

Urban Diagnosis as a Method to Assess Vulnerability of Communities in the Context of Spatial Planning and Management; Kathmandu Valley

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Synopsis

This paper describes the status quo of vulnerability situation in urban communities of Kathmandu valley, Nepal, by using the method of urban diagnosis. Various spatial planning and management issues related to earthquake vulnerability of the communities are analyzed. The ongoing urban changes in terms of physical, social and economic aspects and how these have contributed to vulnerability are described. Finally, the prospective countermeasures are discussed to reduce the vulnerability of these communities.

Keywords: Earthquake vulnerability, Urban Diagnosis, Coping Capacity

1. Introduction

The chronological record of earthquake in Kathmandu, Nepal shows that there is a major earthquake in the 75 years and a high probability of next large one in near future. To manage low frequency and high impact disaster like earthquake, there is a need of more integrated approach; linking urban planning and management, including the phase of pre-disaster and the time mode of everyday life, and participation by government sector, NGOs, private companies, citizens and residents (Okada et al., 2004). Disaster risks in urban areas are spatially and temporally distributed and a comprehensive examination of such risk is necessary for proper management. Okada (2006) calls this methodology urban community diagnosis and adds that the method of urban diagnosis is characterized in analogy by the relationship between medical doctors (corresponding to disaster and urban experts) and patients (corresponding to local citizens).

The community management process using

urban diagnosis begins with check stage before moving ahead to planning and action. In order to manage problems with uncertainty such as earthquake, the cyclic process of check, action, plan and do (CAPD) is adopted as a method for the study. Moreover, this study concentrates on check stage of urban communities to reveal the current status of vulnerability and then prescribe prospective countermeasures to enhance their quality.

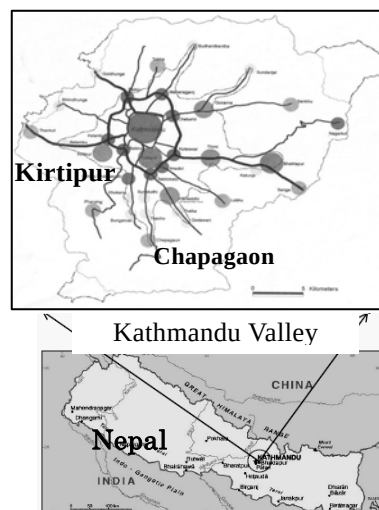


Fig. 1 Location map of study area.

2. Study Methodology

This study is based on previous field survey records, secondary data and the available literature. It focuses on two urban communities; Chapagaon and Kirtipur in Kathmandu Valley, as both of these areas is earthquake prone.

Chapagaon is located in the outlying area to the south of the Valley. It is a dense traditional settlement inhabited predominantly by Newari people, the indigenous ethnic community in the valley. The area of Chapagaon VDC (Village development committee) is 6.76 km² with annual population growth rate of 4.57 %. It is one of the fastest growing VDC's within Kathmandu. The development prospects of proposed outer ring road of Kathmandu valley and rural to urban migration resulted from political conflict has created rapid urban sprawl around Chapagaon. No disaster considerations are made for settlement planning in this area.

Kirtipur with an area of 17.9 km² is located on a hilltop at the south west part of Kathmandu Valley. Being closer to the city centre of Kathmandu, this area has been an attractive residential location for many migrants. The active faults running closer to Kirtipur area like Chovar fault and Chandragiri fault coupled by unplanned urbanization have been making the area unsafe from probable earthquake disaster. Moreover, the people of Kirtipur have wrong perception that the hill site of their town is one single solid rock and therefore earthquake have little effect on their building.

Vulnerability assessment framework for the study

Vulnerability is widely used in scientific, social and economic languages and understood differently. There is little consensus among researchers, planners, and disaster managers regarding the meanings of and approaches to undertaking vulnerability analysis (Wisner et al., 1993). Vulnerability assessment thus depends on how we define it and on what criteria we are interested in. Numerous definitions of vulnerability exist. Weichselgartner (2001) points out three distinct themes in vulnerability studies; first vulnerability as the degree of loss (exposure)

associated with the occurrence of a hazard, second vulnerability as socio-cultural and economic process and the ability to cope with disaster. The third is vulnerability as both biophysical and social response within a specific geographic area. Various models try to provide a framework for understanding vulnerability. "Pressure and release" and "access" model (PRA) traces the progression of vulnerability by working back from the immediate to the root causes, and provide a framework for investigating vulnerable people's access to assets, income and other resources in a society (Blakie et al., 1994). Cutter (1996) mentions about the hazard of place model where vulnerability is dependent both on geographic context and social fabric (community ability to cope, economic and demographic characteristics). Turner (2003) mentions that the components of vulnerability as exposure, sensitivity and resilience (coping) are interactive and scale dependent (place, region and globe), such that analysis is affected by the way in which the system is conceptualized.

The present study conceives vulnerability as function of both exposure (spatial distribution of objects to be harmed) and coping within a specific geographic locality and focuses on following aspects:

Physical, social, and economic vulnerability within area under study.

Causes and processes that have brought the urban communities into unsafe condition.

A brief description of existing coping mechanisms.

3. Findings of the Study

Physical Vulnerability and indicators

1. Dense and unsafe built form

The ongoing physical changes within Chapagaon and Kirtipur can be observed as land use changes, new built form, land transaction and land fragmentation. Changes in land use have occurred both inside the traditional core area and in the newly expanded areas out of settlement in Chapagaon. The physical mapping along with the field survey reveals that the built form of the traditional area is gradually converting into non engineered, unsafe modern structures. More traditional buildings have been replaced by unsafe

new RCC (Reinforced Cement Concrete) structures due to the perception of people about new structures being more commercially viable than older ones (Fig. 2)



Fig.2 Unsafe modern houses along with indigenous houses.

The conversion of open spaces into built form has degraded the balance of built and non-built spaces that existed in traditional settlement planning and made the place more vulnerable (Fig.3).



Fig. 3 Loss of open space in traditional core area of Chapagaon.

The new structures are built by untrained local contractors and are vulnerable to earthquakes. Moreover, the open spaces as places of escape during major disasters such as fire and earthquakes are also depleting adding to the vulnerability of the settlement.

Apart from this, the traditional buildings are also changing with vertical division of houses due to property subdivision among family members. Many traditional houses have added new floors to accommodate increasing family size. This has made buildings more unsafe and vulnerable to earthquakes.

The perception of inhabitants of these areas is that people owning a reinforced concrete structure has high social status. So, the wealthier families tempt to reconstruct the old houses in modern style RCC buildings without earthquake safety measures. The physical exposure (based on number of unsafe buildings, population and road access) of wards in Chapagaon is shown in Fig 4. The core area (ward 9) and the newly urbanized area (ward 6) are highly exposed to earthquake disaster.

There is an increasing trend of building construction both in Kirtipur and Chapagaon as indicated by high number of building permits issued (Chapagaon 205 and Kirtipur 1549 in the past 5 years). The rising number of building permits issued in Kirtipur Municipality is shown in Fig 5. Most of the construction works are carried out haphazardly without proper monitoring by skilled technicians for earthquake safety.

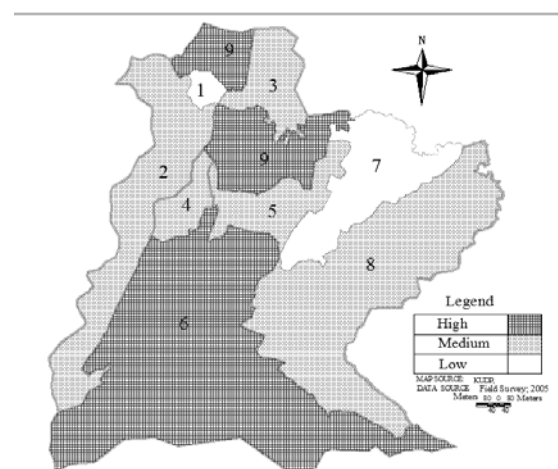


Fig.4 Physical exposure of wards in Chapagaon.

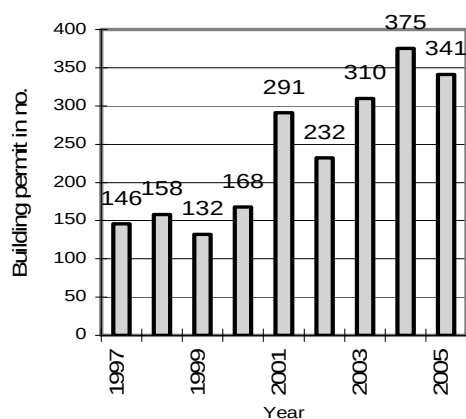


Fig.5 Buildings permit in Kirtipur area since year 1997. (Source; Kirtipur Municipality)

2. Chronological history of seismic record

The seismic record of Kathmandu extends back to 1255 AD when an earthquake of 7.7 Richter scale struck the valley. Then three earthquake of similar size occurred in 1810, 1833 and 1866 AD. In 1934 AD, 8.4 Richter scale of earthquake destroyed 20% of building stock in valley (Dixit, 2003). A major earthquake has been reoccurring in every 75 years in Kathmandu valley (Koichi et al., 2006).

3. Infrastructure

The infrastructural level of these areas is inadequate to serve the fast pace of urbanization. Many of the vital infrastructures essential during disaster are also gradually depleting with the growing urban pressure. Around 60 % of the municipal area in Kirtipur is only served by gravel roads or trails (ICIMOD, 2003). Most of the newly built houses by low and middle income migrants in Chapagaon are served by narrow trails. The traditional streets and courtyards of the old core area are built mainly for pedestrians. These areas are densely populated, but many parts are not accessible to vehicles. This raises serious concerns as ambulances and fire brigades cannot reach the area in times of emergency.

The telephone service available in Chapagaon is 146/1000 population and in Kirtipur is 135/ 1000 population. The telephone exchange office and control room complex has not considered any earthquake resistance and retrofitting measures.

Around 6-7 open spaces and 10 ponds within Kirtipur has been encroached upon by present days urbanization (Dhamala, 2006). These spaces were

used for evacuation during earthquake and fire. Ponds were the water reservoirs used during fire or for construction purpose.

Numerous educational institutions as well as private nursing homes are running their activities in ordinary residential buildings, built by informal process. These critical facilities and mass gathering buildings used as evacuation shelters as well as mass treatment centers are the first to be hit by an earthquake in the case of communities in Kathmandu.

Social Vulnerability and indicators

Social factors contributing to the vulnerability of Chapagaon and Kirtipur includes high population density in core areas, rapid population growth rate, inadequate social infrastructure like hospitals, and significant number of children and old age people in the population structure. Gender is the other factor found to be related with the vulnerability of urban community. In a study by Dhamala (2006) in Kirtipur, the area with largest number of households headed by female (20%) has the highest building damage ratio of 31%. The percentage of children under 10 years and old age people over 65 years are significant in the study area showing high social vulnerability. The indicators for social vulnerability in the study areas are listed in Table 1.

Table 1 Indicators of social vulnerability

Area	Population density (core area)	Health institutions/ 1000 population	children (<10 yrs) and old age (> 65 yrs)
Chapagaon	24810p/ sq.km. (growth rate – 4.57%)	0.13	25.38%
Kirtipur	30826p/sq km (growth rate – 2.57%)	0.27	23%

(Source; CBS 2001, field survey 2005)

Social changes in terms of changing occupational structure of the farming community and decreasing level of cooperation can be observed in Chapagaon. The improved educational status of households (revealed by all 85 households interviewed in 2005) is inferred as the reason for the occupational base to shift from agriculture to other service oriented activities. 22 house owners among the 85 interviewed revealed that there is less interaction among the neighbors as everyone has adopted urban way of life i.e. getting engaged throughout the day in their own profession and spending rest of their time indoor watching television and using other modern amenities. Few house owners (2 /85) regarded the changing religious beliefs (around 30 households have shifted to Christianity in the last 20 years) as a reason for declining social interaction. 9 out of 85 respondents interviewed inside the traditional settlement mentioned that the tradition of labor sharing “perma” (perma system is an old practice that incorporates agriculture as well as community development activities within certain groups in a community) among agricultural community has been replaced by waged labors. The insufficient food production from reduced land parcels has converted farmers into waged labors. The social mobility towards paid labour has led to decline in traditional social bond within the community.

Declining Guthis and loss of social cooperation

The mutual support system which existed among the various section of society in the past has been degrading with the changing lifestyle of people. The communal organization called Guthi which was active in traditional communities like Chapagaon and Kirtipur not only exhibited community cohesiveness but also played an important role in urban management. It conducted many rituals and customs that bound the society together and carried activities like maintenance of public buildings and infrastructures. Now, the mode of entertainment is changing from outdoor cultural activities to in house activities like watching television channels. Cultural practices like singing and dancing during festive occasions are decreasing and are replaced by modern music. Many rituals and customs are declining due to the

loss of income from Guthi land. The land has now been reduced so much that there is hardly any money with Guthi organization to conduct various religious and cultural functions. The consequence of this is the gradual breakup of the close-knit community structure reinforced through these cultural activities. This is crucial for physical as well as psychological recovery in the aftermath of a disaster. The indigenous people describe that after the 1934 earthquake in the settlement, various social groups helped each other to rebuild the village on their own without much external help. At present, the emerging migrant households are yet to form a social bond that can be utilized for collective action during disaster.

Economic vulnerability and indicators

1. Land fragmentation and its economic implications

The major physical change observed in the study areas is the reduced land holding of the farmers and landowners. In Chapagaon, 25.7 hectares of agricultural land has been converted into urban use between 1979-2001, and in Kirtipur 201 hectare of land has been converted into urban use between 1992- 1998. The forces that have contributed to changing ownership include; 1) Family subdivision and property inheritance and 2) landowners intended subdivision to sell the land to external migrants. In some cases the dual ownership of farm land between landlord and tenant has come to an end leading to change in ownership of farm land.

Figures 6 & 7 depict the relationship between family size and land holding that has changed in the past 20 years in Chapagaon. The larger sizes of land are getting fragmented and the larger family sizes are holding smaller plots. This reduced land holding of original farmers and landowners may ultimately phase out people from agricultural activity and displace them from original location. There are 26 families who hold less than 1 ropani of land, income level is less than Rs 5000 (1 N.Rs. = 1.6 yen) and family size is more than five. There is a possibility for these families to displace due to poor economic status. They end up settling in unauthorized areas and become vulnerable to disaster.

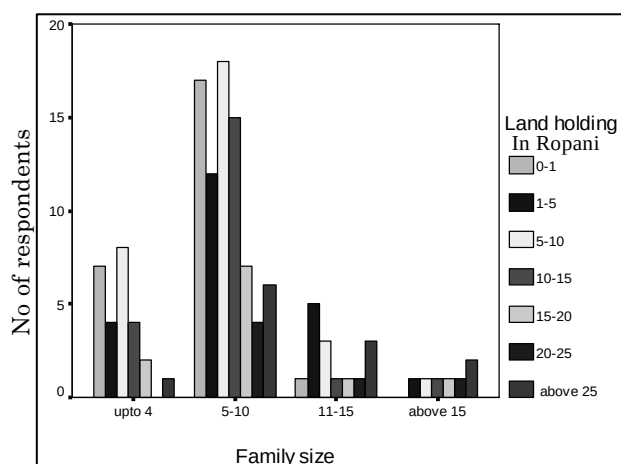


Fig. 6 Land holding – Family Size relation ship
(20 yrs ago) (1 ropani = 5476 sq.ft).

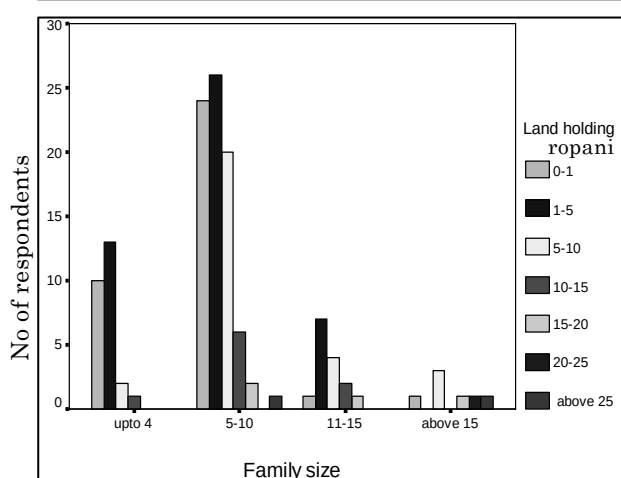


Fig. 7 Land holding – Family Size relation ship
(At present) (1 ropani = 5476 sq ft).

Another interesting reason for local people selling their land to outsiders is explained through local cultural practices. Traditionally the agricultural land is equally divided among the brothers. This has led to gradual decrease in size of individual land-holdings. Earlier, though the land was physically divided, the entire joint family managed these lands. Now these are increasingly managed separately. On the other hand, the size of the individual landholding has become so small that it is no longer fit to give enough economic returns from the produce. Also, the value of agricultural produce has decreased considerably, while the price of land has increased many folds. As a result, they find it much more economically beneficial to sell off the land rather than continuing to put it under agricultural produce. Another consequence of this is people are becoming more and more dependent on

external resources for their own sustenance. This makes them more vulnerable in disaster situation when they have to be fully dependent on external resources for fulfilling their daily needs.

2. Low income level and low saving

14% (12 out of 85) of households surveyed in Chapagaon had no saving and sometimes they spent more than what they earned. This compels people to sell their land and ultimately they enter into poverty trap as they lack skill to invest the money into more productive use.

Mostly the low income migrants reside in peripheral areas like Chapagaon as the land value is cheap. These small land parcels are scattered and the residences constructed don't have adequate services, this leaving the inhabitants in a more vulnerable state during disaster.

Existing coping capacity

1. Institutional Setup

The ministry of home affairs is the national focal body for disaster management in Nepal. Natural disaster relief act has been promulgated in the year 1982 and the activities are oriented towards post disaster relief and rehabilitation. The regional and district level offices has no fund allocated for disaster mitigation and preparedness activities. The national action plan matrix for disaster management was formulated in the year 1996 by the national committee for IDNDR. The government is yet to formulate legal framework and institutional setup to implement the plan.

The institutional setup in peri urban areas like Chapagaon and Kirtipur is weak in planning and policy formulation with lack of both finance and trained manpower. The grass root organization like the Village Development Committee is not involved in taking decisions on matters relating to disaster mitigation and preparedness.

2. Emergency services:

The level of services for emergency is far less with only 5 fire fighters in Kathmandu valley (3 in Kathmandu, 1 in Lalitpur and 1 in Bhaktapur) providing services for around 200 fire cases in valley per year. There are no hospitals in Chapagaon and Kirtipur area and during emergency people need to travel to Kathmandu or Lalitpur city centre. The medical facility available within urban

centre of Kathmandu is inadequate to treat mass casualties or injuries.

3. Disaster considerations in traditional settlements:

The traditional building systems embodied various aspects that contributed towards mitigating, preparing and recovering from the impact of earthquakes. The traditional buildings derive a fair level of earthquake resistance through use of technological innovation like symmetrical plan configuration, use of double wood frames going all round the opening, use of cross ties, timbering plates and reduction of wall thickness in upper floors. The presence of public, semi-public and private open spaces in settlements like Chapagaon is crucial for emergency escape in the event of an earthquake. Such building practices and social collectiveness had been a strong coping capacity in earthquake disaster during the past.

4. Conclusion and Recommendation

The physical vulnerability of communities in Kathmandu Valley with rapid urbanization, poor built form, low level of development of infrastructure and emergency services are observed. Social vulnerability has been added due to rural to urban migration and high rate of population growth along with an increasing number of the urban poor. Rural migrants to the Valley have increased because of recent political conflict. As a consequence, land market is booming in Kathmandu and many poor farmers in peri-urban areas such as Chapagaon are turning landless. Farmers are forced to become economically vulnerable due to reduced landholding and loss of productivity. Earthquake disaster vulnerability has increased due to these ongoing physical, social and economic changes. Despite the increased education level of households in Chapagaon, earthquake resistant building constructions are not still taken into consideration. Concerns for employment and other internal problems are observed rather than for earthquake disaster from households in Kirtipur. With this preliminary study and understanding of different aspects related to vulnerability, some recommended prescriptions are suggested to improve the area under study. First, integrated approach involving different governmental and non

governmental agencies, citizens and residents at local level and their direct participation in disaster management is necessary. There is a need for participatory community management process where all the participating agents share each others knowledge which helps in enhancing the coping capacity of community. The urban diagnosis method adopted in disaster management must be made more participative both to check the status quo of community and develop policy countermeasures. Secondly, the root cause of vulnerability is related to poverty and centralization of activities in Kathmandu. These issues need to be resolved with a policy at national level to decentralize Kathmandu as socio- economic hub of the nation.

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コミュニティの空間設計と管理における脆弱性評価手法としての都市診断 —ネパール・カトマンズ市を例として—

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要 旨

本研究は、ネパール・カトマンズ市の脆弱性を都市診断手法を用いて分析している。その中で、さまざまな地震脆弱性に関する空間設計及び管理事項を分析した。進行中の物理的、社会的、そして経済的变化に、これらがどのようにして脆弱性をもたらしたのかを検討する。最後に、コミュニティにおける脆弱性を軽減するための対策を提言する。

キーワード: 地震脆弱性, 都市診断, 災害対処能力