.7 Environmental Issues and Concerns and the accompanying text succinctly summarizes factors including shortage of habitable land, continuing loss of public open space, increasing demand for urban land, conversion of agricultural lands, fragmentation of land parcel arising from inheritance, backlogs in infrastructure development, water supply and distribution problems, poor wastewater collection and treatment, tourism and environmental deterioration, air pollution, electrical power shortages, and duping of solid wastes, perennial traffic congestion, risks to building and infrastructure from natural hazards.

Figure 3.1.1, Critical Facilities Map, identifies the overall configuration of structures, natural features, and infrastructure for KMC. Other

concerns include loss of cultural heritage, ineffective education policy, decreasing performance of industries, and weak institutional capacities. Approaches considered include urban rehabilitation, conservation, redevelopment, preservation, re-blocking, and land readjustment, in combination with several broad urban form strategies dealing with land supply, demand management, and control of sprawl.

This chapter concludes with a series of mutually reinforcing risk reduction and development strategies such as restricting or discouraging new structures in high risk areas, economic incentives to discourage development in high risk areas, relocation of occupants in high risk buildings, protection of critical facilities, and encouragement of acquisition and buying out of properties. These strategies are further linked to particular issues/problems, goals, objectives, and strategies in Tables 3.6 - 3.10.

**Recommendation 3.1:** Although seismicity is properly emphasized, threats arising from climate change deserve additional attention. Primary among these is flooding. The International Panel on Climate Change has identified a variety of effects of climate change, including earlier snow melt, heavy spring flooding, increased heat, and decreased water supply, leading to hazards such as such as flooding, landslides, debris flows, and fires.

**Recommendation 3.2:** Chapter 3 should directly address the need for various levels of government, including KMC, to undertake systematic natural hazards mapping to strengthen risk sensitive land use planning over time, as suggested in the Phase 1 External Review.

### Chapter 4 Comments

Chapter 4, Towards a Preferred Urban Form, discusses the preferred urban form as the organizing concept for guiding the physical growth of the city. The process of generating alternative spatial strategies for KMC involved balancing urban land demand and supply, overlay analysis taking into account seismic risk analysis, and selection of a preferred spatial strategy. Although the procedure involved consideration of alternative urban forms, basic land use planning references were the current KMC land us map (2008) and KVTDC (2007) land use plan.
The difference of the preferred urban form with the other plans stems primarily from incorporation of results of the 2002 Kathmandu Valley Earthquake Study results into the land use planning process. Immediate concerns include reducing risk of building damage and reducing loss of life in the core and dense residential areas of KMC. The strategy focuses on protecting assets, limiting further densification of the core areas, locating future structures in safe and planned areas in a multi-centered series of growth satellites supported by a properly planned transport system.

Chapter 4 also notes that similar issues may be faced by other urbanizing municipalities and VDCs. Common seismic vulnerability assessments and transportation studies may be required to integrate these concerns across jurisdictional boundaries. Proposed strategies suggest the possibility of a phased approach emphasizing development in KMC in the next 5-7 years and location of future large-scale developments outside the city toward the end of the planning period. Given the vulnerability of existing building stock within the core and opportunities for meeting higher building standards in new centers, limitation of further densification within the KMC core and establishment of a multi-core satellite pattern within and outside city boundaries is logical from a risk reduction perspective.

However, the preferred urban form intensifies challenges of providing substantive policy and best practices guidance to staffs of KMC, KVTDC, and the VDCs for integrating disaster risk reduction with land use planning and coordination across jurisdictional boundaries. It also requires a transport system extending beyond current limitations. Although bus systems are mentioned, no suggestion is made of the long-term potential of developing a mass rail transit system for the Kathmandu Valley.

**Recommendation 4.1:** To improve the chances of success for this strategy, consideration should be given to KMC adoption of new regulations, protocols and practices needed to assure adequate levels of land use and building regulation as well as coordination across jurisdictional boundaries.

**Recommendation 4.2:** Consideration should also be given to the long-term possibility of development of a rail mass transit system to support this multi-nodal growth pattern connecting the core, the airport, satellite centers and other parts of the Valley.

**Chapter 5 Comments**

Chapter 5, KMC Risk Sensitive Land Use Plan, presents the land use plan and the policy framework for regulation of future land-using activities consistent with the chosen spatial strategy, with national and other higher level policies, and with the vision for their city.
Chapter 5 integrates outputs of the planning process, data gathered and analyzed, issues addressed in workshops, expressions of participants, conditions of the city, and, using the preferred spatial strategy coordinates these into the draft RSLUP.

The draft RSLUP is to serve as the long-term guide for shaping the future physical growth of the city, and a policy framework for use by KMC in exercising authority in prescribing reasonable restraints on use of property within its boundaries. The RSLUP is to be the basis for the enactment of a revised zoning ordinance, for the regulation of subdivision developments, among its major applications. The RSLUP is comprised of four component parts corresponding to the major land use policy areas of settlements, production, protection, and infrastructure areas. These four policy areas cover all areas of KMC territory, and align the RSLUP with physical framework plans of higher governmental authorities.

Chapter 5 presents detailed discussion of policy areas in terms of needed policy/legislation, describing each policy area down to the ward level. Time and other resource constraints for Phase 2 have precluded the detailed surveys needed to prepare detailed zoning prescriptions. Therefore only tentative and generally indicative zoning recommendations are made in this chapter until a more detailed delineation of each policy area can be made in the future.

Desired interventions for each policy area are classified into two categories: programs/projects/activities and policy/legislation in Table 5.2, Proposed Land Use Interventions. The recommendations for intervention indicate policy/legislative measures needed to support implementation of the RSLUP without spelling out all the details of such actions.

In this sense the draft RSLUP actually represents what would be known in some jurisdictions as a "Specific Plan" which can serve as legislative guide to further detailed action by providing specific direction subject to further detailed articulation. Table 5.2, Proposed Land Use Interventions, provides a broader planning framework than represented by an ordinary zoning ordinance, constituting a specific policy framework leading to future action on more detailed instruments, such as a zoning ordinance. Specific Plans carry a stronger legislative commitment than an ordinary land use plan and are adopted by ordinance, thus having the force of law.
Recommendation 5.1: Following relatively minor adjustments to its format to make it easier to use (e.g., inclusion of headings at the top of each column on each page), the RSLUP should be reviewed for detailed content by the public and the KMC legislative body, after which it should be put considered for adoption by the legislative body as a Risk Sensitive Land Use Specific Plan (RSLUSP) for KMC.

## Annex B. Data Collected for the Sectoral Profile

| Description of the Data | Source |
|---|---|
| Kathmandu City at a glance; a table of information about Kathmandu City | KMC Website: www.Kthmandu.gov.np |
| Land Area by sector and wards | KMC Ward Profile, 2005 |
| Lives Lost Due to Different Disasters | Dhakal, 2006 |
| Epicentral Distribution around Nepal from 1255 to 2001 | Earthquake Disaster Mitigation in the Kathmandu Valley, March 2002 |
| Modified Mercalli Scale and the Description of Damage | NSET- Nepal |
| Population by Ward from 1991 and 2001 | Population Census 2001, CBS<br>Kathmandu Valley Mapping Project<br>T. Pradhan, KMC-GIS Section |
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| Tertiary graduates | Population Census 2001, CBS |
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| Number of Teachers | Population Census 2001, CBS |
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| Higher School Enrollment Rate in KMC, 2000 | Population Census 2001, CBS |
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| Crude Birth Rate (per '000 population), 2001 | Population Census 2001, CBS |
| Crude Death Rate (per '000 population), 2001 | Population Census 2001, CBS |
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| Occupancy Status | Population Census 2001, CBS |

| Description of the Data | Source |
|---|---|
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|---|---|
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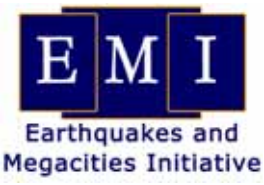


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