REDUCING DISASTER VULNERABILITY THROUGH LOCAL KNOWLEDGE AND CAPACITY

The Case of Earthquake Prone Rural Communities in India and Nepal

Dr.ing Thesis

Rohit Jigyasu
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NTNU
Norwegian University of Science and Technology

Faculty of Architecture and Fine Art
Department of Town and Regional Planning

Main Adviser:

Professor Hans C. Bjønness
Department of Town and Regional Planning, Faculty of Architecture and Fine Art, NTNU, Trondheim, Norway

Co-advisors:

Professor Tore Haavaldsen
Department of Building and Construction Engineering, Faculty of Engineering Science and Technology, Trondheim, NTNU,
Professor Nalini Thakur
Department of Architectural Conservation, School of Planning and Architecture (SPA), New Delhi, India

Adjudication Committee:

Professor Hans.C. Bjønness (Administrator)
Department of Town and Regional Planning, NTNU, Norway
Professor Nabeel Hamdi
Centre for Development & Emergency Practice, School of Architecture, Oxford Brookes University, United Kingdom
Professor Sudarshan Raj Tiwari
Department of Architecture and Urban Planning, Tribhuvan University (TU), Institute of Engineering (IOE), Kathmandu, Nepal
Professor Bjørn Røe
Department of Town and Regional Planning, NTNU, Norway

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Norwegian University of Science and Technology
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ABSTRACT

This dissertation investigates the past and present status of local knowledge, skills and capacity of rural communities in India and Nepal for reducing their vulnerability to earthquakes. Disaster vulnerability is investigated not only as pre disaster condition but also as a continuous process, which is influenced by underdevelopment, process and various response decisions in post disaster situation. To get an integrated and dynamic picture of how local knowledge and capacity and disaster vulnerability influence each other, three case studies are investigated, namely Marathwada region in India, Kutch and Saurashtra regions in Gujarat in India and Kathmandu valley in Nepal. While the first case looks into the impact of post earthquake rehabilitation after seven-eight years, the second case looks in detail into the immediate transition phase from relief to rehabilitation, in a span of one year after the quake. To get an overview of total situation in both the cases, post disaster situation is essentially linked to the pre-disaster vulnerability situation. The third case looks into various transformation processes in rural communities, which create conditions for pre-disaster vulnerability. The three case studies are analysed for various underlying structural and non-structural causes that create negative conditions in which disaster vulnerability of these communities is increasing because of weakening local knowledge and capacity.

These case studies throw significant light on three inter-related aspects. First, they show key features of local knowledge and capacity of rural communities for mitigation, preparedness and recovery from earthquakes. They are embodied in physical planning and buildings, skills for using local resources, mutual support systems and informal livelihood mechanisms. Second, these (especially the Kathmandu case) provide an in-depth understanding of various transformation processes (pertaining to changes in built form, land use and ownership, occupational structure and social and economic structure) and their impact on traditional knowledge and capacity and resulting pre-disaster vulnerability to earthquakes. Third, these (especially Marathwada and Gujarat cases) show the implications of post earthquake rehabilitation on disaster vulnerability in the long run. These show, how certain decisions taken as part of rehabilitation not only reinforce pre-disaster vulnerabilities but also create new ones.

Five main issues and challenges in the context of rural communities of India and Nepal are pointed at for reducing their disaster vulnerability through building local knowledge and capacities. These are loss of material and land resources, loss of traditional skills, cultural incompatibility of external interventions, increasing social and economic inequity and weakening of local governance. The issue of culturally insensitive ‘transfer’ of local knowledge is

also taken up here. The research concludes by articulating socio-cultural, territorial and eco-developmental perspectives that can contribute towards developing a new framework (paradigm) for disaster management in India and Nepal.

Finally, I suggest strategies for introducing disaster management into strategies for rural development by regenerating rural livelihoods, formulating strategies for rural land management, improving spatial planning and building, improving quality of education on disaster mitigation and preparedness and most importantly finding out ways of intervening in local power structure. Several measures for improving post earthquake rehabilitation are also suggested.

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Rohit Jigyasu
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LIST OF ABBREVIATIONS AND LOCAL TERMS

ADB	Asian Development Bank
ASAG	Ahmedabad Study Action Group, India
BHEL	Bharat (India) Heavy Electricals Limited
BMPTC	Building Materials and Technology Promotion Council, India
CRF	Calamity Relief Fund, Government of India
CAP	Contingency Action Plan, Government of India
CMIE	Centre for Monitoring Indian Economy
CII	Confideration of Indian Industries
CPCs	Community Participation Consultants in MEERP
CPDP	Centre for people-centred Development and Planning
CBOs	Community based Organisations
DDC	Distric Development Committee, Government of Nepal
DNDRC	District Natural Disaster Relief Committee, Government of Nepal
DAC	Department of Agriculture and Cooperation, Government of India
DFID	Department for International Development, United Kingdom
EADI	European Association of Development Research and Training Insitutes
GOM	Government of the state of Maharashtra, India
GOs	Government Organisations
GDP	Gross Domestic Product
GSDMA	Gujarat State Disaster Management Authority, India
GOM	Government of Maharashtra state, India
HDI	Human Development Index
HUDCO	Housing and Urban Development Corporation
HFFS	Himalayan Frontal Fault System (geological term)
IFRC|	International Federation of Red Cross
IK	Indigenous Knowledge
ITDG	Intermediate Technology Development Group
IGNOU	Indira Gandhi National Open University
INGOs	International Non-governmental Organisations
IOE	Institute of Engineering, Tribhuvan University, Kathmandu, Nepal
IUCN	World Conservation Union
KMC	Kathmandu Metropolitan City

LHD	Low Human Development
MEERP	Maharastra Emergency Rehabilitation Programme
MHADA	Maharashtra Housing and Area Development Authority.
MCT	Main Central Thrust (Geological term)
MOH	Ministry of Home, Government of Nepal
NSET	Nepal Society of Earthquake Technology
NGOs	Non-governmental Organisations
PAR	Pressure and Release Model
PMU	Programme Management Unit, Maharastra
RCC	Reinforced Cement Concrete
RRS	Repair, Retrofitting and Strengthening Programme
SPARC	Society for Promotion of Area Resource Centres, Mumbai
SAR	South Asian Region
SCMG	State Crisis Management Group, Government of India
SCR	Stable Continental Region (geological term)
SDO	Sub-divisional Officer, Government of India
TISS	Tata Institute of Social Science, India
UNDRO	United Nations Disaster Relief Organisation
UNDP	United Nations Development Programme
VDC	Village Development Committee, Nepal
VOs	Voluntary Organisations
WHO	World Health Organisation
WDR	World Disasters Report

Chatai	A mat made from locally available bamboos or twigs also used for making walls in traditional dwellings of the poor.
Chowk	Public and private courtyards in a house or a village
Chullahs	Cooking Stoves
Darbar Square	Traditional public squares in traditional Newari cities.
Garhis	Fortresses in mud or stones with high walls are typical features of a rural settlement in Maharastra. These were not mainly meant for defense but in most cases were occupied by the Patels, the most wealthies and respected family in the village.
Gauchar area	Traditional lands belonging to Hindu temples, where sacred cows could freely graze.

Gram Panchayat	Panchayat system is the traditional system of governance at village level in India. Panchayat consists of a group of five elected members from the village who are empowered to take decisions for the welfare of the whole village.
Gram Sabhas	Village Committee. Sometimes this term is used for Panchayats
Guthi Sansthan	Traditional religious cooperative organisations for Newars
Harijans	Literally means 'People of God'. This term was coined by Mahatma Gandhi for all those who were considered as 'low castes' in traditional Hindu society.
Hitis and Pokharis	Traditional water systems in Newari settlements. Hitis are water spouts and Pokharis are small ponds.
Jhompri	Hut. It is considered a permanent shelter by most of the villagers.
Kaanth	The periphery of traditional Newari settlements.
Karkhanas	Factories.
Kutcha and Pucca	Temporary and permanent, respectively.
Lamanis	Nomadic tribes. There settlements are known as Laman Tandas. Many villages have these tandas as satellite settlements to the main village.
Mahila Mandals	Women Groups
Pattidari and Zamindari System	Zamindars and Pattidars were big landowners who employed lot of petty tenant farmers to work on their lands for meagre sum of money and exploited them.
Rajpath	Road of National Importance
Samvad Sahayak	Communications facilitators

SCs and STs	Scheduled Castes and Tribes are the official words for those ethnic groups or tribes, which have been considered as 'low caste' in traditional Hindu society.
Swayam Shikshan Prayog (SSP)	Self Education Experiment
Tehsil or Talukas	After district, the next lowest administrative unit in India is Tehsil or Taluka. These are governed by Tehsildars or Talukadars.
Toles	Traditional Neighbourhood boundaries in Newari settlements. These may be different from present lowest administrative units i.e. wards.
Wada	Traditional middle and high class housing in Maharashtra is characterised by a courtyard surrounded by a colonnaded verandah along which rooms are generally located. These are locally called Wadas.

SUMMARY

Development Objective and Research Question

The research is encouraged by the growing concern at the increasing vulnerability of rural communities to natural disasters such as earthquakes, especially in the context of 'developing' countries. Various initiatives towards earthquake preparedness, mitigation and rehabilitation in rural areas by public, semi-public and non-governmental agencies have failed to produce significant difference in the vulnerability situation. Therefore this research is undertaken with a development objective aimed at identifying key issues essential for formulating long term planning and mitigation measures for reducing disaster vulnerability in particular related to earthquakes of rural communities in India and Nepal. It seeks to explore the potential role of existing resources and strengths of these communities in formulating these.

Therefore, in the context of this objective, my main research question is:
What are the potential roles of local knowledge, skills and resources for planning and mitigation measures to reduce vulnerability of rural communities against earthquakes in India and Nepal?

Developing the Scope of Research

The study has been inductive and it has developed over time in terms of main focus and issues at hand. Initially I started my study with an aim of 'rediscovering' local knowledge, which is embodied in built heritage. Eventually I discovered that substantial knowledge has already got lost. What ever exists is mostly to be found in traditional buildings and townscape, local and traditional institutional frameworks and land relations. Thereafter I set out on a path to find out why and how local knowledge has disappeared, rather than merely finding out knowledge per se.

Moreover, on extensive study of literature on disaster topics, I figured out that 'vulnerability' and 'capacity' is the two closely related key words. And local knowledge in fact falls within the purview of 'capacities' of the people to mitigate the impact of disasters, prepare for them and also recover in the aftermath. This somehow enlarged the scope of 'local knowledge' that I am after. It was no longer limited to knowledge embodied in built (physical) fabric but also assumed to exist in various other traditional skills, ecological (man-environment) relationships, resilience mechanisms and coping strategies that communities develop on their own terms of reference. Moreover, I discovered that physical knowledge is inextricably linked to many other factors and not necessarily disaster mitigation. As such, the people may not have consciously

developed this knowledge for disaster mitigation, preparedness or recovery, but nevertheless such knowledge has a potential role in undertaking these.

While I was expanding the scope of local knowledge, skills or capacity, per se, my investigation of the current status and the related questions of 'how' and 'why' local knowledge is degenerating led me to investigate 'vulnerability'. The vulnerability issue was at the centre since the degeneration of local knowledge and capacities is in fact creating negative conditions of vulnerability to some extent and this is also a consequence of vulnerability conditions on the other hand. Of course, this was very much linked to the under-development, processes, which I found have created congenial conditions for this vulnerability to become an essential negative condition for some sections of people, while it reaped benefits for only a select few.

Review of Theory and Practice

The research builds on extensive literature review on three aspects. First it reviews various definitions and positions relating to the key terms of 'local knowledge' and 'capacity', especially in the context of traditional communities. Second, ongoing theoretical discussions on 'Disasters' and 'Vulnerability' are discussed to articulate technical, social, developmental and ecological perspectives on disasters, which in many cases are discussed independent of each other. Lastly, practical implications of the theoretical understanding on disaster management practices are discussed through various secondary case studies, pointing to the existing dilemmas and challenges. The interrelationships between these aspects are then articulated to point to the main research question in the context of India and Nepal.

Research Methods

This research is purely qualitative in nature and is based on scores of open ended, semi-structured interviews with various stakeholders in the three case study areas. Besides, the local way of life and various activities are recorded primarily through observations on site. Physical changes pertaining to housing and open space structure and developments around the village are recorded through documentation, especially in the third case of Bungamati in Kathmandu valley. Changes in social structure of the village are also recorded.

Criteria for selection of case study areas

My study has also been inductive regarding selection of case study areas. Initially I was focussing on just two cases of Kathmandu valley and Latur. The former is an assessment of vulnerability situation before the earthquake and latter is assessment of a long-term impact of the rehabilitation process.

Clearly as some literary sources have already pointed out, vulnerability and capacity are the two sides of the coin, which are always changing – vulnerability may increase at the cost of capacities or vice-versa. A detailed understanding of transformation processes in rural communities can help in identifying the changing scope of local knowledge and capacity and the underlying reasons for disaster vulnerability. Therefore, through Kathmandu case, I looked into these transformation processes in detail. On the other hand, post disaster rehabilitation certainly provides an opportunity of initiating positive changes in a development continuum. Therefore through Marathwada case, I investigated the impact of various strategies in reducing existing vulnerabilities and building on existing local knowledge and capacities.

Another important dimension to my research was added to my thesis last year (year 2001) with the devastating Gujarat earthquake. Gujarat case added importance on the ground experience and relevance to the dynamic perspective of the relationship between vulnerability and capacities. This provided me with an opportunity to investigate closely this transition phase from a pre-disaster vulnerability situation to a post disaster rehabilitation situation. This somehow filled the gap between a detailed analysis of pre-disaster vulnerability situation (presented through the case of Kathmandu valley) and post-disaster situation in a long-term perspective of 7-8 years (presented through the case of Marathwada, India)

Case Study 1- Marathwada, India

In Marathwada case study, I briefly traced traditional knowledge, skills and capacity that contribute towards reducing vulnerability to earthquakes. These are embodied in their sustainable livelihood source i.e. agriculture, social networks that ensure mutual support systems. It is also found in traditional building knowledge, notably Malwad (timber under-structure) constructions with several examples of good stone masonry. Many traditional artisans possessed skills in traditional building techniques such as good quality stone masonry construction, which had potential of performing reasonably well in the event of an earthquake.

Further, an assessment of pre earthquake vulnerability situation in the region brought out the fact that traditional building knowledge had degenerated to a considerable extent prior to 1993 earthquake. The underlying reasons for this could be traced to several factors, notably lack of maintenance due to poverty, loss of several traditional occupations that supported traditional building construction and general ignorance on measures for earthquake mitigation.

My study has further traced the situation after a destructive earthquake struck the region in 1993 and rehabilitation efforts were initiated at an unprecedented scale through the generous support of World Bank and other international

organisations. Housing was one of the major components of the rehabilitation programme. Accordingly, the most affected villages were relocated to safer sites and reconstructed through building contractors hired from outside (A category), while others were proposed to be reconstructed in-situ (B category). Seismic strengthening and retrofitting programme was launched in the third (C category) of villages. Houses were also divided into various categories based on the size of land holding, which reinforced existing social and economic segregation and in some cases even created new ones.

During the course of my fieldwork in Marathwada, I undertook a detailed assessment of the impact of rehabilitation, seven years after the earthquake hit the region. In most of the relocated villages, it was fascinating to see how villager had initiated changes to the built fabric that was tailor made for them. These changes present an interesting case of how people adapt themselves and also change the surroundings to suit their 'way of life'. However relocation has its shares of problems associated with it, which were evident during the course of my field study. These were mainly: -

- Cultural incompatibility of village layout, house designs and construction technology
- Increasing distance from livelihood source (agricultural land)
- Lack of consideration for long-term sustainability.

A shocking consequence of this is that some relocated villages are now being vacated by people, who are moving back to their old site and initiating traditional constructions in poor quality.

The seismic strengthening and retrofitting programme did not succeed as there was little technical assistance and most of the local engineers trained in 'western' education perceived traditional housing as 'outdated' and 'weak'and thus strongly advocated local people to vacate them and build 'modern' housing. Local people who had suffered great trauma also accepted these expert views and vacated their traditional houses, many of which were nearly intact. Ironically, these are being replaced by modern structures in poor quality due to lack of resources and technical know-how, are in fact increasing the existing vulnerabilities in the hope of decreasing them.

Lastly, my assessment of the training programme as part of reconstruction efforts revealed that these were not sustainable in the long run due to unsustainability of technology and negligible involvement of traditional artisans and their skills. Also I discovered that in many case 'community participation' was limited to certain sections of the community and the consultants had little knowledge of ground realities. Marathwada case, demonstrated how existing vulnerabilities have been reinforced and knowledge and capacities are in fact overlooked in the post earthquake rehabilitation process, thereby increasing vulnerabilities in many ways.

Case Study 2 – Gujarat, India

The second case study of Gujarat was undertaken after a destructive earthquake hit Kutch and Kathiawad region on 26th January 2001 (refer chapter 8). Like the earlier case, my study revealed that this region also has tremendous wealth of traditional knowledge, skills and capacity, which are embodied in local building types such as Bhungas, timber laced structures and adobe constructions. Strong social networks are a key strength here too, which help local communities in coping with disasters. However here too, vernacular buildings had become weak and vulnerable prior to earthquakes, the underlying reasons for which were striking similar to Marathwada.

The earthquake of 2001 had profound physical, social, psychological and economic impact, which was documented in my study through reconnaissance visit to the region nearly a month later and also through various media reports. The external response by government, NGOs and other organisations towards relief and rescue was also recorded to understand the issues confronting relief management. These brought forward a nearly total absence of pro-active measures for meeting the threat of earthquakes in the region. On the other hand, the community response, showed some inherent social support systems, belief systems and informal livelihood mechanisms such as preparing soil blocks and providing labour (for reconstruction) that helped them cope with this disaster.

The rehabilitation process in Gujarat that was initiated afterwards was quite similar to Marathwada in its earlier conception. Here also, relocation and total reconstruction through village 'adoption' by NGOs or donor agencies was proposed for the most affected villages through partnership between government and NGOs. Interestingly, contrary to Marathwada, relocation and 'adoption' was rejected by most of the people, who preferred to carry reconstruction on their own.

During the course of this study, I closely followed the sequence of decisions relating to relief and rehabilitation following the earthquake over a period of one year. A detailed field assessment of the progress in rehabilitation process was made nine months after the earthquake. The situation in affected areas was assessed to find the status of rubble clearance and provision of various kinds of formal and informal temporary shelters, provided by various organisations or through self-help. This revealed that in many cases, the temporary shelters were climatically inappropriate, expensive and unsustainable in the long run. Contrary to this, several self-help temporary shelters showed optimum use of locally available resources. Another interesting feature was the construction of semi-permanent structures as intermediate shelters to prevent from the approaching monsoons. However their slow execution and gradual transition to

earthquake-unsafe permanent shelters raised several crucial issues questioning their appropriateness.

Gujarat is certainly an interesting case of NGO involvement in the rehabilitation process. During my field study, I documented work of various NGOs, voluntary organisations and donor agencies, on various aspects of rehabilitation, specifically reconstruction of semi-permanent and permanent shelters and seismic strengthening and retrofitting. While most of the NGOs were facilitating self-help reconstruction by advocating specific indigenous designs and low cost technologies, several donor agencies also undertook 'full fledged adoption' of villages using heavily reinforced 'modern' technologies like in Marathwada.

All these observations pointed to several crucial issues, which were strikingly similar to the ones in earlier case of Marathwada.

- A shocking implication of owner driven approach is social as well as physical break-up of villages due to existing social segregation.
- Several complaints regarding corruption, inequitable compensation was found during the field study.
- Besides, it seemed that the whole approach was getting heavily centred on financial compensation, without working out and facilitating actually ways and means to achieve earthquake resistant features in physical reconstruction.
- In many of the 'adopted' villages, the sustainability of the introduced 'earthquake-resistant technology' employing heavy use of external and expensive resources was put into question very much like the case in Marathwada. There were also some efforts in introducing indigenous building designs and low cost technology by using local materials in reconstruction. However internalising such a technology with local communities seemed very much in doubt.
- House designs and village layout were also found to be incompatible to local cultural practices.
- Strengthening and retrofitting programme found more acceptance with the government than the earlier case. However, local people were still finding it hard to accept these measures because of general perceptions against effectiveness of traditional techniques. In fact, very much like in Marathwada, misperceptions on the issues of 'appropriate' building technology were evident both on part of 'official' engineers and local people. Most of the people were changing over to 'modern' techniques using reinforced concrete, though the quality of these self-help constructions was very poor. This was found to be mainly because of lack of knowledge about the new techniques, non-affordability due to heavy reliance on outside resources and most importantly, lack of availability of water in this drought prone region.

'Community participation' was the keyword in the rehabilitation process initiated here also. However, equitable participation of all sections of the community was lacking in my case areas. Unfortunately, in this case also, local skills and capacities were not utilised to their maximum scope. In some cases, this also made local people highly dependent on external resources and help.

Gujarat is also the pioneering case, where development focus was clearly articulated through setting up of village-level data-collection units (called 'setus'), which were supposed to serve as bridge between community, NGOs and the government. However, the link between the community and the government was structurally so weak, that effective communication and action on behalf of the government, based on community feedback was missing. Besides posing challenges relating to good governance, this also related to the fact that till now, grass root governance has not been given any roles and responsibilities in the rehabilitation process.

This case is interesting to compare with the Marathwada one as it brings forward emerging challenges in post earthquake rehabilitation for building on local knowledge and capacities for reducing disaster vulnerability of rural communities in India. These challenges relate to: -

- General ignorance on earthquake mitigation measures
- Unsustainability of introduced technology
- Cultural incompatibility and unaffordability of planning and design for reconstruction
- Reinforcing social inequity
- Increasing economic inequity
- Misperceptions on traditional building techniques

Both the cases have clearly shown how vulnerability of rural communities is compounded by post earthquake decisions taken for relief and rehabilitation.

Case 3 – Bungamati Village, Kathmandu Valley, Nepal

The third and the last case study of Kathmandu valley throws light on the underlying transformation processes, which in the first place are creating vulnerability of these rural communities. These are studied in detail for one village called Bungamati, which is located southwest of Patan city in Kathmandu valley. (Refer chapter 9)

Bungamati is a traditional rural settlement of Newars, one of the ethnic groups in Nepal, with strong socio-economic networks defined through caste system. It is characterised by well-defined systems, which is typical for such settlements in the valley. At the physical level, the settlement has always been compact and well defined through boundaries. It is organised into various neighbourhood units and are linked by a hierarchy of streets and open spaces,

some of which are processional routes for various festivals and rituals. Significantly, the village has several public spaces, which are collectively owned and used for various activities. The relationship with agricultural land around the village is also very crucial as it is linked not only to their primary livelihood base but also has great associational value. A large part of these lands are called Guthi lands and income from their produce is used for carrying out religious and other activities, which are of common interest to the village. Besides traditional Newari architecture has typical characteristics in their building typology, design and construction system.

Like the earlier two cases, the study showed that traditional systems of rural settlements like Bungamati demonstrate various aspects, which contribute towards mitigating, preparing and recovering from the impact of earthquakes. Sizeable knowledge is embodied in the spatial structure and buildings such as public and semi-public open spaces, symmetrical plan configuration, timber ring plates and wedges to hold the sloping roof tightly to the walls, ring ties, double framing of windows and double columns. Besides, here also like the earlier two cases, mutual support systems are traditionally defined through caste system, which determines roles and responsibilities to mutually sustain these communities. Also, private and collective agricultural lands are sustainable livelihood resource, which helps local community in effectively coping disaster situation.

My study has further looked into various transformation processes and their impact on these traditional systems and resulting consequences on vulnerability of rural communities like Bungamati to disasters in general and earthquakes in particular. I recorded in detail with fellow NTNU and NORAD fellowship students; changes in built form, land use and ownership pattern, occupational structure, cultural practices and governance systems in Bungamati. A perspective of more than 30 years has been achieved by comparing present situation to an earlier study of the village done by a team of Danish students in 1968. Interestingly, while public open spaces in the village are still intact, the private vegetable gardens are being built over, leading to general densification of village, though at a slower rate. Moreover traditional village boundaries are also nearly intact. The traditional structures are getting first vertically and then horizontally divided. Also there are changes in space usage, construction materials and in openings, which are making these structures weak and vulnerable to lateral forces of earthquakes. ‘Modern’ structures are replacing many of the traditional structures by choice or by compulsion. However, the quality of their construction is generally very poor due to lack of resources. Ironically, the general perception in this case is also against using traditional techniques for new constructions. In fact people perceive ‘modern’ concrete constructions as panacea for their progress.

Interestingly, this case study has revealed forced transition around the village because of which agricultural land belonging to the villagers is slowly getting

lost to outside pressures, thereby depriving local people of their vital resource. People from outside are slowly converting this land for residential and public usage. In most cases, the local people are forced to sell this land due to extreme poverty. As a result "Guthi" lands (belonging to religious trusts) are also getting lost and thus there is not enough money to carry out collective activities for the village. All this is increasing external dependence of local people, thereby significantly decreasing their coping capacity.

There are significant changes in the occupational structure of the village and inclusion in the urban agglomeration of Kathmandu valley as most of them are taking up wood carving as their main occupation. However they are catering mostly to tourism and no longer serving the primary shelter needs of the village. Ironically these craftsmen have traditionally possessed skills in using wood in traditional constructions, which could effectively withstand lateral forces of earthquakes.

Besides these changes, the study has also brought out decreasing level of co-operation among villagers due to increasing social and economic segregation. Another issue that emerged from the study related to weak governance at the village level due to lack of financial resources and political power with the village development committee. All these transformation processes point towards underlying reasons for increasing disaster vulnerability of rural communities like Bungamati to earthquakes.

The study concludes by taking a broader overview of the existing efforts in disaster management and their ineffectiveness in reducing overall vulnerability conditions to earthquakes due to lack of understanding of various dynamic factors which are increasing disaster vulnerability in the first place. It takes a re-look at the recovery initiatives following 1934 earthquakes based on secondary sources and assesses the extent to which the rehabilitation process was built upon local skills and capacity.

Research Findings

The three case studies undertaken in this research throw significant light on three inter-related aspects.

- First, they show key features local knowledge and capacity of rural communities for mitigation, preparedness and recovery from earthquakes, which are embodied in physical planning and buildings, skills for using local resources, mutual support systems and informal livelihood mechanisms.
- Second, these (especially the Kathmandu case) provide an in-depth understanding of various transformation processes (pertaining to changes in built form, land use and ownership, occupational structure and social

and economic structure) and their impact on traditional knowledge and capacity and resulting pre-disaster vulnerability to earthquakes.
- Third, these (especially Marathwada and Gujarat cases) show the implications of post earthquake rehabilitation on disaster vulnerability in the long run. These show, how certain decisions taken as part of rehabilitation not only reinforce pre-disaster vulnerabilities but also create new ones.

These studies point to five main issues and challenges in the context of rural communities of India and Nepal for reducing their disaster vulnerability through building local knowledge and capacities. These are loss of material and land resources, loss of traditional skills, cultural incompatibility of external interventions, increasing social and economic inequity and weakening of local governance. The issue of culturally sensitive 'transfer' of local knowledge is also being taken up here. The comparative and combined analysis of the three case studies is undertaken in chapter 10.

Revisiting Theories

In the following chapter (no. 11), I attempt to 're-visit' the theories that were the subject of review initially and some of which like that of 'disaster', 'vulnerability', 'rural communities' in fact formed the framework of my overall approach and analysis. My discoveries through case studies led me to re-visit the following theories and bring in new theoretical perspectives in the light of issues that I encountered.

Firstly, I engage in a discussion on theoretical linkages between disaster vulnerabilities and capacities. Disaster vulnerability is understood both as 'products' and 'processes' in three main aspects: -

- As 'product' of ongoing social, cultural and economic transformation 'processes' within communities
- As 'product' of normal (under) development 'process' and,
- As 'product' of immediate and long-term disaster response.

Secondly, an attempt is made at redefining disasters in a dynamic and integrated perspective, integrating socio-cultural, development and ecological perspectives. This is followed by a detailed discussion on cross cutting issues that emerge from the study, namely poverty and local control of land and material resources, cultural continuity and compatibility, sustainability of livelihoods, equitable participation through empowerment, ethics, roles and responsibilities of local governance.

Lastly, territorial, socio-cultural and eco-developmental perspectives are articulated, contributing to the development of new paradigm for disaster

management. Three essential shifts are advocated for reducing vulnerability in the context of rural communities of India and Nepal, namely

- Moving from external resources to development of local resources in land and land use practices, cultural heritage and skills and construction materials.
- Moving from only stressing social consequences of disaster towards ethical and overall eco-developmental perspectives and
- Moving from command and control and relief model towards community determined development model facilitated by CBOs, NGOs and local governance.

Importantly, the 'Community' based disaster management is re-visited here for the challenges confronting the traditional rural settlements in South Asia. These challenges are articulated for these communities that are in transition from socially segregated coherent entities with a well-defined structure to a multi-ethnic, multi-cultural pluralistic societies. The role and relevance of local knowledge in the light of these transformations are discussed for making 'disaster resilient communities' in South Asia.

Recommendations

The research concludes my recommending some policy implications and suggestions for further research (refer chapter 12). These pertain to improving institutional structure for disaster management by delegating roles and responsibilities to local government and civil society, and reinforcing institutional links between disaster management and rural development sectors. Here I suggest strategies for introducing disaster management into strategies for rural development by regenerating rural livelihoods, formulating strategies for rural land management, improving spatial planning and building, improving quality of education on disaster mitigation and preparedness and most importantly finding out ways of intervening in local power structure. Finally, some suggestions are also given for improving post-earthquake rehabilitation policies and practices. These include: -

- Formulating policies by understanding the linkages to cultural and livelihood patterns
- Recognising linkages of rehabilitation strategies to long term development and sustainability
- Seeing disaster resistant technology within a wider social, economic and cultural perspective'
- Emphasis on culturally rooted education
- Ability to intervene in local power structure.
- Redefining the priorities from relief to rehabilitation
- Proposing alternative strategies for housing reconstruction through partnerships between contractors, local artisans and house owners.

PART I

THE STUDY

1 THE STUDY

1.1 INTRODUCTION

Earthquakes have been the cause of tremendous loss of life and property in both urban and rural areas. In developing countries, their impact is very severe on rural communities due to several social and economic factors that have contributed towards their physical vulnerability to earthquakes.

The South Asian subcontinent has several regions which are earthquake prone. Most recently, on 26th January 2001, a devastating earthquake hit Kutch region of Gujarat in the western part of India causing extensive loss of life and property. As a consequence, a large number of villages are reduced to mere rubble. Also in the last decade, earthquakes have caused extensive destruction to rural settlements. In 1991, the Uttarkashi earthquake rocked several small villages and caused significant damage to the vernacular housing built of mud and rubble. The Marathwada earthquake of 1993 affected several big and small rural settlements. An estimated 65 percent of rural homesteads suffered great damage or collapsed in the wake of this earthquake. The Garhwal earthquake in 1999 also caused widespread damage to vernacular settlements in remote hilly areas.

Earthquakes have always existed in the region. However, over the last few decades their physical, social and economic impact has increased many fold. Various factors have been attributed to this e.g. increase in population, rapid urbanisation, poverty, poor quality of construction and last but not least, lack of effective disaster management policies. Several studies have been undertaken to understand disaster vulnerability in the region. These have ranged from studies of technical causes of physical vulnerability, to those of the relationship of disasters to social and economic issues e.g. relating to livelihoods, gender etc.

Needless to say, the rural communities in the region have a very strong vernacular tradition as a result of which they have amassed an enormous wealth of local knowledge, skills, resources and capacity. A few technical studies have also been undertaken of 'traditional knowledge' for mitigation against earthquakes, which is embodied in traditional and vernacular structures. There is also some interesting work on coping strategies of rural communities against natural disasters. However, in spite of some work in this direction, it seems that local capacity of these communities is generally being overlooked, while analysing their vulnerabilities.

Interestingly, in spite of potential local knowledge, when we look at the ground situation, it is the rural communities that are most adversely affected from natural hazards such as earthquakes. One wonders why this is so, if some researchers claim that there exists traditional building knowledge that has potential for mitigation against earthquakes. This leads us to find out the current status of local knowledge, skills and capacities for disaster mitigation, if it exists at all any more. What is the impact of existing development models and resulting transformation processes? In what way are these affecting local knowledge, skills and capacity and making these societies increasingly vulnerable to natural hazards such as earthquakes?

Various initiatives are taken towards earthquake preparedness, mitigation and rehabilitation in rural areas by public, semi-public and non-governmental agencies. It is also interesting to analyse their strategies and approaches, and assess to what extent they build on existing knowledge, skills, resources and capacity and to what extent do they influence these. This needs an integrated and dynamic, territorial and cultural perspective, in understanding the disaster situation in South Asia and analysing current planning methods to deal with it.

1.2 THE RESEARCH QUESTION

Building on this issue, I am asking the following research question: -

What is the potential role of local knowledge, skills and resources for planning and mitigation measures to reduce vulnerability of rural communities against earthquakes in India and Nepal?

In order to answer the above question, we need to know: -

- What are local knowledge, skills and resources of traditional rural communities that can contribute towards preparedness, mitigation and recovery in relation to earthquakes? What is their current status?

- What are the internal and external dynamic pressures and resulting transformation processes in traditional rural communities? What are their implications on local knowledge and capacity and vulnerability against earthquakes?

- To what extent are existing institutional measures towards relief, preparedness, mitigation and rehabilitation, building on the local knowledge and capacity of rural societies in south Asia? How do they affect these?

1.3 DEVELOPMENT OBJECTIVES

In order to establish a link between research and the practise, this research is undertaken with a development objective aimed at identifying key issues essential for formulating long term planning and mitigation measures for reducing disaster vulnerability in particular related to earthquakes of rural communities in India and Nepal. It seeks to explore the potential role of existing resources and strengths of these communities in formulating these.

The following sub-objectives are stated:

- Reducing vulnerability of rural communities against earthquakes in India and Nepal by applying existing strengths of these communities in formulating long-term planning and mitigation measures.

- Raising awareness of institutional stakeholders i.e. government, non-governmental, voluntary and other community based organisations on ways and means of utilising the potential strengths of rural communities in India and Nepal.

1.4 CASE STUDY AREAS

The three case study areas for detailed study are Marathwada region (Latur and Osmanabad districts) in India, Kutch and Kathiawar region in Gujarat (India) and Kathmandu valley in Nepal. While the Marathwada and Gujarat cases emphasise disaster management practices, more specifically post earthquake rehabilitation process over various time periods, the Nepal case illustrates the impact of existing rural development processes on vulnerability of rural communities. While the earlier two cases show the situation after the earthquake, the last case illustrates the situation before the earthquake. In this way, the three cases give a picture of disaster in a holistic and dynamic perspective.

The Marathwada case examines the post-earthquake situation over a long time. It shows to what extent the rehabilitation has utilised existing knowledge, skills and resources. It also shows impact of the rehabilitation process after eight years, in reducing long-term disaster vulnerability.

The Kutch situation looks at the immediate aftermath of the earthquake and also analyses the complex processes that created the setting or context for a disaster of such immense proportions, just before the earthquake. It also analyses the post earthquake rehabilitation process that is currently underway and compares it to the one followed in Marathwada.

In the case of Nepal, transformation of traditional rural communities is discussed in detail as accumulated and long-term processes. These are analysed for the impact of existing rural (under)development processes and their consequences on increasing vulnerability of such communities against future natural hazards such as earthquakes.

1.5 SCOPE AND LIMITATIONS

The study does not focus solely on a particular aspect e.g. technical, social or others. Rather, it builds on various interrelationships that demonstrate the processes that contribute to building of local knowledge and capacity and also their present status in the light of various transformations.
Moreover, the study looks at a longitudinal time frame with respect to disaster, it does not study pre, post or emergency phase in isolation, rather it looks at the dynamics of the situation and the factors affecting that. Morevover, it is very much exploratory and inductive in its nature. The study is not based on pre-defined questionnaires. Even the case studies have been chosen and added, according to the situation, as it developed through my research period. Initially, I had just two case studies, that of Kathmandu valley and Marathwada region. The Gujarat disaster added a new dimension to the thesis, allowing an opportunity to look at the situation in a dynamic perspective.

I do not claim that results of the three case studies can be blindly applied to each other. These are entirely different contexts and therefore the results of one may not hold true in other situations, especially in a longitudinal time perspective. However, there are some similarities and my research builds on these in a broader context of rural communities in India and Nepal.

Because of limitation of time and resources and considering the fact that the field areas are in India and Nepal, the study is based on number of interviews, and many facts have not been verified. In such cases, references have been given to those whose views have formed basis of certain observations or comments. These views may be highly biased sometimes.

The thesis deals with the issue of vulnerability to disasters in general. In that context, it merely looks at earthquakes as one form of natural hazard and addresses those issues, which are relevant to other natural disasters as well. Therefore, the earthquake phenomena have not been studied in depth from geological point of view. Nor are technical aspects related to physical vulnerability studied in detail.

The scope of local knowledge, skills and capacity is very wide and it encompasses technical, social, cultural and other forms of knowledge. It is not limited to traditional buildings or other aspects of knowledge with a static

ethnographic perspective. Though I started my thesis with such a perspective, hoping to rediscover local knowledge, I very soon realised that such knowledge is very difficult to re-discover, due to the following reasons: -

1. This knowledge of building process is so dynamic that it is difficult to limit this knowledge temporally, as belonging to one period in time.

2. The changing context is also one factor due to which one may find it difficult to justify one kind of knowledge over another. E.g. many resources that were available before (for example, wood) may have gotten depleted to an extent that they are no longer relevant.

3. I discovered that most of the knowledge has already disappeared, at least from people's minds. Most of it is no longer living as clearly perceived skills for disaster mitigation.

4. Only piecemeal knowledge can be re-discovered through study of traditional or historic buildings since these buildings have changed and one may not be sure that this knowledge was 'consciously' put into practise for reducing disaster vulnerability, in particular. Notably, most of this knowledge is holistic in its conception.

Therefore, I have looked at local knowledge, skills and resources with a more dynamic and anthropological perspective rather than merely rediscovering static knowledge. The knowledge may not be specialised knowledge for mitigation, but rather holistic knowledge that may have potential to contribute towards it, although it may not have been consciously designed for this purpose.

1.6 ORGANISATION OF THE STUDY

The thesis report is divided into five main parts, including the present one: -

Part II: Review of Theory and Practice

This part has three main chapters, which are primarily based on review of literature, leading to this research by pointing out the existing knowledge base in the field.

Chapter 2 reviews the scope and nature of local knowledge and capacity for disaster mitigation. It begins by outlining main definitions and positions on local knowledge and capacity per se. Thereafter, knowledge and capacity of traditional rural communities is looked at from an ethnological perspective. Lastly, existing research in traditional building knowledge on earthquake

mitigation is reviewed to point out the issues confronting its scope and nature in each cultural context.

Chapter 3 reviews existing theories on 'disasters' and 'vulnerability' from various perspectives, namely technical, social, developmental and ecological. Next, various approaches for analysing vulnerability are discussed to articulate various indicators of the process.

The implications of theoretical understanding of 'disasters', 'vulnerability' and 'capacity' on disaster management approach and practices are discussed in chapter 4. These are discussed for pre-disaster as well as post-disaster situation. Existing studies on the assessment of post-earthquake disaster management practices are also discussed to highlight the current issues.

Part III: Research Methods

Chapter 5 outlines main research methods by spelling out my major methodological considerations, criteria for selection of the case studies, my research process and main data collection techniques that I have used to carry out my research.

Part IV: Context of the Research

This part has one main chapter. It deals with the South Asian context in particular. The chapter begins by briefly reviewing the traditional characteristics of rural communities in the region. Next, it gives geographical and geological details about earthquake prone regions in South Asia. The relationship of disasters to increasing vulnerability of people in the region is further detailed, through analysis of major dynamics in the region and the link to development. This is specially articulated for the existing status of rural communities in the region. The next part of this chapter details the existing disaster management systems in India and Nepal and does critical analysis of these in terms of their scope and effectiveness. The Chapter concludes by bringing out the main research issue, in the light of 'general' and 'applied' theory discussed in last part and points to my research question.

Part V: Case Studies

In this part, chapters 6, 7 and 8 are the detailed analysis of my case studies, namely Marathwada Region in India, Kutch Region (Gujarat) in India and Kathmandu valley in Nepal. As mentioned earlier, these are respectively in the order of the situations long term after, immediately after and before the main hazard event in question i.e. the earthquake. All these chapters start with a basic introduction to the case study area with regards to their geographical, physical, social and cultural characteristics. Next, the current status of local

knowledge, skills and resources is also examined in a dynamic perspective by analysing traditional systems and present transformation processes affecting those systems. Thereafter, the current situation of rural societies in these regions is assessed to know the present status of disaster vulnerability. Here, there is essential difference between the three studies.

The first two cases qualitatively analyse post-earthquake rehabilitation process in detail over long term (after 7 years) and short term (in the first year). These are investigated for the approaches followed in each and their impact on reducing long term vulnerability. The third case, namely Kathmandu valley in Nepal, assesses the transformation processes in a traditional rural settlement named Bungamati and analyses the impact of current dynamics of development in initiating these processes and their consequences on disaster vulnerability. This chapter also briefly assesses the scope and effectiveness of disaster preparedness and mitigation activities in reducing vulnerability. Each of these chapters conclude with a detailed discussion on the changing vulnerabilities and their link to local knowledge, resources, skills and capacities of rural communities for mitigating the impact of earthquakes.

Part VI: Conclusions

This part has three chapters.

In Chapter 9, the main findings of the research are discussed through comparative and combined analysis of the case studies. First the existing strengths of rural communities for earthquake mitigation are analysed for all the three case studies, based on certain common factors. Second, the weaknesses or vulnerabilities are elaborated for the same set of factors. Third, the approaches followed in post earthquake rehabilitation in Marathwada and Gujarat are compared objectively. The transformation processes in the two cases are then compared for their impact on physical and social vulnerability. Last but not the least, the changing vulnerability conditions before and after the earthquake in all the three cases are analysed for their link to underlying causes.

Chapter 10 reviews the general and applied theories discussed in Part II, in the light of my findings through case studies, elaborated in Chapter 9. In this chapter, I also discuss the limitation of my study with respect to the theory, research methods and findings.

The last chapter 11 brings forward the main challenges, preconditions and alternative models and techniques for improving disaster management practices so as to reduce disaster vulnerability in South Asia in general and India and Nepal in particular. This Chapter ends by citing future research directions based on my findings.

Table 1.1 Organisation of the Study

PART 1 **THE STUDY**	* Introduction * Research question * Development objectives * Study organisation
PART II **REVIEW OF THEORY AND PRACTISE**	* Local knowledge and capacity * For disaster mitigation * Disaster and vulnerability * Disaster management approaches and practises
PART III **RESEARCH METHODS**	*Methodological Considerations *Case Study Method * Qualitative Research *Research Process *Data Collection Techniques
PART IV **CONTEXT OF THE RESEARCH**	*Cultural, social, geographic, geological and developmental context of South Asia *Disaster Management Structure in India and Nepal
PART V **CASE STUDIES**	*Case 1 - Post disaster rehabilitation in Marathwada, India impact after 7 years *Case 2 - Post disaster rehabilitation in Gujarat, India Transformation process *Case 3 - Pre disaster vulnerability situation Transformation process
PART VI **CONCLUSIONS**	* Comparative and combined analysis of case studies * Revisiting theory and methods * Policy implications and suggestions

PART II

REVIEW OF THEORY AND PRACTICE

2. LOCAL KNOWLEDGE AND CAPACITY FOR DISASTER MITIGATION

2.1 DEFINITIONS AND POSITIONS

This chapter deals with local knowledge and capacity for disaster mitigation. It is organised into three sections. First of all, I will examine theoretical definitions and positions on 'local knowledge' and 'Capacity'. This will be followed by a discussion of local knowledge and capacity of traditional communities. Here I will explicitly articulate enthnological and anthropological perspectives. Lastly, I will explore local knowledge on mitigation against earthquakes, which is embodied in traditional building fabric, especially vernacular housing.

2.1.1 Is Local Knowledge scientific ? – definitions and positions

'Knowledge' implies cognition; the fact or condition of having information or of being learned through experience or association. (Websters, 2000).

Various terms are used for referring to 'Local Knowledge' such as "rural people's knowledge", "peasents' knowledge", "farmers' knowledge, "folk knowledge", also "indigenous technical knowledge", "traditional environmental knowledge", "indigenous agricultural knowledge", "ethno science" and "traditional knowledge" (see Sillitoe 1998, p. 223).

In a collection of essays on indigenous knowledge systems edited by Warren et al. (1995), Indigenous knowledge (IK) is defined as

> "Local knowledge that is unique to a given culture or that is existing within and developed around specific conditions of women and men indigenous to a particular geographic area. It is the information base for a society which facilitates communication and decision-making."

According to Paul Mundy and J.Lin Compton (1991) , the sources of indigenous information are: -

1. Indigenous experts (such as a farmer particularly skilled in certain activities)
2. Indigenous professionals (such as healers and irrigation specialists)
3. Innovators (people who experiment with and develop new techniques)
4. Intermediaries (those who pass on messages, such as town criers and messengers) and
5. Recipient disseminators (all others who receive information, modify it, and pass it on).

Such indigenous systems are typically developed locally, are under local control, and use low levels of technology. Many also lack bureaucratic organization. The main channels for communication of local knowledge are traditional performing arts (or 'folk media'), indigenous organizations, 'deliberate instruction' (child-rearing, traditional schooling and apprenticeships), unstructured channels such as conversations at markets and in the field, written and memorized records and direct observation. This just goes to show that local knowledge encompasses the whole cultural context. Paul Sillitoe (1998) describes indigenous knowledge as "by definition interdisciplinary; local people think of and manage their natural environment as a whole system" (ibid., p. 247).

While for some scholars, other forms of knowledge can exist in parallel with "local knowledge" in one society, a large part of the writing on local knowledge marks an artificial boundary between it and formalised, scientific knowledge (Schmuck, 2001).

Richards (1994) emphasises experimentation as an important aspect of local knowledge, and thus makes a claim that local knowledge is scientific. According to him,

> "Local knowledge is knowledge that is in conformity with general scientific principles, but which, because it embodies place-specific experience, allows better assessment of risk factors in production decision. This kind of knowledge arises where local people undertake their own experimentation, or where they are able to draw inferences from experience and natural experiments."

The same emphasis is given by Flavier et al. 1995:479, who states that indigenous information systems are dynamic, and are continually influenced by internal creativity and experimentation as well as by contact with external systems. This continuous process of experimentation, innovation and adaptation enables indigenous knowledge to blend with science and technology as well. According to Gupta and Patel, various processes of innovations leading to production of local knowledge are conceptual transformation, improvisation, accidental or serendipity, collective or individual processes, triggering new metaphor and innovations for fun or humour.

This dynamic nature of local knowledge has also been articulated in "Working with Indigenous Knowledge (IK): a guide for researchers", IDRC, Ottawa, 1998. It states,

> "The development of IK systems, covering all aspects of life, including management of the natural environment, has been a matter of survival to the peoples who generated these systems. IK systems are also dynamic, new knowledge is continuously added. Such systems do

> innovate from within and also will internalise, use and adapt external knowledge to suit the local situation. (p.1)"

However, scholars like Agrawal (1995) state that western-scientific and local knowledge can be classified in different ways, "depending on the interest it serves, the purposes for which it is harnessed, or the manner in which it is generated" (ibid, p.5). Norman Long and his group (Long & Long 1992) and the contributors in Mark Hobart (1993a) argue in a similar way, reasoning that scientific knowledge differs in its aim and purpose from local knowledge, by claiming universality and objectivity. They argue that scientific knowledge is a "world ordering knowledge" (Hobart 1993b, p.1):

They also claim that precisely because scientific knowledge is systematised in written records and reproducible experiments, this knowledge can be disseminated more successfully than local knowledge. Local knowledge, on the other hand, is said to be coupled to activites and expresses "situated practices" (ibid.,p.4)

Georg Elwert et al. (1999) understands local knowledge "as knowledge essentially transmitted by oral face-to-face communication (and therefore rather localised)...the encoding of this knowledge into an oral discourse (not in literary language) and the use of sensual (especially visual) demonstration distinguishes local knowledge from scientific or technical knowledge" (ibid., p. 238)

The above views show an attempt by various scholars to describe the scope and extent of local knowledge. At the same time, they also show an attempt by some to 'package' and 'market' local knowledge as something complete in itself. However, scientific and local knowledge do not exclude each other, rather local knowledge is almost always coupled to scientific activities. It merely distinguishes itself by being "experience-laden, practice oriented and culturally embedded, thus more holistically oriented" (ibid.p.4).

Peter Schröder (1995) has aptly summarised the generally held consensus on local knowledge. According to him,

> "Local knowledge consists of knowledge and practical capabilities which emerged from local conditions and natural and social surroundings, and which have often been tested over a long period of time and are integrated into a larger cultural context" (ibid, p.1, translated from German by Schmuck, 2001)

In the context of above discussion, local knowledge embodied in built heritage is not merely limited to its physical and material form. Rather it is a complex product of people, place and time, which evolves as a result of a dynamic process (Thakur, 1998). Understanding local building knowledge in its wider

scope and definition is crucial for rediscovering and recovering it in the present context.

2.1.2 Local Knowledge and Development thinking

The relations between local knowledge, power and development thinking have also been discussed by some scholars. According to Richards (1985), local knowledge is an important part of the lives of everyone, including the poor. It is a key element of the social capital of the poor, their main asset to invest in the struggle for survival, to produce food, to provide for shelter or to achieve control of their own lives. According to him;

> "The term IK is a contribution to development thinking. In comparison with such labels as 'beliefs', 'customs', 'traditions' or 'modes of thought', the term 'indigenous knowledge' respects the expertise of indigenous peoples. The evidence that indigenous knowledge is often scientifically correct has helped to legitimize it" (p. 13).

However, this is not the only argument that can be put forward to demonstrate that poor people are knowledgeable. IK theory is indebted to Freire's pedagogy of liberation (1984) for the recognition that the acceptance of people's views is a precondition for true dialogue and cooperation.

Specific strategies for protecting, systematizing and disseminating local knowledge will differentially benefit different social groups and individuals. In this context, Aggrawal (1995; 431) further articulates the links between knowledge and power by making the following remarks on the knowledge of the poor;

> "Because the poor and the marginalized exercise some measure of control over their own knowledge, it is possible by focussing on their knowledge to find them a greater role in development. If this is a primary purpose of focusing on IK systems, however, it is ill served by never making explicit the links between power and knowledge. It is this inattention to how power produces knowledge and the acceptance of the rhetoric that 'knowledge is power', which perhaps explains the advocacy of archives for local knowledge"

Rediscovering local knowledge is an organised scientific activity. However, Aggrawal's main concern is how this knowledge, which is rediscovered by the scientific community can actually benefit the people, who possess it. In this context, he is concerned about the the plight of the carriers of this knowledge, namely building artisans.

He further advocates that the appropriate response from those who are interested in preserving the diversity of different knowledge systems might lie

in attempting to reorient and reverse state policies and market forces to permit members of threatened populations to determine their own future. Thus, to facilitate in-situ preservation of indigenous knowledge, indigenous populations must gain control over the use of lands in which they dwell and the resources on which they rely.
Bertus Hoverkort has advocated local knowledge as a basis for encouraging local people to foster their own locally driven development. Thomas Heyd and R.C. Serrano have further related this issue to local people exercising control over land and resources.

However, this is a challenge in the context of broader development issues, notably the present realities of globalisation and market capitalism. The challenge is how best can this knowledge be kept alive in the present situation.

2.1.3 Capacity – Definitions and Positions

Webster's new Collegiate dictionary (2000) defines capacity as the ability or power to grasp and analyse ideas and cope with problems. According to (Schmuck, 2001), capacity encompasses potential of a given civil society,

- To determine who may use coercive power, and its capacity to restrict such use.
- To allocate resources efficiently and distribute resources equitably.
- To mediate and resolve disputes and conflicts between individual members as well as among groups.
- To identify problems and issues, develop solutions to those problems, and implement the solutions.
- To instigate and facilitate processes in which individuals and groups with diverse and competing interests excel as a result of engaging in competition; and, society's capacity to instigate and facilitate processes in which individuals and groups with common interests collaborate to reach a common goal or goals.

Capacity building refers to developing or acquiring the skills, competencies, and tools, processes and resources that are needed to improve the ability of a organization or a society at large to achieve success. It is the process of assisting an individual or group to identify and address issues and gain the insights, knowledge and experience needed to solve problems and implement change (California Wellness Foundation, 2001).

Another aspect of capacity building is aimed at strengthening neighborhood processes and systems so that individuals, families, and local groups may take control of their own lives. Capacity building is an explicit intervention intended to improve a community's potential to achieve its objectives in

relation to its environment. Capacities may also be potential strengths, which the community may or may not be conscious about.

Coping capacity

The term 'coping capacity' carries significance in a post disaster situation. Coping is defined as a manner in which people contest, struggle, combat within existing resources and range of expectations of a situation to achieve various ends (Websters and Blaikie et.al., 1997). Coping skills and capacities can be physical, social, economic and institutional.

In every society there are variety of internal social structures that help individuals and families through difficult periods. These are known as coping mechanisms. In a disaster they become collective instruments for organizing action on behalf of the disaster victims. Examples of coping mechanisms are: the family, the extended family, religious organizations, and clans. They can include more formal organizations such as villages and local governments (Cuny, 1983). In fact, the people hit hardest by disasters are, in the words of Ian Davis, 'coping experts'- people who are extremely self-reliant and, although poor, are quite capable of rapid recovery if adequate resources are made available (ibid).

In any coping situation, that which is most familiar will enhance the coping mechanism and its ability to operate (Kieffer, 1977). Local knowledge base and traditional wisdom that consitute critical local expertise may consitute coping capacity of rural communities (Anderson, Woodrow, 1989). Kieffer (1977) futher makes some observations with regards to coping mechanisms of rural communities;

> "In rural communities, external mechanisms will be more efficient and effective if they operate through an existing internal mechanism. The more contact a traditional culture has had previously with modern culture, the more readily will it accept assistance. Strong external influence may act, often inadvertently, to break up internal coping mechanisms and their effectiveness."

2.1.4 Conclusion

The above discussion brings forward the complex and dynamic nature of local knowledge and capacity. To start with, it is important to mention that local knowledge and capacity are not mutually exclusive terms. Rather in many cases, local knowledge is part of the existing capacity and vice-versa.

Understanding these is crucial in order to find their potential role in disaster management practices. Wisner (2001) claims that vulnerability studies and

practice have not given enough attention to local capacity, especially as social capital. According to him, the past attempts to study local knowledge, perceptions, and coping are mainly ethnographic and individualistic. Sometimes these have been appropriated by outside agencies seeking to "package" their standard remedies in language that will make it acceptable to "recipients" or "clients."

What is actually needed is an understanding of why and how local knowledge is rendered inappropriate or inaccessible, and ways that local people can be empowered to reclaim local knowledge and appreciate its usefulness. Of course, a balanced view of local knowledge is also necessary. Given major rapid changes in environmental conditions, locale (because of migration), population growth or decline (e.g. because of HIV/ AIDS), economic, and political change, some conventional local knowledge may be no longer applicable. Hybrid knowledge and practices are necessary that combine outside and inside points of view (Wisner et al., 1979; Wisner et al., 1991; Wisner, 1994a; 1994b; 1995a;1995b).

What also needs to be researched is how groups of people can be motivated to rediscover their own local knowledge or the generate their own in a cultural environment in which they are told by society that they are "ignorant", "superstitious", "uneducated", "incapable." Unfortunately these prejudices against the knowledge and capabilities of poor people, working class people, ethnic minorities, elderly people, youth and children,[1] the disabled,[2] refugees,[3] etc. are very common – I would say in subtle and unconscious forms, even universal – in urban and rural areas and in every country in the world (Freire, 1982; Hall et al., 1982; Goonatilake, 1984; Scott, 1985 & 1990; Colburn, 1989; Hardoy and Satterthwaite, 1989; Marglin and Marglin, 1990; Dudley, 1993; Eade, 1997; Holland and Blackburn, 1998; Grenier, 1998; Twigg and Bhatt, 1998; Peri Peri, 1999; Carrasco, 2000).

Last but not the least is the issue of artificial boundaries separating local knowledge from scientific knowledge in the academic discourse. Here I seek to inquire if there exists an 'interface' between these seemingly different 'knowledge systems' in the context of my study area.

With this frame of mind, I attempt to rediscover the local knowledge for its 'past', 'current status' and potential role in reducing disaster vulnerability.

[1] Hart, 1997; Johnson et al, 1998.
[2] Tierney et al., 1988; Helander, 1992.
[3] Refugees and displaced persons often show great creativity in adapting to their new surroundings and, as recent research has shown, do not necessarily destroy the environment of their new temporary homes (Black, 1998).

2.2 KNOWLEDGE AND CAPACITY OF TRADITIONAL COMMUNITIES – ethnological perspectives

Since my research deals specifically with the rural communities, it will be appropriate to discuss their characteristics from ethnological and dynamic point of view. While the former elaborate on the characteristics of inherent systems that work within living communities as interpreted by an outsider at one point in time, the latter presents a more dynamic view of transformation processes taking place in these communities. Understanding these mutually complementing perspectives are crucial for assessing the potential role of local knowledge and capacity for disaster management.

2.2.1 Defining 'Community'

The term 'community' is quite complex. In simple terms it implies a group of people sharing common ideas, ideals, resources, environment, aspirations etc. For Max Weber; Community means "belonging together… sharing a common culture, interaction and institutionalisation of central activities". One of the most logical definition of a community has been produced by the World Health Organisation in which a community has been defined as "a group in face-to-face contact having a harmony of interest and aspirations are bound by common values and objectives" (Alley, 1993).

According to Marsh (2001), the term community is both used and abused and misunderstood. Too often it is used in a sweeping fashion without the recognition that all that the people involved in disaster or crisis may have in common is that they live in the vicinity of the risk. Marsh further goes on to say that in fact there is no such thing as the community. Each of us belongs to a number of communities that may or may not be geographically based. He further makes a very important statement;

> "Going beyond the mere geographic or spatial description, community involves a sense of belonging and commitment. Time is involved in developing a community. It is a process and not a passive never changing concept. Community equals shared solidarity; its source is a common set of interests, values and attitudes. (p.4)"

For Ron Wild and Jim Ife; people are often not aware of the communities to which they belong. They simply exist.

For many people, 'a feeling of community', of a common cause, of meaningful relationships with one's neighbours is lacking as their value systems, their interests and activities are different. Thus, within any one neighbourhood or settlement, there will be many diverse communities and within each of these there will be many diverse opinions, value systems and

norms. In fact conflict may occur between opposing interest groups and lead to community formation.

Marsh (2001; 4) further categorises communities on the basis: -

- Of affection or of function e.g religious, ethnic, class or gender when they have emotional ties with each other, where there's a group sharing something together.
- Of competition: where groups come together – in sentiment – as they compete for economic, political and / or social interests which leads to community solidarity.
- Of status, gender groupings and interests e.g. manual workers, professionals, farmers, service workers, non-paid residents etc.
- Of the spatial or local community- using a broader definition of community that is used by administrative councils, community agencies etc. particularly encompassing a geographic area.

For the purpose of management, community implies some or all of the following: a territorial area, a complex of organisations within an area and above all, a sense of 'belonging'. Marsh (2001) believes that knowledge of community for those actors involved in the field of disaster management is important, particularly if a community centred approach is adopted rather than an agency centred one. This aspect will be dealt with later.

The broader scope and definition of community is important while considering 'socially and culturally complex' rural communities. Although they may appear to be homogenous entities belonging to one village, this may not be the case. The difference in class and ethnicity may be an over-riding factor in defining common ideas, ideals, resources, environment, aspirations etc.

2.2.2 Traditional communities – ethnological perspectives'

As mentioned before, ethnological study implies cultural understanding of living communities by carefully observing the systems and relationships existing in a particular community at one point in time. Such a study can help to determine the structural reasons for vulnerability and capacity of these communities to mitigate, prepare and recover from natural hazards.

First and foremost, it is essential to understand the difference between communities and societies. While the former share common interests and values and thus are homogenous, at least in some respects, the latter are more complex and diverse in their nature.

Here I give reference to the concepts of Gemeinschaft (which are also referred to as pre-industrial, pre-literate, traditional or organic communities) and

Gesellschaft (which are characteristic of the social structure in Industrial societies), which were conceived by Tönnies, as early as in 1887.

Social Relationships

The concepts of Gemeinschaft and Gesellschaft are used to differentiate nature of social entities. All social values and ideals have their points of reference in social relationships, collectives, and social organizations. These keystone concepts or ideal types are based primarily upon natural will (in case of Gemeinschaft) and rational will (in the case of Gesellschaft).

According to Tönnies (1988), in the Gemeinschaft communities, the relationship between the community and its members is based not on contracts, but upon understanding, like that within the family. In these communities, social relationships result from physical relationships, which are willed. Elaborating on the nature of these relationships, Tönnies further states;

> " Such relationships are conditioned by the wills of others not directly involved, in as much as society has established or institutionalized rights and duties of individuals. Between individuals in social relations with each other, there always exists a consciousness of something toward which the participants have rights and duties.
>
> The social relationship is the most general and simplest social entity or form. It also has the deepest foundation, because it rests partly upon the original, natural, and actual conditions as the causes of connections, of mutual dependence, and of attachment among people, and because it rests partly on the most fundamental, most universal, and most necessary requirements of human beings. The one basis, like the other, is raised to consciousness with different effects. (p. 7-9)"

On the other hand, the theory of the Gesellschaft deals with the artificial construction of an aggregate of human beings, which superficially resembles the Gemeinschaft in so far as the individuals live and dwell together peacefully. However, in the Gemeinschaft they remain essentially united in spite of all separating factors, whereas in the Gesellschaft they are essentially separated in spite of all uniting factors.

Resource Use

Gemeinschaft communities and Gesselschaft societies can not only be distinguished on the basis of social relationships, but also on the basis of relationships to various resources for example land. Land may in one society (Gessellschaft) be a mere good offered for sale with no more ceremony than exchanging of one denomination of money for another. In another society (Gemeinschaft), however, the land may be the common property of a group,

and may represent spiritual values so closely bound up with the integrity and sanctity of group mores that it could never be transferred.

Morover, Gemeinschaft communities are characterised by collective or shared resource use. The village community, even where it encompasses also the feudal lord, is like one individual household in its necessary relation to land. The common land is the object of its activity and care and is intended partly for the collective purposes of the unity itself, partly for the identical and related purposes of its members.

Relationship to nature and religion

Unlike his pre industrial counterpart, industrial man has sought attainment over, rather than attunement to, the divine and/or natural order. The religion has been a potent force making for order in the preindustrial community. The periodic religious ceremonies, in which a large segment of the community may participate, are one of the few mechanisms the society possesses for integrating disparate groups in an otherwise segmented community. Moreover, various regulations are governed directly or indirectly through customs, folkways and mores of the people.
However, more complex and rationalistic society becomes the more the forms of law become divorced from customs, folkways and mores of the people, and the more important legislative law becomes.

The nature of knowledge and its communication

The nature of knowledge in Geminschaft communities is primarily oral and the lower class and not the educated elite perpetuate much of this knowledge. The artisan, the merchant, the herbologist, the barber-surgeon, have all attained a degree of technological know-how. Metal workers, weavers, dyers, potters, and others often possess rather detailed empirical knowledge, garnered through the centuries of hit-or-miss observation. But this empirical knowledge has been passed on through informal means; it has rarely been put down in writing.
Further commenting on the nature of knowledge in Gemeinschaft (preindustrial) societies, Tönnies states that;

> "The data from myriad feudal orders – traditional India, Tibet, medieval Europe, traditional China, the Middle East – indicate that the abstract thinking, or theoretical framework, of the intellectuals or learned men has not been related to the technical knowledge amassed over time by the common man; the two have been almost completely disjunct. Practical knowledge, being obtainable largely through work with the hands, has been devalued, often most strongly by highly literate, educated men. Intellectuals' concern with everyday matters is limited mainly to the ceremonial aspects of religion or to the political arena. The abstract thinking of the learned men was based on

> observation and speculation, only rarely upon experimentation; nor were their theories conjoined with the practical knowledge of the lowly artisans. This latter would have required work with the hands and identification, or at least closer contacts, with the common man."

Traditional communities have a distinct way of communicating the knowledge, which is very different from the present system of education. As expected in a social order with few mechanisms for diffusing knowledge via the written word and none for achieving oral communication on a massive scale, instruction for most of such societies is gained through direct, face-to-face contacts. Children learn from family members at home, by observation in the streets and markets, and in their place of work. Those fortunate enough to gain a foothold as apprentices to shopkeepers or artisans receive specialized, albeit informal, training in a specific occupation. And everywhere storytellers, street singers, and actors diffuse some knowledge through oral or visual means.
Stanford Anderson (1999) brings out the distinction between traditional communities and modern societies on the basis of their memory systems. He states;

> "Considering the operation of memory in a society/community and its extension in time, is it essential to make a distinction between those communities/societies that possess only memory and those that confront memory with history? In an oral community, even if there is a dynamic that leads to a collective understanding of the past, memory resides in individuals. The absence of records contributes to the modification of social memory and tradition from generation to generation. The past is not as much separate from, as subsumed in, the present. In preindustrial communities, cultural tradition is maintained in face-to-face communication and in the context of present issues. In such an oral community, forgetting – and even forgetting that one forgets – is as important as memory. Collective memory functions in oral societies according to a 'generative reconstruction' that eliminates or transforms those parts of the tradition that are no longer operative. (p. 16)"

Anderson believes that vernacular architecture represents at least a close cohesion of social and disciplinary memory, and second, it is the advent of writing and history that has invited the increasing distinction between these memory systems.

2.2.3 Communities in transition - dynamic perspectives.

However as said earlier, the discussion of traditional communities principally as Gemeinschaft societies and discussion of their main characteristics is very much an ethnological view, which is more or less static in nature.

Such communities are undergoing structural transformation due to changing social, political and economic context. One of the predominant reasons for these changes is the impact of 'modernity'. Deborah Lupton (1999, P 75) in writing on Giddens' (1990) view of risk, reflexivity and the conditions of modernity aptly summarises the impact of modernity on pre-industrial communities. She states that

> "The progressive separation of space, place and time and the increasing role played by disembedding mechanisms – all depend upon trust, vested not in individuals but in 'abstract capacities'. People now cannot simply rely on local knowledges, tradition, religious precepts, habit or observation of others' practices to conduct their everyday lives, as they did in pre-modern and early modern times. Rather they must look principally to experts they do not personally know and are unlikely ever to meet to supply them with guidelines."
>
> This is also related to what Lupton had said earlier in her work, as she commented on the work of Ulrich Beck (1999; 67);
> "People must deal, therefore, with uncertainty: conventional social order seems to be breaking down in the face of the undermining of old uncertainities"

Marsh further states that the impact of the 'modernisation processes' on 'community' and subsequently on disaster management has been profound. For example, with the rise of neo-liberalism bringing with it a lack of certainty together with an emphasis on individualisation within western societies, we have experienced a move from social to individual rights with a subsequent drop in shared social activities and response to disaster.

In order to have a more dynamic picture; one needs to look into these anthropological characteristics that determine the current behavioural patterns, which in turn affect their vulnerability to natural hazards such as earthquakes.

2.2.4 Conclusion

The above discussion has highlighted the general systems that have characterised traditional communities. These systems may embody some of the local knowledge and capacities of these communities to mitigate the impact of disasters. This needs to be looked at in the specific context of the research.

In the light of theoretical understanding of 'traditional' or 'pre-industrial' or 'pre-modern' communities, the rural communities of south Asia are analysed for their transition from 'pre-modern' to 'modern' and from 'coherent communities' to 'multi-cultural' societies. The impact of these transformations on their traditional knowledge and its implication for changing vulnerabilities

and capacities to mitigate, prepare and respond to disasters is further analysed through three case studies.

2.3 TRADITIONAL BUILDING KNOWLEDGE IN EARTHQUAKE MITIGATION

First of all, I will present a brief historical review of seismic research in buildings and structures. Existing research efforts to rediscover local building knowledge for earthquake mitigation follows this.

2.3.1 A historical review of seismic research in buildings

During the period of emergence of seismic design as a discipline within which an academic career could be made, research settled solidly into the engineering schools. This paralleled the existing professional perception that seismic design was the engineer's province. Therefore, most of the research focussed on designing seismic resistant structures and testing the strength of building materials using such powerful analytical tools as computers (Arnold, 1984). All this work was reasonably scientific and, because of its mathematical and experimental bias, depended a great deal on abstraction and elimination of ambiguity. For the engineers, the focus was mainly on modern high rise structures in Reinforced Cement Concrete.

However, the research activity, effective though it was, only dealt with a portion of all the issues that entered into seismic hazard reduction. Continued refinement of the design process for future high rise construction, for example, ignored the fact that the vast majority of people live and work in existing low and medium rise buildings.

Architectural research was conspicuous by it absence, as late as 1975 (ibid). Initially the research was essentially building centred and focussed primarily on physical configuration, design and finishing aspects. In the early eighties, Ed Arens of Berkley extended the scope of architectural research to include site, landscape and urban layout. Inclusive in this was the idea that architectural research should look at the relationship between a building's design and how well the building functions. This illustrated a way of looking at buildings that was much more inclusive than that of the engineer.
It was only in the late eighties and early nineties of the last century that architectural research began to focus on traditional and vernacular architecture and attempts were made to rediscover the traditional technology, inherent in their design and construction. However, the approach still remained primarily building-centred with focus on individual building structure and materials.

2.3.2 Traditional Building Knowledge for earthquake mitigation – existing research

Traditional buildings widely distributed across the world and forming part of many different architectural traditions, could provide a wealth of information to present and future generations on how buildings can adapt to seismic threat and how the problem of earthquakes may be solved.

This aspect was brought into focus as examination of damage pattern after some earthquakes showed that many traditional buildings performed fairly well, for example, the Armenia earthquake in 1988, the Turkey (Marmara) earthquakes in 1999 and 2000. Turkish architects Demet Gulhan and Inci Ozyoruk Guney have shown first hand evidence that people living in modern, reinforced concrete structures died at a much higher rate than people living in older, traditional houses during the 1999 Marmara earthquake.

Importantly most of these buildings are not big monuments; rather they are simple buildings in their time, occupied by the ordinary, also called vernacular housing structures occupied by the ordinary people. They are seemingly unpretentious, weak, insubstantial, but characteristically common buildings. Importantly, their significance does not owe to the fact that they are of great age. Many of them built as late as in the early 20th century. However, quite significantly, most of them have been built before reinforced concrete got introduced in the region.

Such buildings are most often constructed of masonry and timber- rubble, mud and lightweight pieces of wood – without even money for stucco or fancy finishes. They can be found wherever there exists seismically active belt that extends around the globe from Africa and Europe across Asia, and also in Central America (Langenbach, 2000).

There are very limited studies that look into traditional building knowledge per se. However most of these studies do not consider the traditions significant enough, worthy of consideration. In fact, many of these studies look at the pattern of damage by investigating the ruins; very few look for what had survived.

Some examples of traditional building technology from around the world are presented below:

- Traditional construction in San Salvador, called *bahareque*, consisting of timber studs of small dimension (approximately 50mm X 100mm) set vertically, approximately 600 mm on centre, with wood or bamboo lath nailed to each side to form a pocket in the wall. The pocket is

filled with stones in mud mortar or adobe. The wall is then plastered with mud or lime plaster directly over the filling and the lath.

- *'Taq'* construction in Kashmir consists of load-bearing masonry piers and infill walls, with wood "runners" at each floor level used to tie the walls together with the floors. In this type of construction, thick walls of masonry are bonded together with large horizontal timbers embedded in the walls. There are no vertical timbers except around the doors and windows, and thus no timber frame. The overburden weight of masonry serves to "prestress" the underlying walls, contributing to the building's resistance to lateral forces (Langenbach, 2000).

- Similar observations are made for 'Dhajji-dewari' construction, also in Kashmir. The timber runners tie the short wall to the long wall and also bind the pier and the infill to some extent. Perhaps, the greatest advantage gained from such runners is that they impart ductility to an otherwise, very brittle structure. An increase in ductility augments the energy absorbing capacity of the structure, thereby increasing its chances of survival during the course of an earthquake shock (Gosain and Arya, 1967).

- The vernacular housing in Chamoli region in Indian Himalayas also shows some features that help in mitigating the impact of earthquakes. These walls are made in rubble masonry laid in mud mortar. These houses have solid foundations resting on bedrock. Besides the opening system used traditionally is good with enough set back from the corners and the provision of good anchorage. Moreover, the symmetrical house form also serves to mitigate the lateral forces resulting from earthquakes (Sharma, 1999)

- In Turkey, in the Ottoman style house, overhanging jetties actually serve to strengthen the buildings because the joists, which extend well beyond the walls below, hold the walls firmly in place with the weight of the overburden. This compressive force gives the walls below added strength against lateral forces. On the upper floors (or all floors in some buildings) the timber frame and masonry infill style of construction is most prevalent. By not continuing the heavy masonry up to the roof, but substituting the timber frame with a single layer of brick, the walls are lighter, and thus may be supported on the cantilevered joists and brackets.

- In northern Anatolia (the black sea region) of Turkey itself, "Goz Dolmas" technique (filled cells with stone type material) is one of the first examples of prefabrication of wooden structures. It has been developed from the time when the supply of timber began to gradually decrease, and when other readily available building materials, such as

stone and lime, started to be employed for façade construction (Cakir, Ôkten, 2000)

- Also, traditional timber-framed buildings in China have performed excellently in earthquakes. For example, in the 1996 earthquake in Lijang, traditional buildings remained intact while more modern ones collapsed, even in the most seriously damaged areas of the town.

- Similarly, surveying the damage caused by 1963 Skopje, Yugoslavia, earthquake, a London engineer N.N. Ambrasseys reported that the "old adobe construction, particularly those with timber bracing, resisted the shock with some damage, but behaved far better than the 'modern' brick or the hybrid (reinforced concrete with brick infill) construction".

- In the same manner, adobe constructions in Peru are known to demonstrate good seismic performance (Jurina and Righetti, 1999).

- Traditional stone constructions in Yemen also recognised the need to demonstrate certain construction principles in order to withstand earthquakes. Such details are evident in many surviving buildings. (Barahkat, 1993)

In fact, most of these constructions are 'Cator' and 'Cribbage' constructions. The former is known in Turkey as *'Hatil'* and is horizontal structural reinforcement. The latter is an open box-like column made up of short pegged together timbers, to create a structure similar to that traditionally used for supporting coal mine roofs. The main aim of using wood is to reinforce adobe, fired brick and stone masonry with horizontal and vertical ties, which impart a good shear-tensile-torsion resistance capability. This is applied to traditional structural systems that usually work well only in compression (Hughes, 2000).

These complex timber construction techniques are extensively used in the setting of the many tectonic plate junctions traversing Macedonia through Turkey and Iran and over to western Tibet. They are most functionally elaborate in the mountains of northern Pakistan. The techniques, with many variations on a theme, date back to the seventh millennium BC, most probably spreading out from Anatolia. The techniques also reached Yemen, Egypt and Morocco, also countries with tectonic fault structures. (ibid)

These buildings have certain qualities that help in the mitigation of earthquakes and not just resisting lateral forces of earthquakes but absorbing their impact and dissipating them evenly. This is due to special characteristic of most of these structures – the ability of the disparate materials, each of relatively low strength, to work together as a single system to resist catastrophic damage from the overwhelming forces of earthquakes.

Another common feature of most of these constructions is use of timber. Unlike, inflexible concrete structures, timber buildings have the ability to move with an earthquake and absorb its force throughout the entire structure. Also they have some special features, if not the whole building structure, which are effective in mitigating the impact of earthquakes.

2.3.3 Existing vulnerability of traditional buildings

In spite of these qualities, the ground reality at present is that most of these structures are weak and highly vulnerable to earthquakes. This is substantiated by the fact that in recent earthquakes, the majority of them were heavily damaged and this has resulted in great loss of life.

One needs to ask the question – what has changed between the past and the present? Why have people lost the kind of knowledge and familiarity with the construction of their own houses in the traditional way that they once had?

The damage to these structures is actually enhanced by previous deterioration, or it is a failure of the system or a maintenance problem. For example, most of the damage to traditional *Bahareque* buildings in San Salvador was due to rotting of timbers, which were permeated with insect holes (Langenbach, 2000). Lewcock (1983:6) attributes the destruction of traditional Yemeni construction following 1982 Dhamar earthquake to the following;

> "…The builders have become skimpy and careless; building materials and mortars are often poor, foundations weak, wooden ring beams are inadequate and often are not properly joined, and roof beams are of poor quality and too short, with bearing over only a short distance into the walls".

However Barahkat (1993) believes that it is too simplistic to blame it all on the carelessness of the builders. According to him, it also has to do with economic pressures that must have led both the householders and their builders to cut costs by excluding some of the traditional reinforcement details. For instance, timber was often used in the walls to strengthen and stabilise stonework; in recent years this practice has been abandoned.

Also in some cases the basic building materials are no longer available, for example in Nicaragua, the *'taquezal'* or "pockets of mud" construction suffered heavily in the 1971 earthquake compared to the 1931 one, because, in this span of time, lumber from locally grown tropical hardwoods ceased to be available, and was replaced by the more vulnerable northern softwood (Ibid).

Another reason is that importation of reinforced concrete building technology has often been so effective in displacing the native ways of building that the memory and understanding of those ways has effectively disappeared.

Also, a lot of these houses have been altered and modernized in ways that has corrupted the integrity of their original construction. For example, in Nepal, the only seriously damaged parts of the building after the 1988 earthquake were the walls, which had been partitioned, and new windows installed. This is also the case in Chamoli where addition of one or more rooms to make an extension, replacing sloping roof with a flat one using reinforced cement concrete of poor quality and changing the size and type of windows is making vernacular housing more vulnerable to earthquakes (Sharma, 1999).

These examples point to the fact that there may be nothing in particularly wrong with inherent technology, rather the problem may lie with its existing condition.

2.3.4 Conclusion

The technical view is explicit in most of these studies on traditional buildings and structures. These have concentrated essentially on the effects of ground motions on the artefacts alone. The buildings are seen merely as documents embodying knowledge, a sizeable amount of which may have disappeared. The essential link between the buildings and their spatial location and their interrelationship with the people was essentially missing. In that way seismic research produced limited results. Moreover, these studies do not see local knowledge in the light of the present realities, in an effort to see their current relevance in reducing disaster vulnerability.
Arnold (1984) rightly believes that to say that architectural research is dedicated to determining the relationships between a building's physical form and its functions are hardly limiting- it encompasses vast fields of research in the physical, biological, and social disciplines. This comment introduces the important notion of the integrative nature of architectural research and our sense that the building does not exist purely as a physical entity but its functions ultimately depend on its relationship to people.

The time dimension is not given importance, especially in relation to hazard events i.e. earthquakes. The built fabric undergoes changes after every earthquake. In fact, every earthquake provides an opportunity to do structural changes, for example, following the 1934 earthquake in Nepal, the erstwhile Rana king reconstructed the historic temples, palaces and housing by undertaking some modifications which were made to improve the seismic performance of these reconstructed buildings. Similarly, a mixed-structure wood-masonry building type, locally called "casa baraccata", was developed to rebuild 153 villages in Calabria (south Italy) after the 1783 earthquake. The same system was also followed after the 1883 earthquake on the island of Ischia (Naples, Italy) (Polverino, 2000)

Last but not least, the complex and dynamic aspects of traditional building knowledge needs to be studied to search for its relevance in disaster management practices.

3. THEORETICAL DISCUSSION ON DISASTERS AND VULNERABILITY

This chapter deals with theoretical discussion on disasters and vulnerability. It is organised into two sections. The first section will examine various aspects that contribute towards theoretical understanding of disasters. Their theoretical conception and understanding has undergone a significant shift over last few decades. This is followed by a discussion of various approaches for analysing vulnerability.

3.1 UNDERSTANDING DISASTERS – CHANGING THEORETICAL PERSPECTIVES

3.1.1 Techno-centric paradigm

Most of the 20th century witnessed a technocratic approach, which was essentially based on objectivist, positivist, determinist and reductionist assumptions of logical empiricism[1]. The application of measuring and monitoring techniques, sophisticated management strategies and engineering structures (e.g. dams, levees) were seen as the only choices humanity had to withstand the vagaries of nature. Scientific effort was spent on the study of environmental triggers, rather than on human actions, with great emphasis placed on geo-tectonics, climatological, or biological 'trigger' events arising in nature (Bolt *et al.,* 1977; Bryant, 1991; Smith 1992).

Accordingly, disasters were attributed to natural forces, representing them as a departure from a state of normalcy to which a society returned to on recovery. This denied the wider historical and social dimensions of hazard and focused attention largely on technocratic solutions. (Gregory Bankoff, 2000). Under this paradigm, disasters were conceived as similar to wars. Gilbert (1998) states that;

> "Catastrophe was imputed to an external agent and human communities were entities that reacted globally against an aggression. Bombs fitted easily with the notion of an external agent, while people harmed by earthquakes bore an extraordinary resemblance to victims of air raids. (p. 11)"

[1] According to this model of Technical Rationality - the view of professional knowledge which has most powerfully shaped both our thinking about the professions and the institutional relations of research, education and practice - professional activity consists in instrumental problem solving made rigorous by the application of scientific theory and technique (Schon, 1983:21).

The hazard science and risk field thus drove research in the disaster field for most of the 20th century, building strong alliances with applied scientific disciplines (i.e. engineering). The outcome was concentration of effort in three areas (Hewitt, 1983a, b)

- monitoring and analysis of geophysical processes,
- Designing, planning and managerial activities to contain the geophysical processes or to modify human behaviour relative to those processes.
- Developing emergency measures (warning systems, relief).

Such an approach also established a conviction that societies were able to take steps to avoid or ameliorate disasters through a 'command and control model' of planning, which advocates the application of appropriate technocratic measures properly carried out by bureaucratically organised and centrally controlled institutions. Disaster prevention, therefore, was seen as largely a matter of improving scientific prediction, engineering preparedness and the administrative management of hazard. Kenneth Hewitt argues that this technocratic approach permitted hazard to be treated as a specialised problem for the advanced research of scientists, engineers and bureaucrats, and so be appropriated within a discourse of expertise that quarantines disaster in thought as well as practice (1983:9-12, 1995:118-21)

Moreover, the planning solutions were thought as establishing a number of restraining criteria for land development arrived at by making a weighted evaluation of several factors linked with a given risk (intensity, frequency, vulnerability of certain structures). (United Nations, 1978)

3.1.2 'Alternative' paradigm - Social perspective of Disaster

In the eighties and nineties, seismic research took on a new meaning in the field of social sciences with research on the societal response to various disasters (including earthquake). Luhmann (1993) provided a vocabulary for analyzing how highly differentiated social systems attempt to deal with the uncertainity created by disruptions. His analysis examines the language of risk and danger as part of a general social process by which social systems reduce complexity in their environments. His general work on systems theory (1992,1995) remains an untapped resource for disaster researchers.

According to Susan Cutter (1998; 180),

> *'societal responses to* hazards are related both to perception of the phenomena themselves and to awareness of opportunities to make adjustments. It is unusual for a society to be unaware of the existence of possible hazards in its environment. Yet, the perception and definition of the threat constituted by such hazards may differ markedly between and within societies. A wide range of responses thus

> characterises the manner in which a society may act to minimize the impact of a hazard'.

Moreover, disaster vulnerability extends beyond the mere probability that someone is killed, injured, or suffers loss. It is also seen to embrace the relative ease or difficulty with which an individual, family group or social group recovers following a disaster. (Ben Wisner, 1997).

Recently, a lot of debate has also been generated among sociologists on various perspectives on the question 'What is a Disaster?'(Quarantelli, 1998). However the focus of research again has been on societal responses to hazards and not on the processes that produce disasters (Piers Blakie,1994). Blaikie states that the vulnerability of people is primarily rooted in social processes and underlying causes which may ultimately be quite remote from the disaster event itself. It is a means for understanding and explaining the causes of disaster (Blaikie, Cannon, Davis and Wisner, 1997).

Here one must acknowledge that the research on the social aspects of disasters focused and recognised the importance of local contexts for the first time. The observation that human and material losses from natural hazards increased over the twentieth century without conclusive evidence of a corresponding rise in the frequency of such events, and the same phenomena caused vastly different outcomes both between and even within societies, have drawn attention to the need to view disasters from a wider social and historical perspective (Hewitt, 1997: 11).

Accordingly, disaster is defined as an expression of social vulnerabilities (disaster is the result of underlying community logic, of an inward and social process). As such, it cannot be regarded as a discrete event, because by doing so it becomes externalized from the activities and processes that create its context. Moreover, a disaster is not only part of its context, it is in part caused by its context. This context is physical but social, institutional and political as well. Hewitt (1997:11) has aptly summarised the above approach;

> "The new approach to disaster not only reverses the old hierarchy of factors, but also gets rid of the overwhelming notion of agent. Starting from an analysis of disaster seen as a process tightly tied to social vulnerability, the new paradigm considers that the causes of disaster are to be explained on structural as well as contextual grounds. When social risks explode that are totally raised inward into the community, then there is a disaster. As a result of this first conceptual shift, disaster is no longer experienced as a reaction, it can be seen as an action, a result and more precisely as a social consequence."

Putting it briefly, two main factors that are essential in understanding disasters from a social perspective are:

- the event's effect on people and their environment
- And, the human activities that increase its impact.

3.1.3 'Alternative Paradigm' – Developmental perspective of disaster

Much of the thinking surrounding the relationship between disasters and development has been (and still is) about how post-disaster response can be better made to relate to 'development'. In the meantime, development has run the risk of being interrupted and impeded (or even negated) by disasters and post disaster responses, but development has been something apart from such inconveniences. The disaster-development 'continuum' has been the most recent expression of this concept (Cuny, 1983, James Lewis, 1999).

However vulnerability itself accrues as a result of processes of change and therefore is a potential product of all activities and undertakings of society. It is the product of sets of prevailing conditions within which disasters may occur. Development is (usually) a planned process of change which as the creator of prevailing conditions and contexts within which people live and participate, becomes the framework within which all else happens – planned or unplanned. Lewis (1999) advocates that vulnerability has to be addressed therefore, not only by post-disaster concern and response, but as a part of the day-to-day management of change – whether or not this change is called development.

In the literature on disasters and development it is common to find statements to the effect that development can either increase or decrease vulnerability and disaster risk according to the consideration given to risk reduction in the formulation and implementation of development projects (see Stephenson, 1992, for example). On the other hand, Anderson and Woodrow (1989) in their excellent study of reconstruction strategies in times of disaster offer an elegant and succinct definition of development stating that this involves a process whereby vulnerabilities are reduced and capacities increased.

Lewis (1999) sees the 'obvious' contradiction between the two types of statement summarized above. He states;

> "If development involves the reduction of vulnerability it obviously can not at the same time lead to an increase in this! If this were not the case then it would be equally valid to say that development can both lead to an increase and decrease in mortality rates, educational levels, and living and health conditions. This is clearly not so. Development can never be defined in terms of the propagation of negative conditions for human welfare. This does not of course deny the fact that economic growth and change does lead to the development of those who gain

> access to it's rewards whilst others, many times the vast majority, are excluded from these benefits, living in conditions of deprivation and poverty. (p. 127)"

He believes that a good part of the conceptual problem relating to vulnerability and development derives from two common errors. Firstly, economic growth and development are many times considered to be synonyms. Given this it is common in the disaster field to refer to all investment projects as if they were development projects without giving much consideration to their development impacts. For example, take the case of projects that promote certain development parameters such as improved education and health for the underprivileged, whilst at the same time constructing vulnerable schools and hospitals for attending these needs.

Secondly, vulnerability is considered as a dependant variable that can be influenced negatively or positively by development. Vulnerability is not thus considered to be a part of the development or underdevelopment process as such. Lewis considers this as an unsustainable argument. He states that;

> "The reduction or non-creation of disaster and other types of human vulnerability should be considered an integral component in the definition of development. As such it should be included amongst the important parameters used in such indices as the UN Human Development Index."

This discussion points to the significance of 'notions' of development. What is conceived as 'development' by some, may in fact lead to under-development of a few sections. This point is very crucial while looking at the inter-relationships between disaster and development.

The relationship between disasters and development is particularly relevant when it comes to the vulnerability that affects the masses of urban and rural poor in the developing world who have little access to the resources, power and choice mechanisms needed to radically change their life circumstances. According to Lavell (1999), these people and the vulnerability they suffer end up being the "necessary" and supposedly "non structural" result of someone else's adequate growth and development policy. It is extremely difficult to imagine an economic growth model that continually leads to an increase in poverty being accompanied, at the same time, by a government inspired social policy that guarantees that those affected by poverty live on safe land, in safe houses and with safe livelihoods! This argument of Lavell is based on his criticism of the current forces of neo-liberalism and globalization, structural adjustment and privatization dictated by established parameters of growth models. He wonders whether it is really possible to significantly reduce the levels of vulnerability without fundamentally changing the parameters of the growth models as such.

Shifting temporal framework

Disasters, in the same way as other types of economic or social crises, have a life history. This includes pre-disaster situation in which the structural conditions for disaster are established, the period of onset, when natural hazard such as earthquake strikes and resulting development of disaster conditions as such, and finally, the subsequent responses of society during what are known as the relief, rehabilitation and reconstruction "phases".

Lewis believes that these distinct moments are somewhat inaccurately portrayed as the "before", "during" and "post disaster" stages in the jargon of disaster experts. As such, disaster, reconstruction and development are conventionally perceived and represented linearly. In reality however they are simultaneous, each 'stage' overlapping with others in the same or neighbouring places and in response to the same or different disasters and responded to by the same or different authorities and organizations. This leads us to ask which way round should the relationship between disaster and development be; 'disasters and development' or 'development and disasters'? Which comes first and which has the greater influence upon the other? Cuny (1983) has put forward this argument very comprehensively;

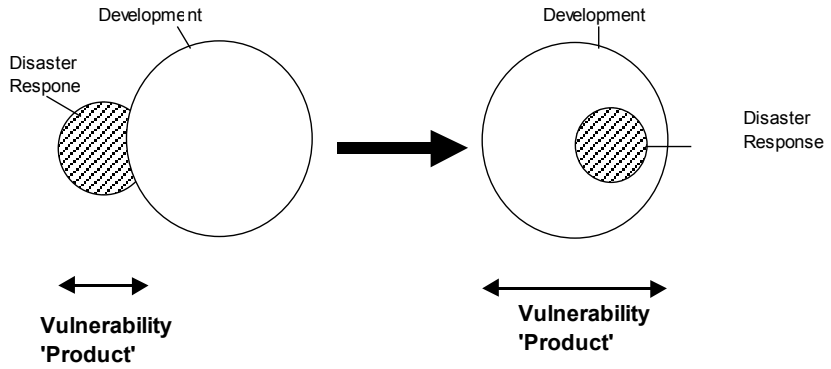
> "For a single disaster event, Disaster, reconstruction and development, usually represented linearly, are in reality cyclical. Though a disaster may commence a process that leads to development, development has invariably preceeded disaster and had a bearing upon the extent and implications of the disaster that ensued – for better or for worse .(p. 129)"

The above arguments lead us to believe that an accurate and relevant assessment of this can only be achieved using an integrated temporal framework for analysis as suggested by Cuny; (1983) and Lewis, (1999). I also intend to use this framework of analysis for my research. This framework considers disaster causes, consequences and social response in the same analytical framework. This signifies that if we are to achieve an adequate balance as regards the interpretation of the impact of disaster on development, we must also consider the ways in which different models and patterns of economic growth have contributed to the very disaster conditions we are analyzing. These two "moments" cannot be considered apart as if they were two different problems.

As Albala Bertrand has so convincingly pointed out, the restriction of the notion of disaster to the destruction and disarticulation brought by the event itself, and its immediate consequences, belies the very idea of disaster as a phenomenon. Any relevant analysis must also consider the responses and

reactions of society to the events and the destruction. This means that any integral and valid conclusions as regards development effects can only be drawn if the analysis comprehensively studies immediate disaster impact and the subsequent reactions of society during the response and reconstruction "phases". The 'disaster continuum' approach positively attempts to align post-disaster assistance with development, recognizing the intervening stages of recovery, rehabilitation and reconstruction.

However, the self-centric 'disaster cycle' discussed earlier did not acknowledge that there were other sectors of activity continuing outside the cycle. Not everything that happened, or that was undertaken, pertained to this interpretation of natural disaster management, though it invariably did subscribe to the contexts for the impacts of natural disasters themselves. Development or simply 'change' was also taking place – of its own inevitable



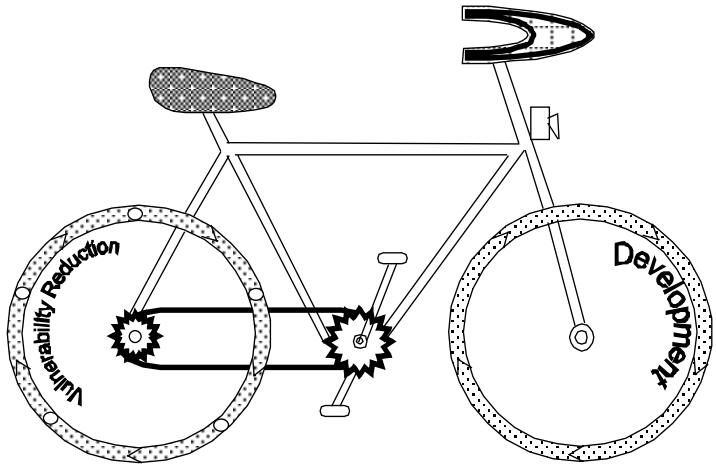


Fig. 3.1 Changing relationship between vulnerability reduction and development
Source- Lewis, 1999

volition or in a planned and programmed way. Lewis further suggests that there is not one 'cycle' but two; it was not a 'disaster cycle' but a 'disaster bicycle'. However, he is careful to point out that the disaster cycle and the development cycle were not, and still are not, driven by the same forces.

3.1.4 'Alternative Paradigm' - Ecological perspective of disaster:

Systems theory in sociology is especially underdeveloped in the area critical to the study of disasters. This is because it has neglected the theoretical placement of human systems in the context of a general ecological field, or active environment, in which human socio-cultural systems can be seen as part of larger natural processes. To use systems theory to understand disasters, it is obviously necessary to broaden systems theory by developing a conceptual apparatus that can allow us to construct images of a process which involves organized human action in the environmental context in which it takes place.

As already elaborated in the social perspective, disasters emerge as a result of interaction between humans and the environment. In particular, they arise when there is a lack of 'mutuality', a measure of both how well a society is adapted to the environment and how well that environment fares at the hands of human activity (Hoffman and Oliver-Smith, 1999:6). As a society interacts with its environment, it engages 'in a series of processes over which it has incomplete control and incomplete knowledge, particularly over longer periods of time' (Oliver Smith, 1999:26). It is these conditions that turn a natural phenomenon or hazard into a social crisis, a disaster. At its most extreme, it can be argued that disasters are always present or embedded in the local-level society and that a hazard simply provides the catalytic agent to produce an intense social crisis (Watts, 1983).

Looking at this aspect from an ecological perspective, then, disasters are primarily processes in which hazardous events represent moments of catharsis along a continuum whose origins lie buried in the past and whose outcomes extend into the future. It is the pre-disaster conditions that mainly affect a soceity's ability to cope with hazard; it is its reconstruction operations that largely determine the effects of subsequent events. The point is that disasters are totalising events in that all dimensions of a social structural formation and the totality of its relations with its environment may be involved (Oliver-Smith, 1999:20, Gregory Bankoff, 2001).

An integrated ecological approach conceptualises the nature of disasters as total events in such a way that they are thought of as part of a natural process in which human systems and their environment interact, changing in relationship to each other in a kind of evolutionary process. The theoretical perspective needed should also be capable of conceptualising the process by which disasters are produced, develop as events and are eventually absorbed as part of the natural evolutionary process of this planet.

While the relationship of disasters and development is cyclical or bi-cyclical, the ecological relationship is in the form of a cyclic loop.

3.1.5 Conclusion

The above discussion brings out various perspectives on disasters, as an alternative to the traditional 'techno-centric' paradigm. Taking all these 'alternative' perspectives into consideration, an integrated framework will represent a shift from focussing only on the technical aspects of the physical phenomenon to a wider perception, that natural disasters are predominantly environmental, social and developmental issues. This does not mean that we can deny the significance of technical aspects.

- First, the impact of natural disasters is affected by a society's values and institutions which shape the development and planning processes, the production of goods and distribution of resources, and the provision of opportunities and socio-economic facilities; this is a *social perspective.* However here I acknowledge that although the social dimension is explicitly articulated in the available literature, the cultural dimension is conspicuous by its absence. This dimension is explored at a greater length for my research context.

- Second, the crucial link between disasters and development is shown. The impact of natural disasters on human settlements results from the failure of the human use system, pre- and post-disaster, to protect people and their belongings. In the pre-disaster situation, this is directly related to the existing development conditions, which create vulnerability to disasters in the first place. These include among many other factors, settlement growth, construction methods, and planning for mitigation as well as the economic marginalisation of certain sections of the society. In the post-disaster situation, the impact is influenced by the effectiveness of relief and emergency operations, the availability of resources to deal with the losses and chaos and long term coping strategies and various other methods which are also dependent on the 'development conditions' in a particular society. In short, the impact of natural disaster is directly related to the level and type of development of a society; this is *a developmental perspective.*

  This aspect has an important bearing in my research as I am considering normal development processes that are outside the direct purview of disaster management, but still have very strong impact on disasters and their management systems. In this way, I am exploring the 'disaster-development' continuum in the context of this research.

- Third, natural disasters are neither unforeseen nor isolated problems. They are integral parts of the spectrum of man-environment relations; this is an *ecological perspective*. Humans can indeed instigate natural hazards, directly and indirectly, by their inadequate or inappropriate intervention in the environment. Here one needs to consider the totality of man-environment relationships that have direct or indirect bearing on creating disaster conditions and responding to them. Importantly these relationships are embedded in a cultural context, which I seek to explore through case studies.

After exploring various perspectives related to disasters in general, through my research I am trying to evolve a converging paradigmatic basis for managing natural disasters in general and earthquakes in particular in South Asian context. The before mentioned perspectives construct a vivid and dynamic view of disasters from their social and cultural construction (in past and present) to relationship to development processes extending into the future. The ecological dimension puts the whole into a dynamic process with several hidden and explicit interrelationships (systems) that extend into various time phases of the construction of disaster.

In my research, I tend to view disaster in its extended scope and definition, taking into account all these perspectives. These together form the basis, in which disaster vulnerability is understood and analysed for a particular context. The complex and dynamic nature of disaster and its management systems are also analysed taking all these perspectives into consideration. In this way, this discussion forms the philosophical basis of my analysis.

Here it is important to mention that there are no rigid boundaries between these three perspectives, rather they are interrelated in more than one way. This makes disaster research a very complex proposition.

3.2 ANALYSING DISASTER VULNERABILITY – THE CONCEPTUAL DISCUSSION

In this section various approaches for analysing disaster vulnerability are investigated. Wisner (2001) has categorised these approaches as techno-centric, target group, situational or community based. They are linked to changing paradigms of disasters, which are discussed in the last chapter. Here, I have briefly analysed various models, frameworks and matrices for analysing vulnerabilities under four main clusters. These show various indicators that are considered for analysing vulnerability, depending on the main approach followed.

3.2.1 Technocentric analysis

Under technocentric approach, vulnerability and risk are objectively defined as the degree of loss to a given element at risk or set of such elements resulting from the occurrence of a phenomenon of a given magnitude. It categorises "elements" at risk to varying degrees, given hazards with certain characteristics and an array of elements with differing degrees of potential for damage or loss (hence: structural vulnerability of buildings, bridges, health care systems, etc., AND people).

The former UN Disaster Relief Organization (UNDRO) definition was also inspired by a technocratic approach: "... the potential for damage or loss" (Alexander, 2000). The definition by certain agencies like Emergency Management Australia (1998) express vulnerability on a scale of 0(no damage) to 1(total loss) quantified on the basis of magnitude of risk.
This approach also considers physical vulnerability of buildings through technical inspection of faults and weaknesses, which cause these buildings to behave poorly, if they are hit by lateral forces of an earthquake. The data on material aspects relating to buildings, economics and ownership is analysed on the basis of mathematical models to predict loss estimation. This is exemplified by a study for earthquake loss estimation for Kathmandu city core (Asklien, Bakke and Nohre, 1994). In this study, the existing building stock in the city core is typified on the basis of its structural characteristics and location. This data is then correlated with rock/soil conditions, location of active faults and secondary hazard sites. The vulnerability of buildings is then assessed through specifying damage-usability categories of various building types, leading to presentation of the vulnerability functions for the selected structural types in the city core. Various models are then used to calculate physical, economic and human casualty loss estimation.

These approaches tend to consider human beings as one of many elements at risk, defined as the population, buildings and civil engineering works, economic activities, public services and infrastructure, etc. exposed to hazards. (Emergency Management Australia, 1998) However, there is no reference to people, their community and social associations, networks and processes that underpin and facilitate life in our society.

The list of vulnerable groups is also limited and restricting and looks at only one dimension of vulnerability. Groups are identified basically as first existing outside place (with any location specific mix of hazards, such as close to chemical plants), community facilities (which may reduce vulnerability). Second as being outside time (variations in vulnerability over time as periodic changes such as across the year or across repeating events such as drought or economic downturn) and third as being independent of social and economic trends.

In this list the emphasis is placed on the list of groups. Though how and why they are at greater risk than others is not identified or evident from a simple statement of the class of people as vulnerable. (Phillip Buckle, 2000) These definitions and the emphasis they place (or, just as importantly, do not place) indicate a particular view of the world and a view of what matters or which elements have priority. Moreover, they clearly suggest an emphasis on the hazard agent rather than the consequences of interactions between the hazard agent and community, property and the environment.
These limitations to these concepts have clear potential to affect planning and management in practice. (ibid)

3.2.2 Target Group analysis:

The second approach focuses on the vulnerability of social (target) groups, and is concerned with the causes of this social vulnerability. These approaches begin from the empirical observation that different groups of human beings often suffer different degrees of injury, loss, disruption in the same event, and also experience different degrees of difficulty, success or failure, in the process of recovery (Enarson and Morrow, 1997; Hewitt, 1996; Blaikie et al., 1994; Lavell, 1994; Aysan, 1993; Maskrey, 1989). These approaches tend to break vulnerability down into different kinds (social, economic, environmental, informational vulnerability, etc.), and they tend to work on the basis of empirically developed taxonomies (e.g. the vulnerability of women, children, elderly people, the disabled, ethnic/ racial/ or religious minorities, illegal immigrants, etc., etc.).

Surely the taxonomic approach is a major shift from the conventional use of the term “vulnerable” that does not clearly differentiate between things, systems, and people.

As part of this approach, Aysan (1993: 12) has identified certain aspects which undermine capacity for self-protection, blocks or diminishes access to social protection, delays or complicates recovery, or exposes some groups to greater or more frequent hazards than other groups. These are;

- Lack of access to resources (material/ economic vulnerability)
- Disintegration of social patterns (social vulnerability)
- Degradation of the environment and inability to protect it (ecological vulnerability)
- Lack of access to information and knowledge (educational vulnerability)
- Lack of public awareness (attitudinal and motivational vulnerability)
- Limited access to political power and representation (political vulnerability)
- Certain beliefs and customs (cultural vulnerability)
- Weak buildings or weak individuals (physical vulnerability)

Here, one can also consider the matrix devised by Mary Anderson and Peter J., Woodrow (1989) who have categorised vulnerabilities as well as capacities as :-

- Physical / Material; What productive resources, skills and hazards exist?
- Social/Organizational; What are the relations and organization among people?
- Motivational /Attitudinal; How does the community view its ability to create change?

This analysis always refers to factors at the community level, rather than at the individual level. Aysan further divides these three kinds of vulnerabilities and capacities on the basis of gender (women/men) and economic class (rich/ middle/poor).

Both the approaches have some practical benefit in assessing vulnerability. However, analytically these taxonomies and lists are still rather blunt tools. These do not explain the characteristics of a specific hazard, specific circumstances.and specific persons, all of which are capable of change.

3.2.3 Situational Analysis :

A third kind of approach tries to go beyond these "laundry lists" and "taxonomies" and explains the actual situation. The key question is not what kind of group a person or family belongs to, but the nature of their daily life, their actual situation (including the way it may have changed recently or may be changing). The temporal dimension is implicit in this kind of analysis. Wisner (2001; 5) states that;

> "Situational analysis recognizes two or three kinds of contingency. First, social vulnerability is not a permanent property of a person or group but changes in respect to a particular hazard. The second kind of contingency concerns the constantly changing daily, seasonal, and yearly circumstances of a person's situation as regards access to resources and power. Such circumstances change dramatically as the life cycle unfolds, as physiological and anatomical changes accompany childbirth or occupational disease or accident, etc. Finally, there is the contingency born of the complex interaction of particular overlapping identities and forms of empowerment or marginality."

Situational analysis separates human beings in their complexity and also groups of humans from the heterogeneous mass of things and systems said by mainstream planners to be "vulnerable." Situational analysis also builds upon the wealth of empirical work that has given rise to the taxonomies and lists of vulnerable groups discussed earlier. However, by recognizing complexity, change, and contingency, it provides a more sensitive tool of analysis. An

important thing to be borne in mind here is that this approach is expert-oriented as here the analysis is done by the 'experts' for the affected / vulnerable people. This approach is used in the "pressure and release (PAR) model" and "access model" utilized by Blaikie et al. (1994).

PAR is a simple model of the way in which 'underlying factors' and 'root causes' embedded in everyday life give rise to 'dynamic pressures' affecting particular groups, leading to specifically 'unsafe conditions'. Being at risk of disaster is shown to be the chance that the characteristics of people generated by these political-economic conditions coincide in time and space with an extreme 'trigger event' natural hazard to which they have been made vulnerable.

The access model is a more magnified analysis of how vulnerability is generated by economic and political processes. It indicates more specifically how conditions need to change to reduce vulnerability and thereby improve protection and capacity for recovery. It also avoids the oversimplification of the PAR model, which suggests that the hazard event is isolated and distinct from the conditions that create vulnerability.

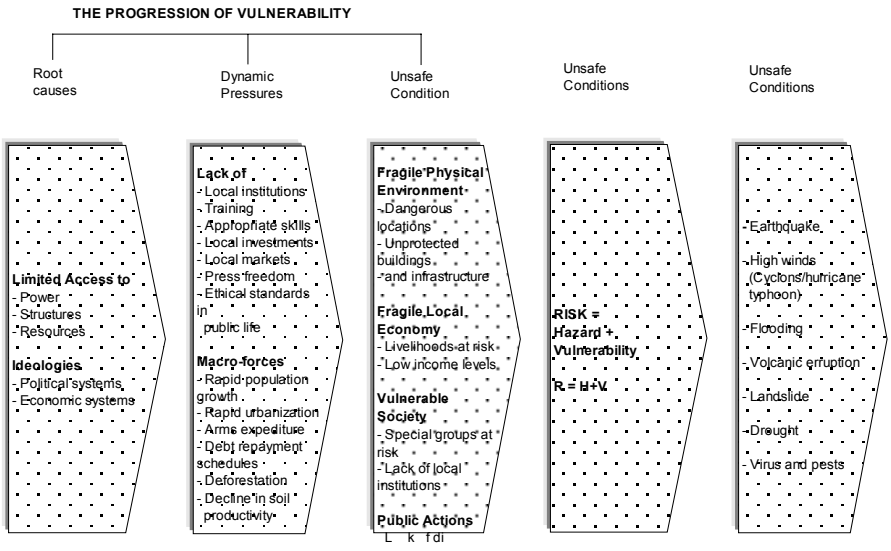


Fig. 3.2 Pressure and release model by Blaikie et. al. (1994)

Blaikie further suggests that root causes reflect the distribution of power in a society. Dynamic pressures are processes and activities that 'translate' the effects of root causes into the vulnerability of unsafe conditions. Dynamic

pressures channel the root causes into particular forms of insecurity that have to be considered in relation to the types of hazards facing those people. Unsafe conditions are the specific forms in which the vulnerability of a population is expressed in time and space in conjunction with a hazard. According to him, root causes, dynamic pressures and unsafe conditions are all subject to change, and in many cases the processes involved are probably changing faster than in the past.

These models establish clear links between disaster vulnerability and poverty, land, livelihood, power, dependency and governance. These relationships have also been articulated by Cuny (1983); Davis (1978); Anderson and Woodrow (1989); Lewis (1999)

Weischeselgarner and Bertner (2000) have also proposed a concept that falls under the perview of 'situational analysis'. It considers vulnerability both as a pre-existing condition and as tempered response (focussing on coping responses, societal resistance and resilence to hazards). Their concept combines elements of the two. Vulnerability is conceived as both a biophysical hazard as well as a social response within a specific geographical domain. Since hazards affect spaces, indicators are considered which allow assessment of the degree of vulnerability of a given area: biophysical, technical and social vulnerability. The approach attempts to identify "qualities" and "factors" which determine potential damage and characteristics that are relevant for defining the "values" of these "factors". The following factors are considered as relevant with regard to loss reduction (p. 89):

- Hazard (the physical process itself)
- Exposure (all individuals, infrastructure etc. which are exposed to hazard)
- Preparedness (all precautionary activities and measures which enable rapid and effective response to hazard events)
- Prevention (all activities and measures in advance of a hazard event designed to reduce hazards and their effects and provide permanent protection from their impacts).
- Response (all activities and measures taken immediately prior to and following a hazard event to reduce impacts and to recover and reconstruct an area affected by a hazard event)

Peter Winchester's model, based on differential vulnerability, establishes a link with development – the emphasis being on minimising avoidable suffering rather than just maximising safety. His vulnerability model for a household or a community, takes into account those relationships and processes that are external and internal, and which affects its vulnerability. He identifies the external relationships and processes as being climate, physiograpy, the social relationships production and development policies (after Blaike; 1981 – "Class

landuse and Soil erosion"[2]). To this, Winchester adds the relaionship between production, exchange and consumption (after Sen; 1981, 'Poverty and Famines'[3], and Swift[4] (1989).

Terry Cannon (2000) in his framework considers vulnerability in terms of five components; initial well being, self-protection, social protection, livelihood resilience and social capital. According to him, each of these are crucially linked to the likely severity of impact of a given hazard, and yet primarily they are all determined by political, economic or social processes. Each of these contains the possibility of both vulnerabilities and capabilities, with these varying over time (as individuals and groups subsist and compete within given livelihood possibilities), and being affected in regard to different types of natural hazards.

The key to encompassing adequately the multiple, dynamic connections among poverty, environment, and hazard is, in fact, an adequate understanding of vulnerability! The "situational" approaches to vulnerability mentioned above contain models that link access to a variety of resources (land, legality, credit, services such as extension and health care, tools, information, markets, labor, etc.) to the ability to improve or maintain the quality of the local environment, and to cope with extreme natural events. Resources or assets in such a model usually include such social capital as traditional institutions; faith based groups, mutual aid, and even local NGOs. Failure or deficiency in access to some or all of these can lead BOTH to land degradation, AND increased vulnerability to extreme natural events.

3.2.4 'Community based' Analysis :

The fourth form of analysis is quite different from the other three. In this case communities and groups appropriate the concept of vulnerability to inquire into their own expose to damage and loss. The concept becomes a tool in the struggle for resources that are allocated politically. The employment of the concept of social vulnerability as a tool in and by the community also involves

[2] According to Blaikie, the social relations of production were the result of the interaction between the political economy and the systems within which problems are defined and decisions taken. The political economic context is basically the product of the inter-relationship between: Climate and physiography, the social relations of productiona nd historical developiment policies.

[3] "Why are rural people vulnerable to famine". Sen showed that famines could take place even if there were no production failures and he identified failures in the exchange market mechanisms (wage labour, agricultural and pastoral commodity markets). In Sen's view, vulnerability to famine was a direct function of relative poverty, and relative poverty is a direct function of a household's ownership of tangible endowments (assets of land, labour and animals and the rate at which it can exchange these for food)

[4] Swift expanded on Sen's concept and said that one way of measuring vulnerability is through asset accumulation or depletion of time. He proposes a model, which identifies three types of asset – investments, stores and claims.

a thorough analysis with and by the residents of their own resources and capacities/ capabilities. In this context, (Wisner, 2001:6)[5] believe that;

> "Although this "other side" of the vulnerability coin is sometimes present in checklists, taxonomies, and to a greater degree, externally produced situational analyses, it is in the hands of local people that the logic of their situation, the phenomenology of their living over time with risks, that forces them to be aware of and to discuss their strengths, capabilities, as well as their weaknesses and needs".

In some parts of Latin America and southern Africa such community based vulnerability assessment has become quite elaborate, utilizing all sorts of techniques to map and make inventories, seasonal calenders, and disaster chronologies (Wisner et al., (1979); Cuny, (1983); Maskrey, (1989); Wisner et al., (1991); Geilfus, (1997); Soto, (1998); von Kotze and Holloway, (1998); Anderson and Woodrow, (1998); Carasco and Garibay, (2000); Plummer, (2000); Turcios et al., (2000); Chiappe and Fernandez, (2000); Wilches-Chaux and Wilches-Chaux, (2001).

Such a community based approach is also reflected in practice in the 'community model for disaster management which will be discussed in the next chapter.

3.2.5 Conclusion

Having looked at various models, we can conclude that there have already been detailed discussions on analysing vulnerabilities by taking into consideration various 'technical' as well as 'social' factors. These have taken into consideration various quantitative as well as qualitative aspects that contribute to increasing vulnerability. However, I think that there are some loopholes in these discussions.

First and foremost, there is considerably less emphasis on including the existing strengths / capacities of the communities. In fact, except for some models like that of Anderson and Woodrow, very few consider capacities at all in their analytical frameworks.

Secondly, whereever capacities are considered, if at all, they are considered distinct from vulnerabilities. To restate the point, the link between capacities and vulnerabilities is weak, in the sense that some weakened capacities can in fact lead to vulnerabilities. This is not explicitly clear, in either of these models.

This is also linked to the third issue that both vulnerabilities and capacities are considered more or less as static in most of these models. None of these models are dynamic, to bring out how these change over a specified time period. This

[5] See an interesting discussion of "poverty as capability deprivation" in Sen (2000: 87-110).

is crucial as some of the vulnerabilites and capacities may have changed or increased or been reduced or reinforced in a considered time period. This period is all the more important if it includes a particular disaster situation and the rehabilitation process initiated afterwards. One of the shortcomings of the PAR and access model is that it shows disaster as an 'end result' caused through sequence of processes that are elaborated in detail. It does not encompass it within a broader systems view.

Last but not the least is the issue concerning the four main approaches mentioned in this chapter. It seems that all the four approaches have their own logic and one of these can not be glorified at the cost of the other. All these approaches explore quantitative as well as qualitative indicators for analysing disaster vulnerability.

In my research, I have mainly used the 'situational' approach to structurally explain underlying causes for the existing status of local knowledge and capacity in my area. Nevertheless, a technical approach has been crucial to analyse physical vulnerability of rural communities.

As far as the community-based approach is concerned, I wonder to what extent the communities are able to and willing to define their vulnerabilities and capacities or whether this is necessary in the first place. Also related is a wider question of relevance. Do these communities need to comprehend their capacities by theorizing about them, if the skills and actions that constitute their capacities are very much part of their day to day life? The questions relating to the real scope and nature of the communities is also put forward. I will examine these issues in my research.

4. DISASTER MANAGEMENT APPROACHES AND PRACTICES

4.1 INTRODUCTION

This chapter will discuss at length the practical implications of theoretical understanding of disasters on existing pre-disaster and post-disaster practices in disaster management, especially in the context of rural communities in developing countries.

"Disaster Management"[1] has been defined as a continuous and integrated multi-sectoral, multi-disciplinary process of planning, and implementation of measures, aimed at preventing or reducing the risk from disasters, mitigating the severity or consequences of disasters, emergency preparedness, a rapid and effective response to disasters and post disaster recovery and rehabilitation.

This chapter will elaborate on disaster management practices for rural communities. Many of the policy approaches are very clearly and nicely articulated in various international and national policy documents. However, it is interesting to see how these get translated in practice. This is especially important, considering the hard fact that social, economic and human impact of disaster on rural communities is steadily rising.

4.2 PRE-DISASTER MANAGEMENT PRACTICES

4.2.1 Definitions

The key terms that describe pre-disaster management practices are "mitigation" and "preparedness".

Mitigation in relation to a disaster means measures aimed at reducing the impact or effects of a disaster. The UNDP disaster management manual defines it as a collective term used to encompass all activities undertaken in anticipation of the occurrence of a potentially disastrous event, including preparedness and long-term risk reduction measures.

"Disaster Preparedness" includes those measures which are aimed at impeding the occurrences of disasters and / or preventing such occurrences and its harmful effects. According to Disaster Management Manual of UNDP, these

[1] Disaster Management Bill of South Africa, 2000

include measures that ensure the readiness and ability of a society to (a) forecast and take precautionary measures in advance of an imminent threat (in case where advance warnings are possible), and (b) respond to and cope with the effects of a disaster by organizing and delivering timely and effective rescue, relief and other appropriate post-disaster assistance.

Red Cross has recognised disaster preparedness as an effective link between emergency response, rehabilitation and development programmes.

4.2.2 Standard policy approaches and their implications

Building and Planning Regulations and Guidelines:

The essential components of pre-disaster disaster management practices are building and planning regulations, guidelines for new constructions incorporating earthquake mitigation features and various technical measures of strengthening of existing buildings.

The planning regulations specify zoning regulations to prevent construction on unsafe lands. It also specifies controls for future development, so that communities can be prevented from the disasters. For example, open spaces can be secured for easy escape after an earthquake strikes.

The new constructions in rural areas are classified as 'non-engineered' by various technical manuals (Boen, Arya, 1978, 1976). According to guidelines for earthquake resistant non-engineered construction[2],

> "The non-engineered buildings are those which are spontaneously and informally constructed in various countries in the traditional manner without any or little intervention by qualified architects and engineers in their design".

This implies that these structures are not technically designed. This definition categorises rural buildings according to uniform technology standards and thus considers them weak and inferior to modern buildings. It is also claimed that most losses of lives during earthquakes have occurred due to the collapse of these structures. These statements negate the probability of 'traditional building knowledge' that may be embodied in these structures. Moreover, classifying all of them into one category overlooks the diversity in the nature and quality of construction within them. It does not take into consideration the probability that the existing status of the building in terms of its maintenance status, the age, additions and alterations done over periods may determine the

[2]Published by the International Association for Earthquake Engineering, October 1986, revised edition of "Basic Concepts of Seismic Codes", Vol. I, Part 2, 1980.

extent of damage suffered, to a large extent. While such regulations and guidelines abound, their feasibility in rural areas is always in doubt.

Building criteria for earthquake mitigation

There are various definitions of what criteria should classify buildings as earthquake-safe. However, all of them consider that the safety aims would be met, if a building is designed and constructed in such a way that even in the event of the probable maximum earthquake intensity in the region;

i) An ordinary building should not suffer total or partial collapse;
ii) It should not suffer such irreparable damage which would require demolishing and rebuilding;
iii) It may sustain such damage which could be repaired quickly and the building put back to its usual functioning;

However some of the most desirable qualities are symmetry and regularity of building form, solid foundation base and reinforcement to improve ductility. Also, there are basically two types of structural framing, which can withstand gravity and seismic load viz. Bearing wall construction and framed construction. The framed construction may again consist of: -

i) Light framing members which must have diagonal bracing such as wood frames
ii) Substantial rigid jointed beams and columns capable of resisting the lateral loads by themselves.

The present research indicates that above-mentioned structural safety criteria can be achieved by adopting appropriate design and construction details involving only small extra expenditure, which should be within the economic means of people in most countries. However, economic affordability is not the only criteria. One also needs to consider ‘repairable’ in its wider scope, taking into account the fact that it is the owners / builders of these houses themselves, who can make decisions with respect to demolition, rebuilding etc.

Of course, there are other factors such as the maintenance status, previous repairs, additions and alterations carried out etc. The above-mentioned basic technical aspects are crucial for determining earthquake mitigation qualities of existing built fabric. Tremendous wealth of the state of the art knowledge exists in design, construction techniques, geological and geo-technical aspects that contribute to make buildings earthquake safe. However, the issue is their feasibility in rural areas.

Training and awareness programmes

As part of disaster preparedness measures, training and community awareness programmes are being initiated as an inclusive, cross-sectoral process involving various stakeholders. These include programmes for various

stakeholders or target groups such as government officials and policymakers, NGOs, professionals, trainers, children, volunteers, local community leaders as well as private sector.

However, these programmes exist in those places where there are key pressure groups focussing on these issues.

4.2.3 Community based vulnerability reduction approaches

Recently, there is a clear shift in focus towards proactive and community-based approaches. Some developing countries like South Africa[3] are beginning to adopt proactive policy approach to disaster management that focuses on reducing risks- the risk of loss of life, economic loss, and damage of property, especially to those sections of the population who are most vulnerable due to poverty and a general lack of resources. Some of these also aim to protect the environment. This approach involves a shift away from a perception that disasters are rare occurrences managed by emergency rescue and support services.

More and more organisations are laying increasing stress on improving the ability of vulnerable communities to cope with disasters through community-based disaster preparedness strategies that build on existing structures, practices, skills and coping mechanisms. According to policy statement of Red Cross (2001);

> "Recognizing that a community-based approach is the best guarantee that improvement in disaster preparedness will be realized and sustained, the assisted population must participate in the planning and preparation for disasters. All activities and programmes should be sensitive to issues of gender, generation and the needs of vulnerable groups such as the disabled."

Various community initiative support programmes and projects are being undertaken to help communities organize vulnerability reduction projects and obtain resources from various external sources. As part of these projects, coordination and communication mechanisms are developed for highly vulnerable communities, private schools and private companies, through which it provides information, orientation and assistance immediately prior to and following disasters. Such projects are being undertaken in many developing countries in the Caribbean, South and Southeast Asia.

[3] White Paper on disaster management in South Africa, part-I (1997)

All the good intentions towards 'community based disaster management', which are mentioned above have also been articulated in section IV C of the Habitat agenda, titled "sustainable human settlements development in an urbanizing world". The agenda also advocates promotion and support to low-cost, attainable solutions and innovative approaches to addressing critical risks of vulnerable communities through, inter alia, risk mapping and community-focused vulnerability reduction programmes.

4.3 POST-DISASTER MANAGEMENT PRACTICES

4.3.1 Definitions

The key-terms signifying post-disaster management practices are "recovery", "rehabilitation", "response", "reconstruction", "repair" and "retrofitting".

"Response" in relation to a disaster, means measures taken during or immediately after a disaster in order to bring relief to people and communities affected by the disaster.

"Post disaster recovery and rehabilitation" means efforts aimed at restoring normality in conditions caused by a disaster.

"Rehabilitation" in particular is defined as actions taken in the aftermath of a disaster to enable basic services to resume functioning, to assist affected persons in self-help efforts to repair dwellings and community facilities, and to facilitate the revival of economic activities.

UNESCO (1996) defines "reconstruction" as rebuilding something no longer in existence, with particular care of producing an exact replica of the original situation.

4.3.2 Various policy strategies – shifting approach

There are some common policy approaches that are implemented as part of post-disaster rehabilitation process in rural areas. One of the most important aspects of rehabilitation is physical reconstruction especially housing. There are various strategies for carrying this out.

One of the conventional strategies is to undertake reconstruction with the help of building contractors who are employed by the agency in charge of reconstruction. For this purpose different voluntary organisations may 'adopt' the whole settlement or village and undertake total reconstruction of housing as well as other infrastructure.

However, here also, it is being increasingly realised that a crucial aspect of integrated disaster response is strengthening community level strategies. This approach supersedes the view of people as victims and looks to partnerships at all levels in societies that both mitigate the immediate effects of disasters and sustain livelihoods after disaster strikes.

Efforts are being made by organisations to link shelter delivery with community development and capacity building initiative to enhance the self-sufficiency of communities. Examples of these approaches are widespread in developing countries. One of the approaches is 'self-help' housing, contrary to 'contractor' driven housing.

International Organisations have played a major role in post disaster reconstruction in developing countries. These are also laying greater emphasis on community based disaster management. The International Federation of Red Cross and Red Crescent Societies (2001) says in its main policy statement;

> " Each national society and the international federation shall undertake rehabilitation activities with the active participation of the community in the planning and implementation of the activities on the basis of a timely and thorough assessment of unmet needs and available response capacity and ensuring that, should assistance be given, it is targeted to the most needy and most vulnerable groups and complements rather than replaces the responsibilities and activities of government services."

The Red cross like many other organisations also stresses enhancing local capacity building by using rehabilitation programming as an opportunity to further develop their own skills and capacities in order to be better able to respond to disasters in the future.

According to a policy statement of World Bank, it supports housing reconstruction components that aim to restore housing assets and activities destroyed or disrupted by a natural disaster. According to World Bank's policy document (2001);

> "Such components can include the direct and indirect provision of permanent housing for the poor, targeting particularly the uninsurable among them. It also includes mitigation measures to reduce the impacts of future disasters. These components should always observe good sector practices of housing design, location, disaster resistant

materials, financial management and cost-effectiveness to avoid undermining long-term sector reforms."

This document further outlines the good practices in housing reconstruction as (i) addressing community cohesion and participation; (ii) use of local organizations, NGOs and private firms to help administer resettlement; (iii) new location with comparable access to employment, infrastructure, services and production opportunities; (iv) new settlement with favourable environmental impacts; and (v) institutionalising a grievance process for those who feel unfairly treated.

Community based disaster rehabilitation through community participation and capacity building is on the agenda of most of the international, national and local organisations as well as Government. However, their practical implications are very much dependent on particular contexts. In my research, I wish to explore these for India and Nepal.

Earthquake resistant technology for reconstruction– changing approaches

Various types of earthquake resistant technology are being employed in the reconstruction by various NGOs and donor agencies. These range from use of concrete blocks with heavy reinforcement to certain indigenous approaches, for example, in the aftermath of hurricane Mitch, which devastated huge areas of Peru in 1998. The reconstruction project initiated by one international humanitarian organisation, GOAL, provided 100 concrete blockhouses with kitchen extensions, latrines and a drinkable water system.

Alternative approaches are now being tried for developing earthquake resistant technology that is based on traditional techniques. Various international and local organisations have taken the lead in this direction. For example, following a devastating earthquake in the Alto Mayo region of Peru in 1990, Shelter programme of Intermediate Technology Development Group (ITDG) became involved in a major reconstruction project to build earthquake resistant housing using 'improved quincha' – a timber and lattice frame design with an earth infill-based on traditional technologies. Several improvements were done to the traditional techniques such as: -

- Concrete foundations
- Wooden columns treated with tar or pitch to protect against humidity, concreted into the ground with nails embedded in the

wood at the base to give extra anchorage.

- Using concrete wall bases to prevent humidity affecting the wood and the canes in the walls.
- Careful jointing between columns and beams to improve structural integrity.

Demonstration buildings (also known as 'Model houses') are constructed to convince local people of the benefits, and community groups were then engaged to participate in building their own homes and centres and to spread the technology.

To what extent have these 'introduced' modern or alternative technologies taken root with the building culture in a long term? This question is pertinent for each cultural context. However, their success can only be measured by looking at the ground realities in particular contexts.

Repairs vs. Strengthening and Retrofitting

Basic seismic strengthening and retrofitting measures are pretty straightforward and fundamental. These are tying floors and roofs to walls and parapets to roofs, the introduction of shear walls and seismic bracing of buildings. This technique has been widely used in the west for improving earthquake resistance of vernacular structures, especially in the historic towns and villages of western and southern Europe.

Sharpe (2001) makes a clear distinction between repair and retrofitting techniques. He states;

> "When we repair a damaged building, we are bringing it back to its state before it was damaged. When we say we want to retrofit a building, we are talking about improving its seismic performance to a higher level than it was previously capable of."

However, besides techniques for repairs and strengthening, the whole issue of their acceptability and affordability is put to question in rural areas of developing countries.

Social and Economic Rehabilitation

Besides physical aspects, social and economic rehabilitation are also important components of post-earthquake rehabilitation process. These relate to re-establishing social networks and generating livelihood opportunities for the victims. However this is a detailed area of investigation in itself and is not considered within the scope of this thesis.

Role of the Government and NGOs:

Conventional institutional structure for carrying out disaster rehabilitation is top-down, bureaucratic and based on 'command and control' model. However, it is being increasingly recognised in developing countries that local authorities represent the closest level of governance to the general population and they must have a priority role in land use and management decisions. This is based on the fact that the most successful integrated planning processes are taking place at the local level, where local governments have been empowered to maintain the economic, social, and environmental infrastructure and they have the primary responsibility in both the creation of adequate pre-disaster planning and carrying out the main part of post-disaster rehabilitation planning and reconstruction (Sheikh, 2001[4]). The habitat agenda and international bodies like World Bank and Red Cross also stress greater role of local governments. However, the role and effectiveness of local governance remains to be seen in the context of India and Nepal.

Currently, NGOs and donor agencies are involved at an unprecedented scale in the preparedness and rehabilitation process. These are involved in 'full scale' adoption of villages, transferring and implementing 'earthquake resistant technology', devising shelter delivery mechanisms and they are also involved in the other sectors of social and economic rehabilitation.

4.4 LONG TERM IMPLICATIONS – CASE STUDIES

Finally, I will mention some case studies done in the past, which demonstrate the long-term impact of post disaster rehabilitation.

Vladimir Ladinski (1995) in his study[5] analyses the impact of internationally led 1963 earthquake reconstruction of Skopje. His study reveals that the immediate housing, which was provided by building on agricultural land away from the city centre, has caused many problems. Also the acceptance of 'modern' ideas for the city centre redevelopment led to transformation of the city and departure from traditional organic approach to planning. The care to protect buildings with technology based only on earthquake engineering principles led to damage of integrity, identity and the originality of the built heritage.

[4] Shuab Ahmed Sheikh, 2001 "An Integrative Approach to Disaster Planning", CTBUH Review, Vol. 1, NO. 3, Fall 2001.
[5] Adenrele Awotana ed., 1997 "Reconstruction after disaster-issues and practices", Ashgate

Similarly, Robert Geipel (1991) had done an interesting study on long-term consequences (1976-1988) of reconstruction of Friuli, Italy after 1976 earthquake. In his detailed analysis of three settlements, Geipel points out that 'modern' layout and architecture has more or less satisfied the basic needs of inhabitants. However, he further states that highest agreement in his case areas was with statements like "less communication", "more anonymity", and "worse neighbourhood relationships". Also he discovered a strong change for the worse;

> "The old social texture has broken apart. Life is as anonymous as in the big cities. Many people stopped speaking to each other because of personal quarrels during the stage of reconstruction."

Another study has been done on the critical analysis of earthquake housing reconstruction following 1976 earthquake in Guatemala (Miculax and Schramm, 1989). Here, housing had failed because of improper use of technology, e.g. the use of tile roofs, for appearance, comfort and status, had replaced traditional lighter roofs of straw. Moreover, the researchers have claimed that the evolutionary nature of rural housing was not considered. They stated;

> "…Any temporary shelter had to be built in an earthquake-resistant fashion, since it would remain part of the house and not simply be a temporary shelter. Unless the frames were soundly constructed, new adobe walls would be built in the future weaker than the older walls and thus set the stage for the next disaster."

Richard Hughes[6] (1987) studied the impact of rehabilitation, three years after a devastating earthquake hit eastern Turkey in 1983 the impact was studied in three villages, where relocation and total reconstruction was adopted as the main rehabilitation strategy. His findings show that after they were relocated, villagers still place high cultural and functional value on their old village sites. This is in spite of the fact that no new uses were found for these sites. Hughes was also confronted with several issues in the relocated villages where new government-designed contractor built houses were provided but set aside from the village site. These included inappropriateness of land for relocation for example; new Azab village was located near a stream that gets flooded whereas the old village was on a raised river terrace. Also he was critical to the design and layout of reconstructed houses, which were no longer in clusters, and were relatively high structures, as a result of which inhabitants complained of winter damp and cold strong winds. He observed that local people had initiated changes to the new settlements to suit their traditional way of life. Traditional full size byre structures and temporary storage sheds were attached to the reconstructed fabric. Interestingly, people reverted back to traditional techniques. These self-help byre structures were built with stone and timber recovered from the destroyed buildings with fresh soil roofs derived from the

[6]Richard Hughes, "Field report of a visit to Eastern Turkey", Disasters, 11th April, 1987

immediate surrounding ground.

Sultan Barakat (1993) has done another interesting study on long-term impact of the contractor-built reconstruction in Yemen, following the 1982 Dhamar earthquake. Here, Government gave more emphasis to the tender (contractor-built) approach by relocating villages, rather than the Self-help or Repair approaches. Barahkat feels that the cultural dimension of reconstruction was overlooked, which in many cases led to a total rejection of the new settlements by the local people. He states;

> "…The success of the settlement may not be because of its obvious benefits, but because it is possible to sustain its relation with the old one. In most cases the new settlements were not thought of, by their inhabitants, as permanent home, as they fell short of the advantages that were offered by the original village."

Besides, he discovered that in some cases, new settlements within an acceptable distance, were actually competing with the old ones, since they were neither close enough to merge with the original village, nor far enough away to establish a new centre. Another physical factor that was observed to have had a marked effect on the acceptance of the new settlements was their distance from the agricultural land. Moreover, the relocation of villages closer to main roads and the provision of services and infrastructure has had a detectable impact on the economic and social structure of settlements. Barahkat, in his interesting work, is also critical to the architecture of reconstructed houses, which was urban and had no link with local life-style. He found that those houses that were inhabited had been substantially altered, extended or changed in some way, or in a number of cases used for functions other than accommodation (storage or animal byres). Interestingly, he noted that most of these do not employ earthquake safe features.

All the above cases have shown that the reconstruction issues have basically remained the same since 1962. The same mistakes are repeated over and over again and all these point to lack of understanding of local knowledge and capacity while undertaking post earthquake rehabilitation. This issue needs careful consideration in each cultural context.

4.5 THEORETICAL DISCUSSION

After briefly reviewing the current disaster management practices and a brief study of their implications, one can make the following main conclusions.

The review relates outcomes of changing paradigms of disaster to disaster-management practices. Many of the actions that have been taken are purely techno-centric and based on 'command and control' model. These laid stress

on formulating guidelines or byelaws and advocating standard solutions, which were top-down and operated from outside. However, most of these approaches have failed to reduce disaster vulnerability of rural communities. Rather, it continues to increase.

One of the main reasons for this is that in spite of various theoretical linkages being established between disasters and development, the practical linkages between disaster management and development is very weak. The fact is that most agencies regard disasters as caused primarily by natural phenomena and fail to establish the real root cause of the problem: vulnerability derived from poverty. Cuny (1983) states;

> "Mitigation itself is proving to be more difficult to accomplish in the third world than was originally foreseen. Mitigation is a complex process, and many of its parts cannot be dealt with in terms of a disaster only, for they are also related to development. Many mitigation activities either require a certain level of development or are themselves development activities. Third world countries are so affected by disaster in part because of their inability or failure to address the root causes of poverty and underdevelopment. Thus it is difficult to carry out mitigation activities successfully. E.g. many of the most vulnerable areas are urban squatter settlements that have sprung up due to lack of opportunity in rural areas. They are often situated on hazardous sites because governments have failed to provide suitable alternatives due to incapacity, neglect, or failure to seek land reform. For people living there, two of the traditional tools of mitigation, zoning and building regulations, simply will not work. Thus prevention and mitigation can work only in situations where all these problems are addressed. In summary, progress toward development is required in order to mitigate and mitigation is required in order to develop."

Lewis (1999) also states this issue clearly. He states;

> "Disaster management has however, become separated from other aspects of development, as they are separated from each other. Most crucially, disaster management has become separated from the development of everyday affairs that create vulnerability."

On the other hand, existing approaches towards physical reconstruction have brought out certain issues, which are triggered by difference between agencies', and victims' perception of shelter needs as explained by Cuny (1983)

Agencies' perception of shelter needs	*Victims' Perceptions of Shelter Needs*
Temporary Structure	Permanent Housing
Low Cost	Low cost
Rapid Construction	Labour-intensive or self-help
Air-transportable	Traditional Appearance
Lightweight, movable	Place to store animals
Low Maintenance	Replicable by Local craftsmen
Small construction crew	Conformity to traditional living patterns i.e.segregation by sex within the structure

Cuny further states that the post-disaster reconstruction due to the differing perceptions can in fact lead to setback. In a broad sense, the set back problem represents the loss of an opportunity to use the disaster to resolve basic problems. In some cases, it even represents the imposition of new obstacles that must be overcome in order to attain pre-disaster development objectives. Following earthquakes, for example, many relief agencies rush to initiate housing reconstruction projects. Many have no experience in the housing sector and do not know how to build safe houses. Instead of taking advantage of a situation that has eliminated much of the previous unsafe housing and provided interveners with a unique opportunity to start from scratch, scores of housing programs systematically rebuild thousands of structures each year that actually increase the vulnerability of their occupants to the very disasters that destroyed the houses in the first place.

This happens in two ways: -

- First, local resources can be undermined by inappropriate technologies.
- Second, local people are encouraged to adopt production patterns that require continuing inputs of external expertise, technology, or imported materials. (Davis, 1978)

Moreover, the post-disaster shelter provided as part of reconstruction strategy may not be culturally sensitive. These may deliberately attempt to modify the cultural habits of the occupants. In other cases, there have been attempts to produce 'universal' solutions. These have ignored the cultural issue altogether, or else assumed that people's living patterns are more or less identical throughout the world (ibid). Moreover, technological solutions may ignore or fail to address adequately such issues as land tenure or economic problems related to housing construction. (Cuny, 1983)

Based on the negative outcomes of these approaches, there seems to be a clear shift towards community based disaster management approaches, especially for rural communities. This presupposes a fundamental change in the usual notion

that the responsibility of caring for a disaster stricken community should be entirely taken over by outside assistance and the state authorities (Medury, IGNOU, 2000). This approach builds on previous experience that the majority of people prefer to stay in the threatened area and generally take steps to protect their families and themselves (WHO, 1989)

This approach considers that the local population stricken by a disaster should be considered as taking action for itself not as having action taken for it. As such, it advocates local community cooperation and local engagement in the disaster management process (Buckle, 2000).

The approach basically considers that it is the responsibility of the community and local government in any disaster to assume primary roles in managing recovery, setting goals, establishing programmes, developing priorities and distributing resources. The role of central and state governments is mostly confined to that of providing funds, other resources and advice (Medury, 2000). This approach advocates strengthening of local capacity through involvement of various actors at the local level, community based organizations, non-governmental organizations, inter community groups, local government representatives and so on.

A community based approach is considered appropriate not only to respond to disaster situations but also for bringing about disaster preparedness coupled with provision of adequate human, financial and material resources. Local participation needs to be given particular attention in any effort towards disaster preparedness planning. This might take the form of creating appropriate structures at the community level, through which people can participate effectively in the decisions that affect their lives.

The community-based approach also recognizes that services and management arrangements have to be responsive to change across space, to cultural and social difference and to development across time. The command and control model rarely recognizes these dimensions. Further it recognizes that disasters occur in a social and temporal space (some features of which may be diversity, change, competition, conflict and value based perspectives) and the processes and requirements of the broader community need to be understood if disaster management is to be effective (Buckle, 2000).

Based on this approach, terms such as ‘community participation’, ‘capacity building’, ‘sustainable development’, ‘appropriate technology’ seem to be frequently used by various organisations and agencies that are involved in the field.

Community based rehabilitation is being projected as an alternative to earlier techno-centric and contractor-driven approaches. However, it will be interesting to find out: -

1. What are the negative impacts of conventional post disaster rehabilitation in each geographical and cultural context?
2. Whether a paradigmatic shift towards community based approach have actually happened in particular geographical contexts.
3. Has the shift (if it has taken place, in the first place), able to produce ground results in reducing disaster vulnerability of rural communities for future earthquakes? To what extent are disaster management practices able to build upon local knowledge and capacity? Which are the emerging challenges in this?

Since disaster vulnerability is a continuous process that changes from pre-disaster to immediate and long-term phases of post disaster, it is significant to find out how disaster vulnerability be reduced through various disaster management actions taken before and after the earthquake.

However as mentioned before, all these issues need to be investigated for a particular cultural context. In my research, I will investigate them in the context of India and Nepal and find out, to what extent do they build on local knowledge and capacity.

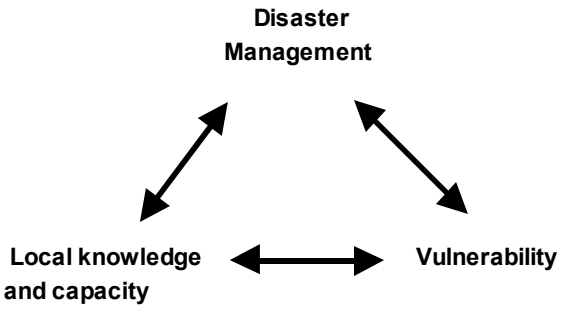


Fig. 4.1 Theoretical inter-relationship between disaster management, local knowledge and capacity and vulnerability

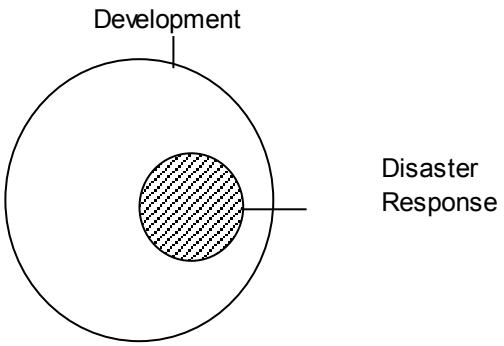


Fig. 4.2 Disaster Response as part of normal development process

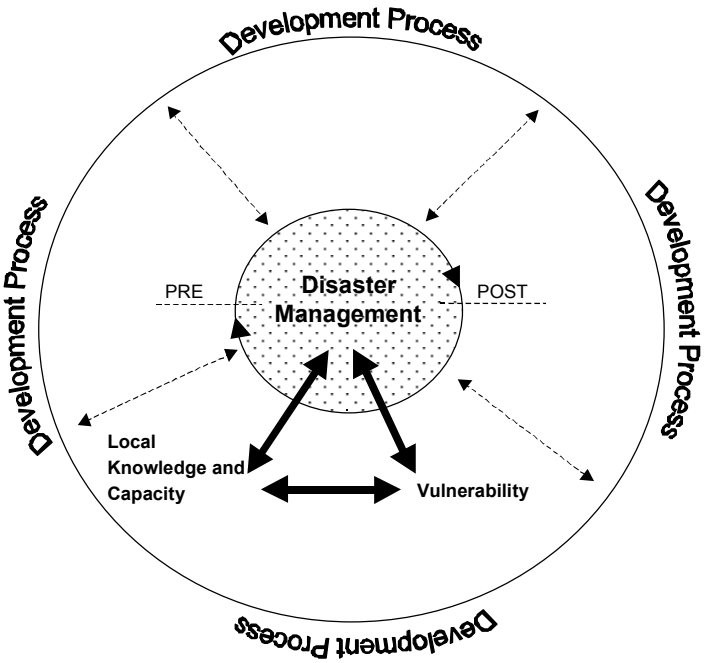


Fig. 4.3 Theoretical relationship between disaster management, local knowledge and capacity, vulnerability and development process

PART III
RESEARCH METHODS

5. RESEARCH METHODS

5.1 INTRODUCTION

In this chapter, I elaborate on various methods that I have used for carrying out my research. I begin by considering various methodological issues that help me define my role as a researcher. In order to do that, I have critically examined various concepts pertaining to 'Theory of Science' and arrived at 'scientific research methods' that I have considered most appropriate to my research area. A brief description of the significance and scope of each of my case studies with respect to my main research question follow this. Here I also explain how and when I went about selecting each of these case study areas.

Next, I explain in detail, my research process by explaining various methods I followed to collect primary and secondary data relevant for my research. This is followed by details of various techniques for collecting data needed for carrying out my research. Each of these techniques is briefly explained along with the way I carried these out considering scope and limitations for each particular situation.

5.2 THE ROLE OF THE RESEARCHER – METHODOLOGICAL CONSIDERATIONS

As is evident clearly from the title of my research, I am focussing on the potential role and significance of local knowledge in reducing disaster vulnerability. This brings into focus the nature and content of 'local knowledge' and the 'scientific' methods to (re) discover it and assess its present status. There are number of issues/questions pertaining to these, which pose challenges in deciding appropriate research methods.

5.2.1 Rediscovering local knowledge

Local knowledge is constructed mainly at two levels of perception; as perceived by the researcher or a professional (external worldview) and as perceived by the local community (internal worldview). In order that the internal worldview of the community and the external worldview of the researcher coincide to produce desired results, it will be useful, at the start, to distinguish between direct, personal knowledge, based on the experience of the knower with the facts at hand, and indirect, or processed, knowledge, which is based on the measurements and systematic observations of the researcher. The processed knowledge in the form of models must get connected to personal knowledge so that both compliment each other.

However, the process of rediscovery can very well be a matter of luck (Chance discovery) or a reflection-on-action (self-learning through retracking back and forth) or through mutual learning (through sharing experiences).

No knowledge is absolute; rather it is inter-subjective in nature, based on mutually accepted meanings and beliefs. In that sense, I do not think that only deductive nomological explaination according to the rules of formal logic is scientific. Science does not encompass only finding out empirical realities understood by our senses e.g. laws of nature. Rather it is built in our consciousness (Bayens, Boham and Mc Carthy, 1987). As such this wealth of `holistic knowledge' is not seen as objective, as something given and external to man. Instead, knowledge is regarded as constructed in discourse. True knowledge is that on which a consensus is formed among informed people discussing the matter in undistorted communication. When assuming that knowledge is inter-subjective rather than objective, 'everything' takes on a less absolute meaning (Sager, 1994).

Therefore, one must understand the following important aspects about knowledge per se:

- Generating knowledge is very different from collecting (making repository of) information
- Knowledge is inter-subjective in nature.
- Knowledge is very dynamic. It changes its content and relevance with time.
- Local knowledge may be consciously developed for a particular end. However in most cases, it is holistic in nature, trying to achieve several ends through multiple sources. In those situations it may not be conscious of its potential or may exist at a sub-conscious level.
- Local knowledge may be living and thus embodied in day to day activities of people dictating use of resources, skills and crafts. It may be dead and surviving evidence may be found in physical fabric / buildings / historical records etc.

5.2.2 Scientific Method for Rediscovery of local knowledge and capacity

Such a dynamic and complex knowledge can not be accumulated only by the deductive scientific method. Rather it works both vertically and laterally. I will assume it as matrix with various inter-relationships that give different meanings to a given set of variables. It that sense, it is very complex. As such, there is no standard instrumental mechanism, which can be called 'scientific research' in the field. It is very much inductive in its nature, as it develops as one proceeds along ones way.

The life world perspective is very important for recovering the internal worldview. Such a perspective is needed to give a description and obtain a comprehension of how individuals immediately experience their situation and their physical environments. This may come under a phenomenological tradition, where what is being focussed is the immediate, direct experience of the physical environments as they appear to the individual (Næss, 1995).

The understanding of some sorts of meanings, particularly spiritual and social ones, by the researcher could be oversimplified or distorted if one doesnot have a thoroughly local knowledge which can control the perceptual reactions (Clifford, 1983). On the other hand, the research should not only explain what is already known but also the hidden meanings in the present settings and the old meanings which have disappeared or have been changed in the present and have not been known by the users (Nooraddin, 1996).

The scope of this kind of research falls in the anthropological field of study. Within the cultural branch of anthropology dealing with traditions in human behaviour and works, ethnology is one of the three principal subdivisions. The task of ethnology is the study of living cultures. (Anderson, 1976)

When we understand the role of a researcher while undertaking such studies, I believe his scientific activity will reside as much in deriving empirical realities and thereby recovering the processed knowledge, as in interpreting hidden meanings through hermeneutics, aimed at recovering the collective knowledge.

Ethnography as a research method is useful in this. Anthropologist Clifford Geertz stated that a critical part of ethnography is thick description, a rich detailed description of specifics (as opposed to summary, standardization, generalization, or variables). He further says;

> " A thick description of a three minute event may go on for pages. It captures the sense of what occurred and the drama of events, thereby permitting multiple interpretations. It places events in a context so that the reader of an ethnographic report can infer cultural meaning."

Hess (1992, p.4) has discussed research techniques that are useful to carry out ethnographic research.

> "Ethnography … means particularly participant observation, frequent and often informal interviews, and the cultivation of insiders known as 'informants'. Ethnography does not mean being a fly on the wall and watching people's behaviour; it means talking to and interacting with people, and ultimately attempting to understand their symbolic worlds and social action. 'Ethnography' is literally 'ethno/graphy': to write about a people (with all of their diversity and plurality of agencies and

> perspectives), or even more literally, to write a people, to help construct a people's identity by writing them."

Pike (1954) has differentiated between 'emic' and 'etic' approaches in the anthropological field of research (Pelto and Pelto, 1970). According to the views of the former, cultural behaviour should always be studied and categorized in terms of the inside view – the actors' definition – of human events. That is, the units of conceptualization in anthropological theories should be "discovered" by analyzing the congnitive processes of the people studied, rather than "imposed" from cross-cultural (hence ethnocentric or 'etic') classifications of behaviour (ibid). Accordingly, the primary research method in 'emic' is interviewing, in depth, in native language, while for 'etic' is observation of behavior. Also the intent of the former is to seek the categories of meanings, as nearly as possible in the ways "the natives define things", while for the latter, it is to seek patterns of behavior, as defined by the observer. Also while the methodological strategy of the former is fundamentally inductive, for the latter, it can range from "pure induction" to various mixtures of inductive and deductive research (ibid).

In the context of the above discussion, I have certain reservations on participant observer mode. Since being a total participant may make it difficult for the researcher to detach him from the observed reality and in turn, values may influence him or her. They may force him to be partial in observing, collecting and analysing data. Therefore, in my research I am primarily using 'etic' approach as an outsider to interpret the actions or knowledge of the rural communities that they may be unaware of. A purely ethnographic research will need a long process of interaction with the local communities, which was not practically possible for me.

Lastly, knowledge within the field must take into consideration the fact that relationships found within one social, cultural and political situation are not necessarily valid under other conditions. A research into any aspect of traditional building knowledge should try to establish relationship with local Geographical (spatial), Historical (temporal) and Anthropological (people) information systems in a particular cultural context (Nalini Thakur, 1998).

Thus resulting theory (ies) is / are non-universal (context dependent in time and space) and non-deterministic (i.e. not enabling us to predict with certainty how people's actions will be or society will develop, but still telling something about what is more or less probable. Such theories enable us to develop knowledge in a cumulative way, by providing a possibility of summarizing results (Brehmer 1993). This aspect is very relevant to traditional knowledge, which has also evolved in this manner.

5.2.3 Assessing the present status and relevance – bringing together ethnological and dynamic perspectives

The perspective described above takes well into consideration the fact that people are producers and carriers of knowledge. It attempts to understand the relationships and social behaviour at one point in time. Thus, merely ethnological focus is very static and one-dimensional, though it is contextual and holistic in many respects.

However, as mentioned earlier, knowledge development is a very dynamic phenomenon. Therefore, knowledge at a particular point in time is dependent on its immediate context that may or may not be relevant at another point in time. This question of relevance is of primary importance especially when it comes to the issue of reducing disaster vulnerability. Vulnerability itself is a process and thus it is appropriate to consider the changing nature and status of local knowledge and its consequence for changing vulnerability, which in my case is that of rural societies in south Asia. In order to understand this 'changing nature' one needs to assess the changing social, cultural, political and economic context and resulting transformation processes. One also needs to assess changing behaviour, attitudes and perceptions of various stakeholders including various sections of the local community, that govern various decisions taken to reduce disaster vulnerability in future.

This clearly brings into focus the relevance of a dynamic perspective in a study like mine, which seeks to assess the current status and potential future role of local knowledge in reducing disaster vulnerability.

5.3 CHOICE OF RESEARCH METHODS

Considering the above discussion, I have primarily adopted case study method and a qualitative research approach within it, to undertake my research. These are briefly explained below: -

5.3.1 Case study Method:-

A case study is an empirical inquiry that:

- investigates a contemporary phenomenon within its real-life context; when
- the boundaries between phenomenon and context are not clearly evident; and in which
- Multiple sources of evidence are used. (Yin, 1981a, 1981b)

This definition not only helps us to understand case studies, but also distinguishes them from the other research strategies. An experiment, for

instance, deliberately divorces a phenomenon from its context, so that attention can be focussed on a few variables (typically, the context is "controlled" by the laboratory environment). A history, by comparison does deal with the entangled situation between phenomenon and context, but usually with noncontemporary events. Finally, surveys can try to deal with phenomenon and context, but their ability to investigate the context is extremely limited.

According to Yin, case study method should be chosen when "how" or "why" questions are being posed, when the investigator has little control over events, and when the focus is on contemporary phenomenon within some real-life context.

In this sense, the case study is a way of investigating an empirical topic by following a set of pre specified procedures. It involves the collection, recording and analysis of a single case or a number of cases. It can be based on any mix of quantitative and qualitative evidence. Such a method provides opportunity to apply a range of data collection techniques and use evidence from multiple sources.

Yin provides another quality of the case study method, which is also relevant in this study, in which I am evaulating post disaster rehabilitation process, for the extent to which it builds on local knowledge and capacity. Yin suggests that case study method has a distinctive place in evaluation research. According to him, there are at least five different applications:

1. The most important is to explain the causal links in real-life interventions that are too complex for the survey or experimental strategies. In evaluation language, the explanations would link program implementation with program effects.
2. A second application is to describe an intervention and the real-life context in which it occurred.
3. Case studies can illustrate certain topics within an evaluation, again in a descriptive mode.
4. The case study strategy may be used to explore those situations in which the intervention being evaluated has no clear, single set of outcomes.
5. The case study may be a "meta.evaluation" – a study of the evaluation study.

However, case study method also has some limitations. The main criticism is related to the question of how to make a generalization from a single case. In answering this question, Yin drew an analogy between scientific experiment and the case study method and argued that in both cases the investigator's goal is to expand and generalize theories. While the former uses statistical generalization, the latter uses analytic generalization.

As mentioned before, the central purpose of the investigation in this study is to make a contribution to our knowledge and better understanding of the role of local knowledge and capacity of rural communities in existing planning and mitigation against earthquakes and more specifically in post earthquake rehabilitation process. Clearly, this requires knowledge and understanding of local knowledge and capacity per se, its existing status and planning and mitigation measures, more specifically post earthquake rehabilitation process. These are clearly interlinked in a dynamic temporal scale and need a qualitative understanding of the phenomenon of disaster in its development, impact and recovery. This involves thorough understanding of local situation, role and perceptions of diversified actors with often-conflicting interests. I think such a complex phenomenon cannot be easily understood merely through broad surveys and it does not even call for a large amount of quantitative empirical data.

The core issue is not to make a static database on building knowledge for mitigating the impact of earthquakes. Neither it is related to assessment of physical vulnerability, nor to the impact of damage from earthquake. The issue at hand is to assess current practices in disaster management, to know how much they build on local knowledge and capacity and discuss their impact and effectiveness in reducing disaster vulnerability of rural communities. However an important aspect that is considered here is that assessment of the impact of disaster management cannot overlook the broader developmental context that creates vulnerability in the first place. It is a kind of investigation that demands careful follow-up study of both short-term effect and long-term impact of vulnerability process on individuals, communities and their living environment. This needs us to apply a range of data collection strategies and diversified source of evidence.

5.3.2 Qualitiative Research

My research is purely qualitative. As Neuman (1991) puts it,

> "The language of qualitative research is one of interpretation. Researchers discuss cases in their social context and develop grounded theories that emphasize tracing the process and sequence of events in specific settings. They explain how people attach meanings to events and learn to see events from multiple perspectives. Only rarely does one hear a qualitative researcher discuss variables or hypotheses. (p. 144)

He further states the relationship between theory and data collection process for a qualitative research.

> "A qualitative researcher begins with a research question and little else. Theory develops during the data collection process. This more inductive method means that theory is built from data or grounded in the data. Moreover, conceptualization and operationalization occur simulatenously with data collection and preliminary data analysis. Qualitative researchers remain open to the unexpected, are willing to change the direction or focus of a research project, and may abandon their original research question in the middle of a project. (p. 145-146)"

Within this kind of research, a qualitative interview aims to understand people's terms and judgements, and to discover the complexities of their individual perceptions and experiences. The main assumption behind the qualitative interview is that the perspective of others is meaningful, knowable and can be explicit. We enter the field without predetermined phrases or categories, which might constraint respondents' answers. Hence, such interviewing aims to capture what is in someone else's mind and to find out things, which we cannot directly observe.

According to Walker (1995; 7) qualitative research methods share the following characteristics: -

- flexibility in execution
- deliberate interaction between the researcher and the researched
- A richness of data that stems from their largely textual nature and from their grounding in the language and experiences of the informants. (Walker, 1985, P. 7).

The temporal dimension is explicit in qualitative research. According to Neuman (1991: 148),

> "The passage of time is an integral part of qualitative research. Qualitative researchers look at the sequence of events and pay attention to what happens first, second, third, and so on. Because qualitative researchers examine the same case or set of cases over time, they can see an issue evolve, a conflict emerge, or a social relationship develop. The researcher can detect process and causal relations"

This apect of qualitative research is very relevant for examining my cases, which look at the sequence of events and transformation processes that emerge over time; from pre-disaster to emergency relief to long term post disaster rehabilitation.

Qualitative research has quite often been used in the field of disaster research. In many cases it is preferred over the quantitative research. The United Nations Disaster Relief Co-operation (UNDRO, 1982b) and Taylor (1981), among

many others, have discussed the issue of a quantitative approach to assessing victims needs. They claim that the inadequacy occurs mainly in three areas.

- Lack of familiarity with the local conditions; housing conditions and processes, habits and lifstyles, people's needs and resources, household and location characteristics.
- Inappropriate techniques: quantification of needs (counting the number of houses damaged and families affected); no distinction between needs and aspirations.
- Weak management: exaggeration, lack of a proper definition of the objectives of assessment, lack of coordination between different intervenors, assessment based on intervenors' self interest and available resources.

Therefore, it is argued that fieldwork in post-disaster situations should not only count things but also define priorities, opportunities, problems and alternatives. Fieldwork should project the dynamic system of human settlement in all its aspects and should help in assessing the viability of alternative course of action. Taylor (1981, p. 139) further argues that: Quantification is useful and may be necessary at a later stage when the needs have been hypothesised, but over enthusiasm for the questionaire as a tool often obscures rather than enlightens a situation.

5.4 SELECTION OF CASE STUDY AREAS

The main reason for selecting rural communities in India and Nepal as main case for study is their similarity in social and cultural aspects, besides their geographic and geological proximity mainly from the point of view of earthquakes. Both the countries are greatly affected by natural disasters in general and earthquakes in particular. In fact, earthquake has been the single greatest cause of very heavy loss of life in the whole south Asia in the last decade. Therefore the study conducted will be of great relevance towards the urgent need for reducing disaster vulnerability in the region. Moreover, the region is rich in vernacular built form, which provided me with an opportunity to look closely at the positive aspects of knowledge embodied in them and also their existing weaknesses that contribute towards physical vulnerability.

As mentioned before, the three case study areas for detailed study are Marathwada region (Latur and Osmanabad districts) in India, Kutch and Kathiawar region in Gujarat (India) and Kathmandu valley in Nepal. While Marathwada and Gujarat cases emphasise disaster management practices, more specifically post earthquake rehabilitation process over various time periods, the Nepal case illustrates the impact of existing rural development processes on vulnerability of rural communities. While the earlier two cases show the

situation after the earthquake, the last case illustrates the situation before the earthquake. In this way, the three cases give a picture of disaster in an integrated and dynamic perspective. One cannot ignore the fact that all the three case areas share a rich historical past and thus share cultural integrity and rich architectural heritage.

Case Area 1 – Marathwada Region in Maharashtra, India

The main reason for selection of this case study area was because it provided an excellent opportunity to study the impact of post-earthquake rehabilitation process over a long time. While numbers of extensive studies have been done assessing the rehabilitation process here, immediately after the earthquake, no study existed on assessing its long-term impact. Moreover, earlier studies done here provided me with an important resource base to build and compare my primary data.

An important decision for me was the scale of my work; whether I should do my detailed investigation at village level or for the whole region. After careful thought, I decided to focus on the whole region. The main reason for this was that no single village could provide me with an opportunity to discuss various approaches towards rehabilitation. Moreover, the impact of rehabilitation was different on different villages, not only depending on the their category for rehabilitation i.e. A, B or C category, but also within each of them.

Case Area 2 – Kutch Region in Gujarat, India

As mentioned before, Gujarat case was added later in the course of the work. This is because it provided me with an opportunity to look at the immediate aftermath of the earthquake and also the complex processes that created the setting or context for a disaster of such immense proportions, just before the earthquake. It also gave an opportunity to assess the post earthquake rehabilitation process that is currently underway and compare it to the one followed in Marathwada.

Here again, the main issue was concerning the scale of my work. Due to the enormous geographical extent of the region and the diversity of reconstruction approaches, it was much more interesting and informative to make a general assessment of the situation in the whole region and cite cases from individual villages to bring forward various issues and approaches.

Case Area 3 – Kathmandu Valley, Nepal

The third case is quite different from the first two. Firstly, here the focus is not on disaster management practices; rather it is on current transformation processes in rural communities and the impact of development processes.

These help to understand the underlying conditions that create disaster vulnerability. Due to very similar social, cultural and developmental context, these conditions were assumed to throw more light on the vulnerability situation in the whole subcontinent in general and the other two case areas in particular. The pre-disaster vulnerability situation of all the three areas could well be compared for their link to local knowledge and capacity. The scale of the detailed investigation in this case area was markedly different than the other two. Here I selected one village, Bungamati and its immediate environs to make a detailed assessment of rural transformation processes.

5.5 RESEARCH PROCESS

The first step in the study was to review literature from various sources (documents, Internet, articles, books) on diverse subjects related to disasters in general and earthquakes in particular.

The field-work was done in three phases to get as much first hand information as possible so as to generate a substantial database. The first fieldwork was undertaken from August to October 1999, during which I did a reconnaissance survey in India and Nepal. During this field visit, I selected two case study areas, namely Marathwada region in India and Kathmandu valley in Nepal.

The second fieldwork was done from July to November 2000. This was the major fieldwork period during which extensive studies were undertaken in the two case study areas.

After the destructive earthquake hit Gujarat on 26th January 2001, I got a chance to visit the region as part of interdisciplinary reconaissance team which was organised by World Seismic Safety Initiative in February 2001. Thereafter I decided to take up Gujarat case as my third case study.

The third fieldwork period was in the months of September and October 2001. During this period, I did detailed fieldwork in Gujarat to assess the progress of the post earthquake rehabilitation process. Besides, I also conducted more studies in village Bungamati in Nepal to supplement the data collected earlier.

The first step in the fieldwork was mainly to acquaint myself with various public, semi public and non-governmental organisations that are working in the field of disaster management in India and Nepal. I contacted them through telephone or mail or other contact.

I interviewed various resource persons to know the existing research and practice in this field. In India, I visited the central offices of public, semi-public and private organisations like National centre for disaster management,

Building Materials and Technology Promotion Council (BMPTC), TARU, Housing and Urban Development Corporation (HUDCO), nongovernmental organisations like SEEDS India and OXFAM, all of which are located in New Delhi.

In Nepal, I visited offices of Kathmandu and Patan municipalities, nongovernmental organisations like Nepal Society of Earthquake Technology (NSET); libraries of UNDP, UNESCO and Institute of Engineering (IOE) located in Tribhuvan University. I also had constant interaction with the office of village development committee (VDC) of Bungamati. Besides, views of various professionals and academicians were also taken into account on various social, economic and technical aspects relating to disasters in general and earthquakes in particular.

However due to the variety of information, it was studied and catalogued under various heads. For example all the information relating to earthquake resistant building technology and that on current policies and institutional structure for disaster management was put together.

The next step was to collect primary information related to my field work areas. Therefore two visits were paid to Marathwada region during August and September 2000, each for a period of two weeks. In order to gain access to official information, contact was made with the office of district collectorate, Latur. This office was very helpful in providing me primary information on the rehabilitation process that has been undertaken in the region, pertaining to various components of the rehabilitation package and main policy approaches. It provided me with maps, documents and statistics on the rehabilitation process, besides giving official views on the government approach. The district collector also helped me to pay first reconaissance visit to the relocated villages. A government official, who showed me the actual work done and substantiated it with the official point of view, accompanied me. Since the extent of the region is quite widespread, I hired a taxi to do the preliminary reconnaissance survey.

In order to reach the community, I took the help of local NGOs whom I contacted directly while I was there. One NGO, named Ahmedabad Study Action Group (ASAG) was very helpful in this regard. This NGO was involved in implementing low cost strengthening and retrofitting techniques in the region since 1993, and had built up a valuable database on the rehabilitation process. I also interviewed the volunteers who were working for this NGO since the earthquake struck and ascertained their views on the rehabilitation process. Views of other NGOs and CBOs were also noted through various interviews. Some volunteers from ASAG also accompanied me during another visit to the region and showed me their work and also other areas of interest. They also introduced me to local community members in a few villages.

Next, I visited some selected villages myself and made primary observations. These were related to the transformations taking place in these villages and also their day to day activities. The vernacular built form and its existing condition was also recorded in sketch form and through photographs. Some of the spatial changes were documented through photographs.

I interviewed local people to know their views on the rehabilitation process. Direct interviews were done since the villagers could understand my language, Hindi. It is important to mention here that I did not prepare standard questionnaires. Rather I took semi-structured interviews with the primary aim of assessing people's views on the rehabilitation to know how it has affected them. It is important to mention that villages from each of the three categories in the rehabilitation process were studied. These included those which were relocated, where in-situ rehabiltation was supposed to take place, and those where a strengthening and retrofitting programme was to be carried out. The information from all these observations was collected in the form of notes and sketches.

The same process was repeated while carrying out fieldwork in village Bungamati in Kathmandu valley. Here access to the community was made through the active help of the local village development committee (VDC) chairman and one local NGO named Rotary Patan West. The VDC chairman further introduced me to the local ward chairman and volunteers of local CBOs. Random household interviews were conducted. However the selection of these households was done so that views of all the sections of the community on the basis of caste, economic status, and geographical location were ascertained. Here also, standard questionnaires were not used. The language barrier was crossed through translators, who were employed from the village itself. Physical changes within the village and around it were documented and compared to the situation in 1968, so as to clearly show the transformation processes. Earlier, I did this work as part of a team of six students in the intensive course on Urban Ecological Plannning which I joined as a NORAD fellow in 1998. This work was further updated during the fieldwork done by me later in 2000 and 2001.

As pointed out earlier, the third case study of Gujarat was added only after the earthquake hit the region in January 2001. Preliminary reconaissance of the situation immediately after the quake was done when I visited the region as part of the interdisciplinary team in February-March, 2001. This helped me to get in touch with government agencies, organisations, professionals, and academics and know their views. During this visit, various documents and media reports related to this disaster were collected. The progress of relief and rehabilitation afterwards was closely observed by collecting media reports on the disaster, which were available through Internet.

The status of the rehabilitation process was assessed through detailed fieldwork conducted in September-October 2001. In this period, two visits were paid to the region during which interviews were conducted with officials from Gujarat state disaster management authority (GSDMA), representatives of various NGOs, professionals and academics who were involved in (or had knowledge of) the rehabilitation process. Here again, no standard questionnaire was used but spontaneous open-ended interviews were conducted.

Also, very much like in Marathwada, some local NGOs like Abhiyan, Veerayatan and Unnati were used as the medium to reach to the communities and assess their views. These NGOs were involved in various aspects of rehabilitation and reconstruction like providing temporary and permanent shelter, livelihood regeneration etc. Visits were paid to their project sites, the work done by them was observed, and the representatives' views were gathered. Since the whole region is quite big, most of the observation was carried out in the villages located in Kutch region. Here again, an attempt was made to visit villages where different approaches towards reconstruction were being attempted. These included villages with full-scale contractor driven reconstruction, NGO facilitated reconstruction and villages with total self-help houses. The observations made in each of these were carefully recorded.

It needs to be pointed out that the fieldwork was done in an inductive way. Therefore a clear chalked out plan for data collection was not made. Rather things took shape, as I progressed.

5.6 DATA COLLECTION TECHNIQUES

I have used multiple methods to collect data for my resources, from primary as well as secondary sources. Secondary data was collected from official records, previously conducted studies, book publications, journal articles, reports and other relevant documents. For collecting the primary data, I have mainly used techniques of field observation, documentation and recording, semi-structured key informant interviews and life stories. These methods are elaborated below:

5.6.1 Review of Documents

In order to gain 'state of the art' knowledge in the field of disasters in general and earthquakes in particular, I undertook a thorough review of books, articles and reports on various subjects related to my research area from library and Internet sources. This was done to acquaint myself with geological, geo-technical and engineering aspects related to earthquakes, their impact on buildings, theoretical understanding of disasters and existing practises in disaster management.

I also undertook groundwork for my case study areas through secondary sources. Through various sources, I learnt about geographical context, social, cultural, economic and political profile of the area. In the case study of Nepal, I was fortunate to lay hands on a Danish report of 1968, which was very useful in assessing the changes over more than 30 years. In the case of Marathwada, I studied various documents from Maharashtra Emergency Earthquake Rehabilitation programme, which provided me with detailed information about the rehabilitation programme initiated by the Government after the 1993 earthquake. Besides I could find access to many other documents and reports done on the area. Similarly in the case of Gujarat, I kept a track of media reports related to the earthquake and the sequence of events that followed afterwards. Also I got access to various government documents pertaining to the rehabilitation process initiated following the earthquake. All the documents that I have referred to are listed in the bibliography.

5.6.2 Field Observation through indirect participation

One of the main sources of primary data was field observation to gain in-depth insights into local dynamics and processes. These observations were made independently by myself or while directly or indirectly participating in various activities in the field. I undertook "transect walks" or rather transect visits to various areas. As stated earlier, in most cases, I used the medium of local nongovernmental organisations to gain access to communities. Importantly, I was not approaching local communities individually as a researcher, rather submersed myself in the normal activities of these NGOs, and made detailed observations.

Being inductive while undertaking research, I did not limit myself to one aspect, rather I tried to make a holistic assessment of the situation. Afterwards, I could draw inter-relationships of various findings to my research question. All these observations were recorded in the form of notes and sketches.

5.6.3 Documentation and Recording

As architect and planner, I am trained to document buildings and visually record various aspects pertaining to spatial qualities. Therefore, another important technique in my research was on site documentation and recording, especially pertaining to physical transformation processes taking place in the village. For example, I have recorded various kinds of physical transformations taking place in Bungamati village, when compared to 1968 situation. The physical changes around the village (its immediate setting) and the daily activities in the village were also recorded.

In the case of Marathwada, physical transformations in the relocated villages were recorded on maps. However for the Gujarat case, documentation and

recording could not be undertaken because of shortage of time and large geographical scale.

5.6.4 Semi-structured Key informant interviews

This is one method that I have most frequently used in primary data collection. One of the main reasons was that through this method, I could get views of different stakeholders and also assess their issues and problems, in the shortest possible time. As a starting point, I identified various stakeholders, who were various sections of community especially marginalised (most vulnerable) groups, officials from government agencies at various levels, leaders, representatives and volunteers from various NGOs, specific groups of people like craftsmen, contractors and architects. These were identified with the help of available contacts. In most cases, I identified these while I progressed. So the list was updated as per the developments in the field. All these stakeholders became key informants for my research. In many cases, these informants provided me contact with other informants.

Since in most cases, I did not know exactly what kind of questions the informant would be able to answer, I generally approached these with a semi-structured format of questions, which could be adapted as the conversation developed. Because I was not rigid in the type of questions that I asked, sometimes I ended up with fascinating sets of information that had not been expected from a particular informant. Also, I found informants to be more comfortable if I asked them questions in a running conversation intercepted with comments and views that could sustain their interest. While sometimes, I made notes right during the course of interview, in other cases; I made notes later on after not too long time.

5.6.5 Life Stories

Life stories give information about which experiences a person uses to make decisions, and how he explains the course of his life to himself (Schütz & Luckmann 1967). I have tried to record life histories of various informants in my research. Notable among these are the old people, who narrated to me their experiences from past earthquake. Also certain life histories of marginalized groups of people acquainted me with the main causes for their vulnerability and how they cope with various situations in their life. Some informants could tell me about the transformations that have occurred in their village during their lifetime.

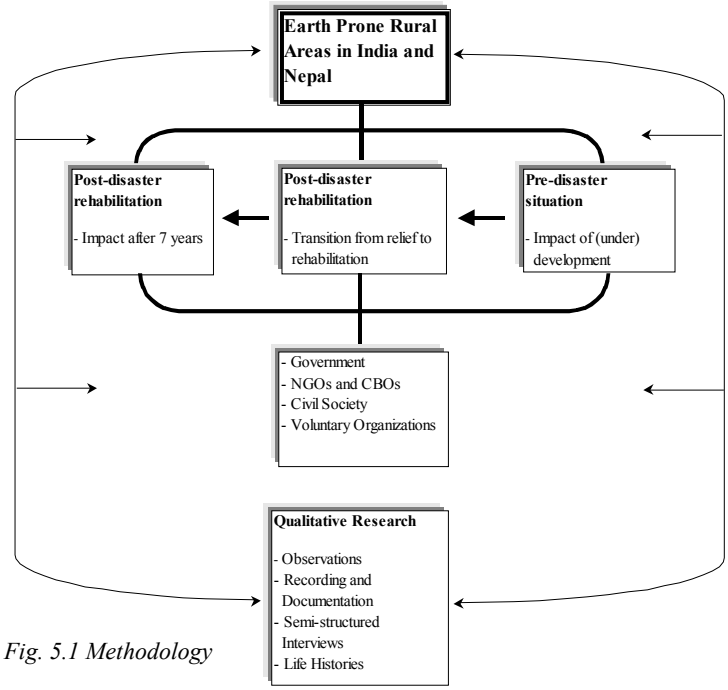


Fig. 5.1 Methodology

RESEARCH METHODS	MARATHWADA	GUJARAT	KATHMANDU VALLEY
OBSERVATIONS	* Daily activities * Tranformation processes in various rehabilitated villages	* Reconstruction process * People's activities in the aftermath of the earthquake	* Daily activities and cultural practises
PHYSICAL RECORDING AND DOCUMENTATION	* Physical changes in relocated villages * Social segregation in relocated villages	*Photographic recording. No physical recording because of time constraints	* Physical tranformation in the morphology of rural settlement of Bungamati (comparison to year 1968) * Traditional ritual paths, neighbourhood boundaries * Developments around village Bungamati
SEMISTRUCTURED INTERVIEWS	* Interviews with Collector, NGOs, CBOs, and people in relocated villages	* Interviews with staff of Gujarat State Disaster Management Authority, local engineers, representatives of various NGOs, and victims	* Interviews with chairman of Village Development Committee, *Interviews with CBOs, NGOs & marginalised sections of the community
LIFE HISTORIES	Not Implemented	* Life histories of some people worst affected by earthquake	* Life histories of the poor, single women, women headed households, and socially marginalised groups

Table 5.1 Description of research methods used in the three case studies

PART IV
CONTEXT OF THE RESEARCH

6. THE SOUTH ASIAN CONTEXT

6.1 INTRODUCTION

This chapter outlines the geographical, social, economic, cultural and political aspects of my context area, which is South Asia in general, and India and Nepal, in particular. First, the traditional systems that characterise rural communities in the region are brought out. This will point at their traditional strengths and weaknesses.

Next, the geographical and geological aspects of earthquake prone areas in south Asian region are articulated. The dynamics of increasing disaster vulnerability in the region is further articulated for its relationship to normal development processes. Their implications of this processess on rural communities are further outlined to bring out the link between poverty and increasing disaster vulnerability.

Lastly, the institutional structure and various practices for disaster management in the region, especially in India and Nepal are broadly outlined, specifically in relation to earthquakes, to bring out various issues. Various Institutional and other aspects pertaining to disaster management before and after the natural hazard are also analysed. These issues lead to the argument, which point to my research question.

6.2 THE RURAL COMMUNITIES IN SOUTH ASIA – TRADITIONAL SYTEMS

The South Asian region has been home to one of the oldest, richest and culturally diverse cultures of the world. This has been a land where cultures have mingled after flowing in from both the west and the east. But what is original is that new combinations have taken place here, and sometimes even new inventions.

Rural communities in the region have some specific well identifiable characteristics. In the words of Sir Charles Metcalfe (Saraswati, 1999),

> "India's village communities are little republics, having nearly every thing they want within themselves, and almost independent of foreign relations. They seem to last where nothing else lasts. Dynasty after dynasty tumbles down, revolution succeeds revolution, but the village community remains the same. This union of village communities, each one forming a separate little state in itself, has contributed more than any other cause to the preservation of the people of India (p.5)".

Notably, here Metcalf is referring to Indian subcontinent before partition, which included present India, Pakistan, Bangladesh but this also to a great extent holds true for other countries in the whole region. This statement by Metcalf gives an impression that traditional rural communties in the region were self-sufficient indpendent entities.

This view has been shared by Louis Dumont who believes that village boundaries have been but seldom altered; and though the villages themselves have been sometimes damaged and even desolated by wars and natural disasters, the same name, the same limits, the same interests have continued for ages. Marx also found villages in the subcontinent, singularly resistant to change.

However, these views have been contested by Srinivas (1996) as over simplified and idealized account of the village in pre-British India. In his words;

> " All this explained the static nature of Indian society and its passivity, and British rule, while exploitative, had in motion economic forces leading to the welcome destruction of traditional Indian Society (p.4)."

At the same time, he concedes that the lowest level of the political system, that is the village, enjoyed a considerable measure of autonomy as well as discreteness from the higher levels. Moreover, he believes that villages then, were, not helpless entities but had considerable resources of their own in dealing with higher political powers (ibid).

6.2.1 Caste System

This is one of the strongest and most debatable features of rural societies in the region, especially India and Nepal. In fact, when one starts to look at rural communities in detail, one finds that there is no homogenous community as such. Rather there are many sub-communities within a larger community, which are formed on the basis of caste. Traditionally these castes dictated the occupation or the other way round. It has always been a system of ensuring sustainability through mutual support of various groups within the village.

There has been considerable discussion concerning the inherent value base behind this system. Nehru argues that earlier anyone could acquire a particular caste on the basis of the knowledge he or she acquires. It was only later that these started to get recognised on the basis of birth. According to Srinivas, this may be to ensure transfer of knowledge and skills from one generation to another.

If Indians have used the term 'community' to ignore inequality, to Durmont, Indian villages are not communities because of inequality of caste. He does not

consider at all the question whether unequal groups living in small face-to-face communities can have common interests binding them together. It is assumed implicitly that equalitarianism is indispensable to community formation, and also that such communities are the rule of the western world (Srinivas, 1996 and Dormont 1966; 67). Srinivas thinks that even the widely stated concepts of inclusion and exclusion as characterised by caste system are alien to some extent, as such concepts overlook mutual support systems which are reinforced through clearly defined roles and responsibilities. However, inspite of this debate, what all of them agree on is that the present day caste system is an inherent characteristic of feudal society, which is ridden by inequities.

In fact, it was possible for villages to function as units in spite of the various cleavages within them because everyone, irrespective of his caste and other affiliations, had a sense of belonging to a local community, which has certain common interests overriding caste, kin, and factional alignment. Protection against the threat to property and life from rapacious chiefs, freebooters and dacoits and from such natural calamities as flood, famine, earthquake and epidemics emphasized the common interest of all villagers in sheer survival. Srinavas (1996) believes that British rule, bringing in law and order and welfare measures, favoured the development of factionalism and at the expense of the village[1]

6.2.2 Relation between land and people

Earlier writers classified Indian villages on the basis of the prevailing land tenure system. Two types of villagers were described: the "joint" and the "severally". The first type is found in the North-West Frontier province, the Punjab and the United Provinces (India and Pakistan, at present), and the second in Penisular and Central India. The latter type also existed in Bengal and Bihar before the permanent settlement in 1793. The "joint" type may be further subdivided into the *Pattidari* and the *Zamindari* sub-types, in both of which the village lands are the joint property of an organized proprietary body. In a "joint" village, there are two classes of men, one with proprietary rights, the other without them, power resting exclusively with the former. In the "severally" or roytwari village, a type which prevails over the greater part of the region, the unit of land revenue is not the village, but the holding of each land-holder, which is separately assessed, and each land-holder is individually responsible for its payment. There is no waste land held in common which can

[1]. Like today, the members of a dominant caste have always been in a privileged position vis a vis the other local castes, and its leaders wielded considerable power. These leaders had the greatest stake in the village, had command over the resources and, generally, they were the ones who organize local activity, whether it be a festival, general protest, or fight. They dominated the traditional village panchayat or council. However, they were also subject to certain constraints. The leaders were required to show respect for certain values common to all castes, and for the customs of each caste even when they differed significantly from those of the dominant castes.

be divided if required for cultivation, though there may be common rights of use in the waste land, e.g., for grazing and for collecting fuel. (Saraswati, 1999)

Traditional communities have developed over many generations a holistic traditional scientific knowledge of their lands, natural resources and environment. Their relationship to land extended much beyond their use as economic asset for exploitation. In fact, in these communities land was not easily sellable. Rather, considerable chunks of land had symbolic, spiritual and cultural associations for the villagers and such values were considered higher than economic value. Besides a sizable amount of land was collectively shared for the common benefit of the community at large for carrying out various activities of common interest and also for use in the time of disaster. However, land tenure systems in villages have been a basis for social and economic inequities that have existed for generations.

6.2.3 Economic system

The traditional economic system of these communities has been based on mutual exchange of goods of mutual interest rather than monetary exchange, which is characteristic of present market capitalism. Especially rural artisans served other members of the society in return for food in most cases. One will find that in many villages, most of the artisans are landless, since they never needed to grow food by themselves.

6.2.4 Religion and Symbolism

Religion holds great importance in the way of life of the people in these communities.
The religious practices in India and Nepal are underpinned by holistic approach[2]. This approach is articulated by religious (Hindu and Buddhist) philosophies that have dominated the subcontinent and determined man-

[2] The religions of the east (Hinduism, Buddhism, Jainism etc.) regard man to be part of nature. According to their philosophies, man is never separated from the overall system (cosmos) to which he belongs. In his consistent pursuit to merge with the macro cosmos, he recreates around him a micro-cosmos.[2] This act of recreation gets manifested as rituals, festivals, myths and legends and even spatial configurations with recreated associations (to narrate these myths or legends). This physical manifestation is not materialistic and empirical reality, in the sense that it is not what we observe is real (as nothing is true anyways), rather it is experiential. This experience is not for once and forgotten about...rather it is to be renewed and re-experienced in a cyclic mode. This manifested reality is in constant touch with the empirical reality observed as laws of nature. These are not fixed in time and scale (as divisions of seconds, minutes, hours, days, weeks, months and years have been designed by man to suit his convenience), rather time and scale get their meaning through observed reality (sun rise and sun set, change of seasons etc.). On the other hand, man tries to revive his own self / consciousness (as it is also eternal part of cosmos). He tries to search into himself and discovers the whole cosmos within him.[2](Malik, Johan Galtung, Kapila Vatsayan)

environment relations in terms of experiential, spatial and temporal aspects thereby justifying existence of knowledge both in conscious and sub-conscious realms, determined by particular world-views.

This is not only reflected in their cultural practices and rituals but also gets manifested in morphological patterns though symbolic forms and spaces for carrying out these activities. Also, the psychological role of religiion in perceiving and dealing with disaster situation cannot be under-estimated. Most of the people perceive natural hazards such as earthquakes as 'acts of God'.

6.2.5 Built Form

Like elsewhere, the vernacular rural built form in the subcontinent demonstrates a conscious attempt at optimum use of available resources. These also take into consideration other factors such as local climate, affordability and long term sustainability. Like other places, traditional building knowledge in disaster prone areas is a subject of study for their strengths and weaknesses in responding to natural disasters (Langenbach; 1983, Arya; 1991, Sharma; 1999)

6.2.6 Conclusion

Needless to say, villages in the subcontinent have a distinct cultural personality. What counts in the village culture are the wisdom tradition, the value system, and the local ontology that has been handed down from times immemorial. A complex system of cultural structures is identified with art and architecture, religion and specialized knowledge, human behaviour, environmental conditions and so on. (Saraswati, 1999) Mahatma Gandhi has very clearly articulated the strengths of a villager.

> "The moment you talk to them (the Indian peasants) and they begin to speak, you will find wisdom drops from their lips. Behind the crude exterior you will find a deep reservoir of spirituality. I call this culture – you will not find such a thing in the West. In the case of the Indian village, an age-old culture is hidden under an incrustment of crudeness. Take away the encrustation, remove his chronic poverty and his illiteracy and you have the finest specimen of what a cultured, cultivated, free citizen should be. (Saraswati, 2000; 64)."

In this section, I have comprehensively discussed the main characteristics of traditional rural communities in south Asia. The strengths and weaknesses of these systems in their response to natural disasters, more specifically the earthquakes, can be explored for each cultural context. Also these communities need to be looked at in the present context for their existing vulnerabilities to disasters. The current practices in disaster management also need to be

discussed for their role and effectiveness in reducing vulnerability of these communities. This will be discussed in subsequent sections.

6.3 EARTHQUAKE PRONE REGIONS IN INDIA AND NEPAL – GEOGRAPHICAL CONTEXT

The south Asian region is prone to various kinds of natural disasters such as floods, earthquakes, cyclones, droughts, landslides etc. Some well known natural disasters include the 1991 cyclone of Bangladesh, 1993 earthquake in Marathwada region, Orissa Cyclone in 1999 and very recent Gujarat earthquake in January, 2001, both in India and 1992 floods in Pakistan. Besides, there have been many small and medium scale disasters.

6.3.1 Earthquakes on the Indian sub-continent – Geological phenomena

Earthquake activity on the Indian subcontinent (South Asia) is directly related to the movement of the Indian plate. The Indian subcontinental plate after getting detached from its Gondwanic partners in early Cretaceous (~130 Ma) moved very rapidly with consequent thinning and heating of its lithosphere. It started actively subducting underneath the Asian and Burmese plates at differential rates with intense Ophiolitic activity (100~65 Ma) at its boundary followed by continental collision between Indian and Eurasian plates resulted in episodic uplift of the Himalayas and Naga-Arakan-Yoma mountain ranges during Tertiary and Quaternary times. These mountain ranges attained their present geomorphic expression during quaternary times. Accumulation of compressive stresses with variable disposition of principal axes during mountain building activity resulting in rotational movement of Indian plate; generation of conjugate sets of tensional stress regimes gave rise to many intra-plate rifts; and associated sedimentary basins on the Indian plate – both on shore and off-shore areas. Net outcome of all these processes was formation of several tectonically active mega-structural features dividing the Indian plate into number of fault bound blocks which have moved differentially relative to each other through geological times. These structural features occur as major lineaments on the tectonic map of the subcontinent and on satellite images. Here it is important to mention that all these lineaments need not be seismogenic, only those lineaments showing evidences of Quaternary to Recent movements (Neo-tectonism/Contemporary Tectonism) are seismogenic. These features are in fact, reflection of on-going geo-dynamic processes operating underneath crustal-upper mantle regions. It has been established that differential thermal and crustal structures underneath the Indian shield provides the first order motive force for the relative movements between the various blocks under the overall influence of the ambient stress field generated in the Indian plate. Such movements accumulate strain along

block boundaries and on becoming critical get released causing earthquakes of varying magnitudes, focal depths and focal mechanism. (Ravi Shankar, Geological Survey of India[3])

Due to the above tectonic phenomenon, seismic activity is very strong in the Himalayan belt, which covers the northern part of India and Nepal. It is believed that the Indian plate is going down whereas the Eurasian plate is rising over the Indian plate. Because of this, the Tibetan plateau is moving north at a rate of few centimetres per annum. This action has generated a linear belt of cracks in the tectonic belt in Northern India and Nepal. Main central thrust (MCT) separates the upper Himalaya with lesser Himalaya in most cases. Main Boundary Thrust (MBT) separates the lesser Himalayas (called midlands in Nepal) from Siwalik (called Churia hills in Nepal). The Himalayan frontal fault separates the Siwalik from the Alluviam of Indo Gangentic Plains. (U.M. Malla, Natural Hazards in Nepal)

6.3.2 Earthquakes in India and Nepal

Strong and damaging earthquakes have been felt in various parts of the Indian subcontinent. The most seismic areas are those in the northern regions of the subcontinent (north India and Nepal) and on the Andaman and Nicobar Islands (India). As mentioned earlier, the Indian plate is thrusting (diving below) under the Eurasian plate. On the Andaman and Nicobar Islands, the Indian plate subducts (dives) beneath the Burmese Micro-plate. Earthquakes in these areas are known as Inter-plate or plate boundary earthquakes. Earthquakes in the penisula area occur in the middle of the Indian plate away from plate boundaries. These earthquakes are called Intra Plate earthquakes. The frequency of inter plate earthquakes is generallly higher than intra plate earthquakes.

One of the deadliest earthquakes in Indian history was the 1905 Kangra earthquake in Himachal Pradesh, which left 19,700 people dead. The strongest earthquake recorded was the 1950 earthquake in Arunachal Pradesh. It had a magnitude of 8.6 (Mw) and was the 6th largest earthquake in the world, in the 20th century. The most widely felt earthquake in India to date, has been the 2001 Bhuj earthquake. Shaking was experienced as far away as Chennai in the south, Shillong in the east, Quetta in the west and Kashmir in the north. After the Kangra earthquake, this was the next worst earthquake and caused heavy casualties. More than 13,000 people were killed in Gujarat (according to official estimates). (http://asc-india.org)

The peninsula area was generally thought to be "seismically safe". But recent large earthquakes in this area have proven this statement wrong. Apart from the

[3] From Shelter, A HUDCO-HSMI Publication, special issue, 1999

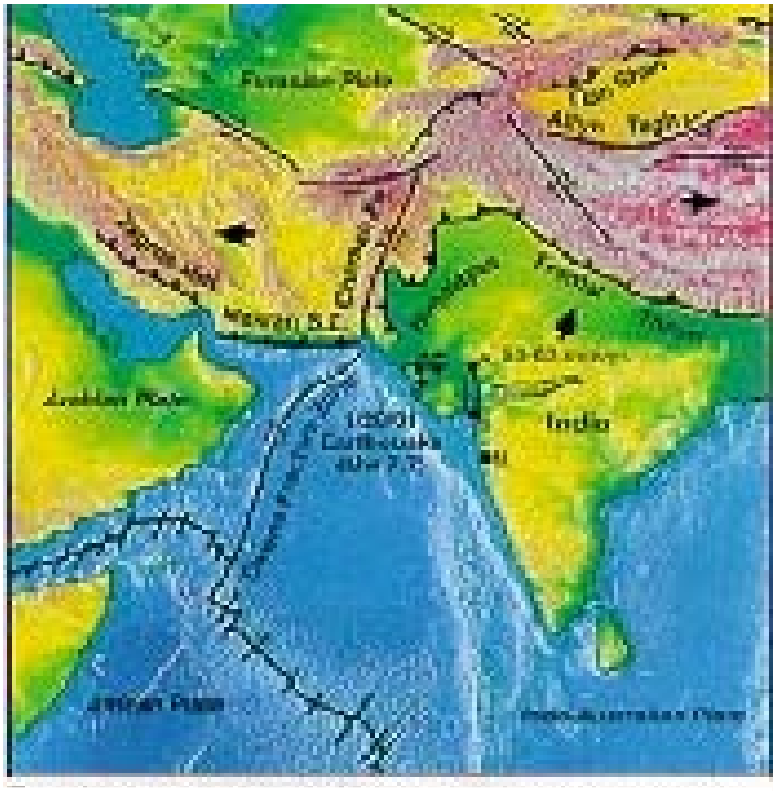


Fig. 6.1 Fault lines in South Asian Region

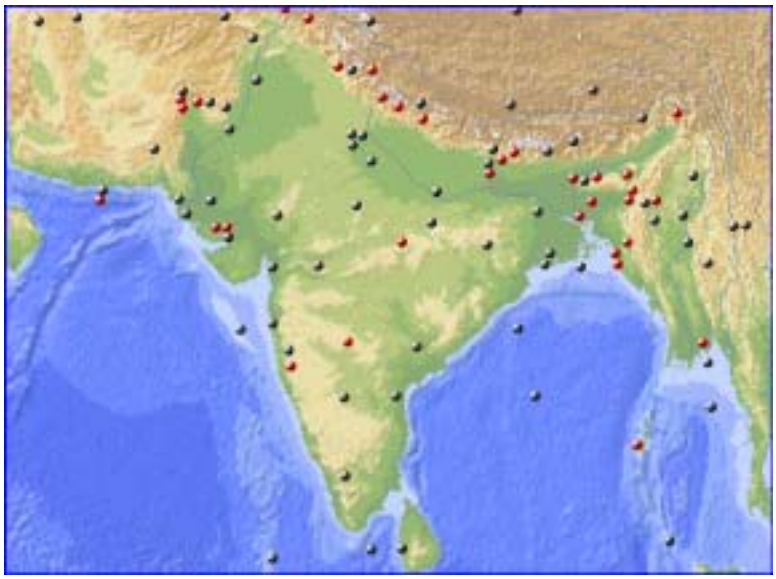


Fig. 6.2 Earthquakes in South Asia - Plotted epicentres are approximate locations. These are not the only earthquakes that have occurred in this region.

Source– http://www.asc-india.org

Latur (1993) and Koyna (1967) earthquakes, several damaging shocks have hit this region, in historical and ancient times.

The seismic record of Nepal goes back to 1255 AD. Since then a series of earthquakes occurred in 1408 A.D., 1681 A.D., 1810 A.D., 1833 A.D. and 1866 A.D. Among all these earthquakes, the event of 1833 A.D. was the major one, the exact data of which is not available. After that Nepal has suffered a very big earthquake in 1934 A.D. with a tremor of 8.4 Ritcher scale Magnitude. Its epicenter was in Kathmandu. This disaster claimed the life of 16,875 people and destroyed 318139 houses. Nepal experienced another two major earthquakes. One in 1980 A.D. had a tremor of 6.5 Richter scale magnitude with the epicenter lying in Bjhang district due to which 178 people lost their life and about 40 thousand houses were destroyed. The earthquake of 1988 A.D. had a tremor of 6.6 Richter scale with epicenter in Udayapur district, which killed 721 people, 1566 cattle and destroyed about 64,467 houses.

6.4 DYNAMICS OF INCREASING DISASTER VULNERABILIY OF RURAL COMMUNITIES IN SOUTH ASIA

6.4.1 Natural Disasters and Human Development

In the last decade (1991-2000), natural disasters reportedly killed 665,598 people. Of all those killed by natural disasters, 83 percent were Asians. On average, natural disasters accounted for 88 percent of all deaths from disasters over the last decade. (World Disasters Report 2001). Natural hazards such as earthquakes have always occurred in the region but it is only recently that their impact has increased many fold. For example, an earthquake comparable to the one in Nepal and Bihar in 1934 which killed almost 8,600 people in this country would today, as one estimate goes, result in not less than 40,000 deaths and render 90,000 homeless[4] (Rajouria, 2001)

However, what is worth noting is that of the 2,557 natural disasters reported since 1991, more than half were in countries of medium human development and two-thirds of those killed came from countries of low human development (LHD), while just 2 percent came from higly developed nations. On average, 22.5 people die per reported disaster in highly developed nations, 145 die per disaster in nations of medium human development, while each disaster in LHD countries claims an average of 1,052 people. When it comes to those affected by natural disaster, 88 percent are from countries of medium human

[4] Alok Rajouria, 'Natural Disasters : Who are at risk and why?', The Kathmandu Post, February 10, 2001

development, while just one-tenth are from countries of low human development. This may be explained by the fact that the United Nations categorizes China and India, home to some of the world's biggest catastophes, as nations of medium human development. These figures clearly show that the effect of development on disasters is very stark. (Ibid)

Experts say that in these countries, over 95% of the deaths in natural disaster such as earthquake result from building failures. Coupled with this, infrastructural weakness, rapid urbanization, poor planning and lack of public awareness are generally blamed for the severity of disasters. But factors like wealth and power, gender and even ethnicity have a bearing on vulnerability. While both the rich and the poor are at risk from earthquake, it is the poorer people who suffer most causalities and face greater difficulties in coping and recovering from the event (Rajouria, ibid). According to World Disaster report (2001), the poor suffered the highest death tolls and were otherwise most affected because poverty weakened resilience to floods, droughts and other natural disasters. According to IFRC, globalisation has also been accentuating the problems of the world's poorest states in dealing with natural disasters. According to Peter Walker, director of the IFRC's Asia regional office, "it is more a change of attitude. Every investment now has to be measured in market terms against targets and expected return rather than alleviation of poverty."

The above facts make it evident that the frequency and magnitude of natural disasters are directly linked to increasing poverty and other aspects related to human development (refer indicator for Human development, Human Development Report, 2001). Let us investigate these specifically in relation to South Asian Situation.

6.4.2 South Asian Situation

South Asia is home to the poorest with 43.5% of the world's poor surviving on less than a dollar a day, has the most illiteracy with some 400 million illiterate adults, has the most malnourished with over 80 million malnourished children and above all is the least gender sensitive region. Preventable diseases kill 3.2 million children each year. Girls and women form the vast majority of these deprived millions. About 500 million people are still living in a state of severe deprivation, lacking sufficient access to adequate nutrition, health, housing, safe water, sanitation and employment, the region is home to over 43 percent of the world's income poor. Moreover, the UNDP Human Development (HDI) rates South Asia lower than all other regions (except for sub-saharan Africa) in terms of average achievements in Human Development.The region has also emerged as the most poorly governed region in the world.

Though the estimates of the incidence of poverty vary widely in the region, the basic fact that all the seven countries in South Asia are deeply entrenched in

mass poverty remains unchallenged. UNDP has reported an increase in the number of poor people in South Asia in the 90s with the exception of Sri Lanka. This is indicated in the table below:

Table 6.1 Poor People in South Asia

Countries	Mid 80s (million)	Mid 90s(million)	Annual Change (%)
Bangladesh	49.0	54.1	0.8%
India	277.4	335.3	1.9%
Nepal	7.0	9.8	3.1%
Pakistan	28.9	31.8	1.4%
Sri Lanka	4.5	4.0	-2.4%

Source – UNDP – 1999a

As observed earlier the region has made very little progress in eliminating illiteracy. With over 400 million illiterate adults, nearly one half of the world's total and over 50 million out of school children it is the most illiterate region in the world. 45 percent of the world's illiterate female adults live in South Asia. The social and economic implications of such neglect are without doubt huge (Human Development Report, 2000).

Reproductive health in the region is in a dire state because of neglect of women's health and nutrition during pregnancy and lack of facilities for safe delivery. Similarly the incidence of malnutrition among children is very high. Although income poverty remains a severe problem in the South Asia, human poverty affects a larger share of the population. The dimensions of human poverty vary in intensity across countries in the region. This is highlighted in a UNDP 1999 report analysing human poverty in four of the South Asian countries as follows:

Table 6.2 Human poverty in South Asian countries

Countries in the region	Human Poverty Index(%) 1997	People not expected to survive to age of 40(%) 1997	Adult illiteracy (%) 1997	Underweight children under 5 (%) 1997
Bangladesh	44	22	61	56
Nepal	52	23	62	47
Pakistan	42	15	59	38
India	36	16	47	53

Source – UNDP-1999A

The region has a very high population growth, which according to one report is expected to cross 1330 million in the 2000-2005. Given the slack in economic

growth in the region, the problems of mass unemployment, health erosion, illiteracy and inequality, hunger and malnutrition will invariably increase with the population growth. The ecological imbalance emanating from the heavy erosion in the mountainous region may lead to serious problems of flood, drought and other national disasters of catastrophic magnitude. It is one of the most disaster prone areas—with recent floods and drought in India, Bangladesh and Pakistan, devastating the areas where they occurred.

Rapid urbanisation in South Asia is giving an explosive dimension to its widespread poverty and human deprivation. Today about one in four South Asians or roughly 330 million live in cities. South Asia's rate of urbanisation over the last quarter of a century has been faster than all the regions of the world except East Asia and the Pacific. At the rate it is multiplying, nearly half of South Asia's population will be living in urban areas by the year 2025 (Human Development Report, 1998) . Besides, the South Asian region is facing environmental crisis; coastal areas are becoming more fragile due to salinity ingress or coastal cyclones. Rapid development of ports, towns and related infrastructure are exposed to new risks. Flooding in major river basins, spreading desert areas and contracting forest reserves pose challenges to the poor in terms of survival.

The regional growth patterns in most of the critical sectors, including agriculture, industry, manufacture and services have not recorded any perceptible increase. With the regional average savings rate of 13.28 percent and investment rate of 18.65 percent, South Asia has been in the vortex of resource crunch. The ever-increasing balance of payment deficits has further affected the situation. With no immediate shift in the production and export structure of the region, these deficit dynamics will further aggravate the dependence on external finance. Presently the region's external debt exceeds 150 billion dollars.

6.4.3 The current status of rural communities– increasing poverty

I have looked at the existing human development situation in south Asia that points to increasing poverty in the whole region. I will now look at the situation of rural societies in the region in particular.

At present, rural South Asia is the home of over two-thirds of the total population. It represents about one-third of the total rural population of the world. Poverty in South Asia is largely a rural phenomenon. While all SAR countries have made progress in reducing the levels of income poverty, it remains high in rural areas. About one third to almost one half of the rural population is poor in all SAR countries, except Maldives (22%). Based on national estimates, about 80% of the total 300 million poor in India reside in

rural areas. In Nepal, the poverty rate in rural areas (44%) in 1995/96 is almost double the rate in urban areas (23%). (World Bank, 2000)

In fact rural poverty goes much beyond inadequate incomes. Interviews with rural people for example, reveal their acute vulnerability to disease, crop failures, labour market fluctuations, domestic violence and natural disasters, which further exacerbate their sense of insecurity. Any one such event hits the poor particularly hard, causing them to fall, or fall deeper, into poverty. A sense of powerlessness, alienation, and inability to influence the environment in which they live, pervades being poor. (Ibid)

Faster progress in reducing rural poverty in South Asia, however, has been hampered by inadequate government priority on ensuring a holistic and integrated approach to rural development. While governments have implemented a large number of programs in key sectors such as the social, agriculture, natural resource, infrastructure, and non-farm sectors over the last few decades, several factors undermined their effectiveness in fully achieving their objectives of fostering equitable rural growth and poverty reduction in rural areas. According to the document titled 'South Asia strategy and action plan for rural development' prepared by the World Bank in 2001, these included:

> (I) A predominantly centralized, top-down approach in the design and implementation of government programs, which undermined their longer term sustainability and also often bypassed vulnerable groups in society (women, tribal groups and the landless); (ii) the lack of coordination among various sectoral programs in rural areas that hindered greater synergies in their development impact; (iii) the creation of a highly restrictive policy and regulatory environment, which stifled private sector initiative, participation and investments in the farm and non-farm sectors that is instrumental for greater employment and income generation in rural areas; (iv) public expenditure patterns characterized by insufficient priority to social and human development in rural areas and an increasing share absorbed by highly distortive subsidies which took away resources for productivity-enchancing investments and in some areas (i.e. fertilizer, power, and water) are contributing to natural resource degradation; and (v) weak public sector institutional capacity which contribute to natural resource degradation; and (v) weak public sector institutional capacity which contributes to poor delivery of basic services in rural areas, especially to vulnerable groups. In recent years, the SAR countries have taken some positive steps to redress some of these constraints, but a lot remains to be done.

As such, increasing poverty has been primarily linked to the increasing vulnerability of rural societies in general. This holds true for natural disasters also.

6.4.4 Increasing vulnerability to Disasters

All these factors point to increasing vulnerability of people to disasters in this region. An estimated one-fifth of the vulnerable poor in South Asia become victims of natural disasters such as floods, droughts, fires, earthquakes and cyclones each year (Bhatt Mihir, 1999). The October 1999 cyclone or Orissa, India and the 2001 Gujarat earthquake are the most recent examples of the poor being exposed to frequent disasters in the region.
The following table, for the whole of Asia further substantiates this. It shows an important trend for the increasing impact of disasters in South Asia, which is home to the largest number of poor people in the world.

Table 6.3 The increasing impact of disasters in South Asia

	1973-77	**1978-82**	**1983-87**	**1988-92**	**1993-97**
Killed	68,454	16,529	17,073	63,435	19,078
Affected	62,502,799	127,831,208	137,858,113	154,905,725	150,661,006
Homeless	3,026,946	588,882	2,361,435	16,861,685	4,250,166
Injured	43,507	18,824	30,547	108,510	85,840

Source – World Disasters Report 1999

Based on the above table, it is worth noting that in contrast to the number of people killed by disasters, the number of people affected by disasters in Asia over the period 1973 to 1997 has remained largely unchanged. This indicates that the disaster preparedness and mitigation programmes have been insufficient to counter the effects of other factors that increase vulnerability such as fast population growth, deforestation, and increasing concentration of people in urban areas. There has been a decline in the number of people rendered homeless over the period 1973 to 1997, which is attributable to better flood preparedness, forecasting and early warning systems. There has been a rapid increase in the number of people injured by disasters. This can be attributed to higher number of earthquakes in the Asian region, which have a relatively high injury to death ratio. However, here one needs to mention that institutional reasons can't be solely blamed for increasing effect of disasters. This is structurally linked to various aspects of development, which are the underlying causes for increasing disaster vulnerability. Needless to say, due to increasing rural poverty, disaster vulnerability of rural settlements is on sharp rise.

Every country in south Asia has developed its own institutional structure and policy approaches to carry out disaster management. I will specifically deal

with these in the context of India and Nepal, since these are the geographical context of my case study areas.

6.5 INSTITUTIONAL STRUCTURE AND EXISTING PRACTICES FOR DISASTER MANAGEMENT IN INDIA

6.5.1 The institutional structure

India being a democracy with a federal structure, the basic responsibility of undertaking rescues relief and rehabilitation measures in the event of natural disaster lies with the state government. The role of the central government is supportive in terms of physical and financial resources, with which the rescue, relief and preparedness measures are supplemented. Moreover the institutional structure is very bureaucratic and top-down being organised mainly at central, state and district levels. Their activities and roles are briefly described below

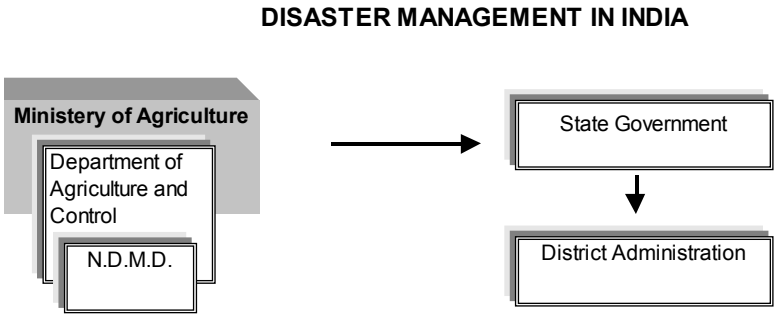


Fig. 6.3 Institional hierarchy for disaster management in India

Source- Sharma (1999)

Central level

The central response can be:

(i) Policy Response: its objectives will be to empathise with the sufferings of the people affected by natural calamity, and to sub-serve long term and short term policy objectives of the Government.

(ii) Administrative Response to a natural calamity can be on account of:

a) A follow-up of a policy objective of the Government.
b) The need for an assessment of the situation and for a central response;

c) States' requests for central assistance; and
d) The need for information as a governance objective.

The department of Agriculture and Co-operation (DAC) in the Agriculture Ministry is the nodal Department for all matters concerning natural disaster relief at the centre. The National Contingency Action Plan (CAP) facilitates launching of relief and rescue operations without delay. The CAP identifies initiatives required to be taken by various Central Ministries, and Public Departments in the wake of natural calamities, sets down the procedures and determines the focal points in the administrative machinery.

In the DAC, the Relief Commissioner functions as the nodal officer to co-ordinate relief operations for all natural disasters. He monitors the developments taking place and provides the necessary feedback, through the Agriculture Secretary to the Agriculture Minister, Prime Minister and the Cabinet.

Various other committees working at the national level for the disaster management is cabinet meeting, national crisis management committee and crisis management group.

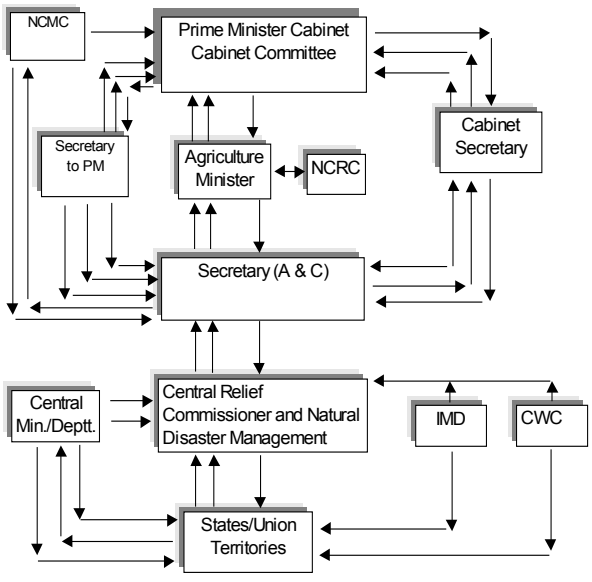


Fig. 6.4 Interaction pattern for disaster management at central level
Source – Sharma(1999)

The Centre plays a major role as far as mobilization of financial resources is concerned. The policy and arrangement for financing the State Governments to

provide relief and rehabilitation measures in areas affected by natural calamities are governed by the recommendations of the Central Finance Commissions appointed from time to time. Under the present scheme, a Calamity Relief Fund (CRF) has been constituted for each State with contribution from the Central and State Governments to undertake relief and rehabilitation measures. A State Level Committee headed by the Chief Secretary decides the norms of assistance under each of the approved schemes. In addition to the CRF, a National Fund for Calamity Relief (NFCR) has also been constituted to deal with calamities of rare severity[5].

State Level

As pointed out earlier, the central government only supplements the efforts of the State Government. The state Governments are autonomous in organizing relief operations in the event of natural disaster and in the long-term preparedness or rehabilitation measures.
The states have Relief Commissioners who are in charge of the relief measures in the wake of natural disasters in their respective states. In the absence of the Relief Commissioner, the Chief Secretary or an Officer nominated by him is in overall charge of the Relief operations in the concerned State.

The Chief Secretary is the head of the State Administration. The State Headquarters have, in addition, a number of Secretaries heading various Departments, which handle specific subjects under the overall supervision and co-ordination of the chief Secretary. At the level of the State Government natural disasters are usually the responsibility of the Revenue Department or the Relief Department. While the Cabinet of the State headed by the Chief Minister makes important policy decisions at the State Headquarters, the Secretary in the Department carries out day-to-day decisions involving policy matters.

There is a State Crisis Management Group (SCMG) under the chairmanship of Chief Secretary or Relief Commissioner. The SCMG is required to take into consideration the infrastructure and guidance received, from time to time, from the government of India and formulates action plans for dealing with different natural disasters.

It is also the duty of the Relief commissioner of the State to establish an emergency operation centre as soon as a disaster situation develops. Besides

[5] The National Calamity Relief Committee manages the fund, which is a sub-Committee of the National Development Council headed by the Union Agriculture Minister. In normal circumstances the State Governments are required to undertake the relief and rehabilitation measures utilizing the annual CRF allocations. They can, however, seek additional assistance from the NFCR in the event of calamity of rare severity.

having all updated information on forecasting and warning of disaster, the centre is also the contact point for the various concerned agencies.

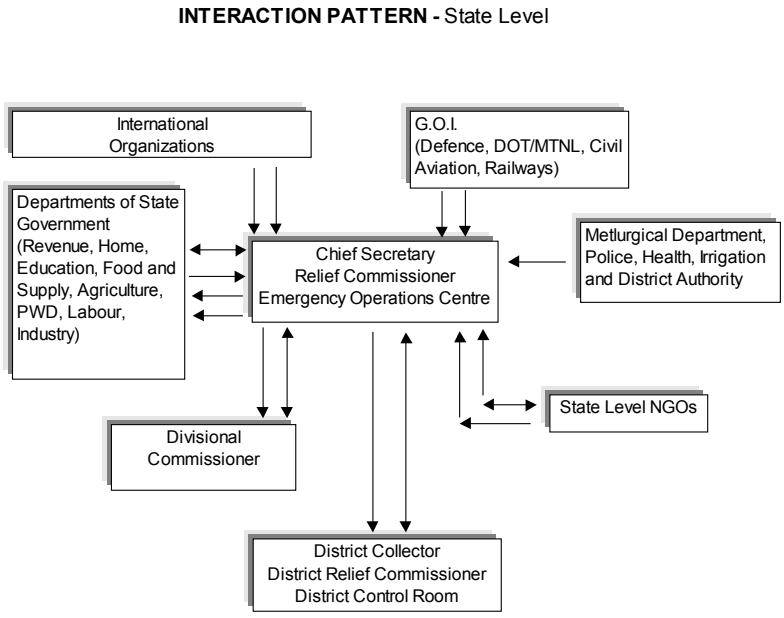


Fig. 6.5 Interaction Pattern at State Level for Disaster Management in India
Source – Sharma (1999)

District Level

States are further divided into districts, each headed by a District Collector (also known as District Magistrate or Deputy Commissioner). It is the District Collector who is the focal point at the district level for directing, supervising and monitoring relief measures for disaster and for preparation of district level plans.

The collector exercises coordinating and supervisory powers over functionaries of all the Departments at the District level. During actual operations for disaster mitigation or relief, the powers of collector are considerably enhanced, by standing instructions or orders on the subject, or by specific Governments orders, if so required.

A district is sub-divided into sub-divisions and Tehsils or Talukas. The head of a sub-division is called the Sub-divisioner officer (SDO) while the head of a Tehsil is generally known as the Tehsildar (Talukdar or Mamlatdar in some states). Therefore in a disaster situation, contact with the individual villages is

through the village officer or Patwari who has one or more villages in his charge.

At the district level, the disaster relief plans are prepared which provide for specific tasks and agencies for their implementation in respect of areas in relation to different types of disasters.

A contingency plan for the district for different disasters is drawn up by the Collector or deputy Commissioner and approved by the State Government. The collector or Deputy Comissioner also co-ordinates and secures the input from the local defence forces unit in preparation of the contingency plans. These contingency plans lay down specific action points, key personnel and contact points in relation to all aspects.

The district level relief committee, consisting of official and non-official members including the local legislators and the members of parliament reviews the relief measures. A Control room is set up in the district for day to day monitoring of the rescue and relief operations on a continuing basis.

The collector maintains close liason with the Central Government authorities in the districts, namely, the Army, Air Force and Navy, Ministry of Water Resources etc. who supplement the effort of the district administration in the rescue and relief operation. He also co-ordinates voluntary efforts by mobilizing the non-government organizations capable of working in such situations.

Besides the District Officials, a host of other bodies too supplement their efforts in disaster situations – particularly the armed forces and the voluntary organizations.

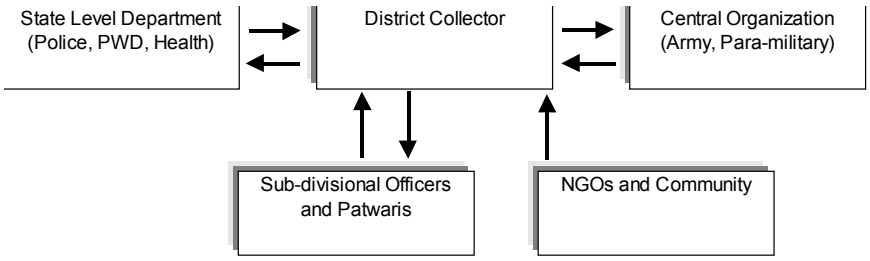


Fig. 6.6 Institutional Coordination for Disaster Management in India
Source – Sharma (1999)

The armed forces

The armed forces of the country have played a vital role during disaster emergencies providing prompt relief to the victims even in the most inaccessible and remote areas of the country. Related to the efforts of the armed forces, are the civil defense and the Home Guard organizations. These organizations are voluntary in nature and character and come in handy in emergency situations like natural disasters. A network of these is now found all over the country.

Non Governmental Organizations

Non Governmental Organizations (NGOs) are increasingly playing an important role as a bridge between Disaster Management Agencies and the affected community. Many different types of NGOs are already working at advocacy level as well as grassroots level in typical disaster situations. Many of these are working on various development issues, in normal situations, but in disaster situations, they assume an important role in preparedness, relief and rescue, rehabilitation and reconstruction. Some of these like Disaster Mitigation Institute, Ahmedabad are specifically addressing various issues related to disasters. These NGOs may be international, national, regional or local.

Research Organisations

Most of seismic research in South Asia has been carried out it India. Though the research activity in India started quite late compared to the west, it has come a long way since then. There are several public, semi-public and private agencies, which have undertaken significant work in the field.

The National Centre for Disaster Management (NCDM) is the nodal agency for research, training, consultancy, and advocacy in the field of natural disasters in India. The NCDM has identified broad areas of research such as disaster preparedness, disaster mitigation, cost-benefit analysis of preparedness plans, environmental impact of floods, droughts, earthquakes, cyclones, and other disasters, and the behavioural aspects of disasters on the affected people. It is networking with various Central Government Ministries and concerned departments involved in disaster management as well as with various autonomous institutions.

A significant amount of research on seismicity as a phenomenon and its implications has been done by Geological survey of India. It has undertaken various macro and micro-seismic studies, especially for the last three earthquakes in Uttarkashi, Latur & Osmanabad and Jabalpur. Other independent institutions such as Indian institute of remote sensing, Dehradun

and Centre for earth Sciences studies, Trivandrum have also been active in carrying out various kinds of spatial analysis of seismicity and its effects, mainly related to measurement, management, monitoring and collection of information on earth surface features, man-made or natural, and processes involved.

In the recent past, Geomatics has made tremendous progress due to rapid advances in the processing speed of computers, availability of reliable and authentic information through remote sensing as well as through other ground based methods, and information processing and data handling capabilities of GIS (IIRS, 1997). Significant academic research in seismic engineering has been carried out in department of earth sciences, University of Roorkee and Indian Institutes of Technology (IITs). The research has primarily focussed on the design of seismic resistant structures, besides carrying out a large number of vulnerability studies. Dr. A.S. Arya, Professor emeritus at Roorkee University is the doyen of earthquake engineering in India. He is the author of numerous books, recipient of many awards and is a veteran who has studies many earthquakes around the world since the 1960s (Arya, Revi and Jain, 1994). He has made a remarkable contribution through plans to strengthen damaged houses using raw materials that are locally available (e.g. in Latur). Besides various management agencies, there are couple of premier research organisations like BMPTC and TARU which are involved in areas such as technology transfer and documentation of post disaster actions.

6.5.2 Building specifications for reconstruction, strengthening and retrofitting of rural (non-engineered) buildings

Provision of adequate earthquake resistance in buildings and other structures is instrumental in earthquake hazard mitigation. In 1962, Bureau of Indian standard (formerly Indian standard institution) issued the first Indian standard recommendations for earthquake resistant design of structures (IS: 1893-1962). Since then, the standard has been revised several times (in 1966, 1970, 1975 and 1984; another revision has recently been done). Also a few more standards pertinent to seismic design of specific types of structures have been issues such as (p. 16-17)):

- Buildings in general – Indian standard Code of Practice for Earthquake Resistant Design and Construction of Buildings (IS:4326-1993);

- Masonry buildings – Improving Earthquake resistance of Earthen Buildings – Guidelines (IS: 13827-1993), and improving earthquake resistance of low strength masonry buildings – Guidelines (IS:13828 – 1993)

- Concrete structures – Indian Standard Code of Practice for Ductile Detailing of Concrete structures (IS 13920-1993).

- Repair and Strengthening – Repair and Seismic Strengthening of Buildings – Guidelines (IS 13935-1993)

All engineered structures in India are supposed to be designed to the specifications of pertinent Indian standards, and the criteria for designing seismically resistant construction must be followed.
However, prior to the 1993 Latur earthquake, building regulations were not enforced in the construction of non-engineered rural buildings in India; consequently, these structures were generally built to sustain gravity loads only. A set of Indian standards related to earthquake resistant construction of low-strength masonry buildings, which are prevalent in the rural areas of India, were issued for the first time in 1993 (Government of Maharashtra, 1998).

According to the IS: 4326-1993: Earthquake Resistant Design and Construction of Buildings – code of practice,

> "Reinforced cement concrete (RCC) band is one of the most important seismic provisions for masonry buildings located in seismic zones II to V. such a band acts like a ring or a belt, tying the walls together and ensuring a desirable, box like behaviour of a building structure in an earthquake. Without a band, each of four walls in a simple one room house would respond to an earthquake as isolated free standing structures, thus providing only a limited resistance to earthquake induced lateral forces. The band is incorporated at the roof, plinth and eaves level. As a low cost alternative seismic bandage can be incorporated by fixing 60cm wide welded wire-mesh reinforcement to the walls at the roof level by means of long nails. (p. 18)"

Other technical interventions for strengthening of rural buildings include;

- Incorporating 'through' stones
- Strengthening corners by introducing wire-mesh or knee bracing.
- External binding (concrete jacketing) is recommended for strengthening damaged or undamaged portions of a burnt brick/UCR stone wall
- Altering the design and location of openings
- Pointing of exterior wall in cement mortar.
- Lightening of the weight of the roof

In spite of the guidelines and the technology for improving earthquake resistance of rural buildings, the issue is concerning their feasibility in the context of rural communities in south Asia.

6.5.3 Existing efforts towards 'technology transfer' to rural communities

India has always had an acute housing problem, especially for the rural poor, who can hardly afford the cost of conventional building materials. However, technology is available for the production of alternative building materials, which could be used to build low-cost houses in rural and semi-urban areas. This need has long been realised by various public, semi-public and private agencies. It was with this objective that a five-year action plan was launched by Government of India on Innovative Building Materials and Housing in 1990. The nodal responsibility was entrusted to the Central Building Research Institute (CBRI), Roorkee, a premier research institute in the country. Several national agencies concerned with low cost building technologies were also involved.

In 1990, a wide range of low-cost technologies for building construction and housing developed by CBRI and several other R&D establishments over a period of more than four decades were available. But, in the absence of an appropriate mechanism, benefits of these innovations had not reached the target user. Some on-site extension and technology transfer efforts had been made earlier, but they were mostly symbolic and selective and did not involve large participation. These efforts were unable to make any sustainable impact for want of desired thrust and focus of a programme. The Action Plan (1990-95) was designed to involve mass participation to disseminate the innovative technology as widely as possible among the rural and semi-urban population, to achieve a high multiplier effect.

The main issues to be addressed were: (1) Lack of motivation to improve dwelling units, (2) lack of adequate trained manpower, (3) lack of awareness about the benefits of using innovative low-cost technology.

The underlying aim was that the new technology should be acceptable to people both from socio-cultural as well as economic point of view. Keeping these in view, the programmes were devised in such a way as to disseminate only appropriate technology among the rural poor who could then propagate it further.

As a step towards generating trained manpower capable of handling the innovative construction technologies at all levels, integrated training programmes for site engineers, architects, trainers, masons and others were organised at different locations in the country. To create mass awareness and acceptability of the innovative technologies and materials among the people, a series of public awareness campaigns through mass-media, get-togethers and exhibitions were organised on a large scale all over the country.

Besides this extensive programme, various efforts have also been carried out by various NGOs in promoting 'low cost' and 'appropriate' technology such as Intermediate Technology Development Group (ITDG) and 'Development Alternatives'. Detailed discussions on various technologies that have been attempted are beyond the scope of this thesis.

Such 'technology transfer' initiatives in housing / shelter have been attempted in post disaster reconstruction efforts. It has been more than a decade since these efforts towards 'low-cost', 'sustainable' or 'appropriate' technology transfer were launched. As such, it is important to assess as to

- What extent these technologies have tried to build on local knowledge and skills?
- What extent, these have been accepted by the rural communities?
- What extent these have proved to be sustainable in a long run?

6.5.4 Critical Review

VK Sharma (1999) has broadly summarised the main concerns regarding disaster management in India. According to him, long-term orientation is clearly missing in disaster management. Another major flaw is that the broad range of issues that disaster management covers are not clearly conceptualised at the national level. Consequently, little emphasis is placed on institutional strengthening and more focus is on stock piling and developing emergency response plans.

Also he states the problem of inadequacy in development planning, with planners often lacking the essential technical information and expertise to integrate disaster risk into their models. Further, at times, it is not realised that many development activities can in fact inadvertently lead to or exacerbate disasters.

Sharma further states that a major problem with the current administrative organization is that centralized planning systems do not give sufficient weight to the view and concerns of regional and local government entities, which, after all, are operationally called upon to lay disaster mitigation roles. As such, the grass root mechanism for disaster management is quite weak.

Nalini Thakur (1998, 2001) has brought forward another issue that special needs of built heritage are not considered while undertaking disaster management in terms of mitigation measures before the disaster and repairs and retrofitting in post-disaster situation. She further goes on to say that official scope of heritage in India is very limited and 'euro-centric'. It is just restricted to select monuments and does not consider many essential heritage components especially vernacular settements and housing with in its perview.

Moreover, conservation is thought of as mere preserving the fabric, without taking into account the special needs of heritage which is still 'living'.

6.6 DISASTER MANAGEMENT IN NEPAL[6]

6.6.1 Institutional Structure

The Ministry of Home (MOH) is the nodal government body in relation to disaster management in Nepal. Other Ministries play a supportive role in the event of a disaster. The major functions of the Ministry are to formulate and implement national policies, undertake rescue, relief and rehabilitation measures in the event of natural disasters, collect data and information, and mobilize fund and resources. The ministry operates in all the districts through its District Offices in 75 districts in the country; with Chief District Officer (CDO) as the head of the office. The CDO acts as the coordinator and chief manager in the event of natural disasters in the district. Other GOs, NGOs and INGOs involved in disaster matters ultimately have to work under the guidance of the MOH. Within the MOH, there is a separate unit called Disaster Relief Section (DRS) headed by a Joint Secretary to look after the critical disaster issues of the whole country. The functions of DRS are to record the reported disaster information and activate the process of resource mobilization in the event of disaster.

Until the early 1980s government activities were mainly directed towards post disaster activities, viz. rescue, relief and rehabilitation. But with the enactment of Natural Calamity Act, 1982, and its amendments in later years, pre-disaster activities also started to be recognized as important activities in the overall context of disaster management. The Act made provisions for a chain of Disaster Relief Committees from the central down to the local levels. These are Disaster Relief Committees at the central, regional, district level and local levels. The functions and duties of all these disaster relief committees are well laid out and as evident from the names, these concentrate on relief work in the aftermath of a natural disaster.

The main functions of the Central Natural Disaster Relief Committee are to recommend to the central government to declare the area affected by natural disaster as disaster area, to formulate national policies regarding the rescue, relief, rehabilitation and reconstruction works, to prepare plans and programs for the control and prevention of natural disaster, to collect cash and kinds and disburse them to the affected areas, to involve and coordinate social

[6] Adapted from Kul Chandra Shrestha, ' A perspective of Disaster Management in Nepal: Challenges and Opportunities', November, 1999 and Centre for Policy studies, Nepal, 'Gender Issues in relation to Livelihood and Disasters – a case study of flood in Nepal' by Intermediate Technology Developmetn Group, March 2001.

organizations in relief works, to form groups and send them to affected areas and to give necessary direction to the District Natural Disaster Relief Committees and Local Natural Disaster Relief Committees as and when necessary.

By publishing a notification in the Nepal gazette, the central government of Nepal may consitute other relief committees in order to undertake the natural disaster relief work. Although, there is the provision of Regional and Local Natural Disaster Relief Committee, nothing has been mentioned regarding the composition of these two committees in the Act. In fact, the committees are like dormant agencies. Therefore, at present the Central Committee and the District Committees are active. And, in fact, the present system has helped to expedite rescue and relief works, as there are only two tiers.

The government has also developed a National Action Plan on disaster preparedness, disaster response, disaster rehabilitation as well as disaster mitigation (MOH, 1996). The Action Plan is presented in a matrix form indicating priority item group, activities, the time schedule and the executing

agencies with specific cooperating agencies. The disaster response action plan includes measures such as evacuation, search and rescue, communication and transportation, temporary settlement, health, nutrition and sanitation.

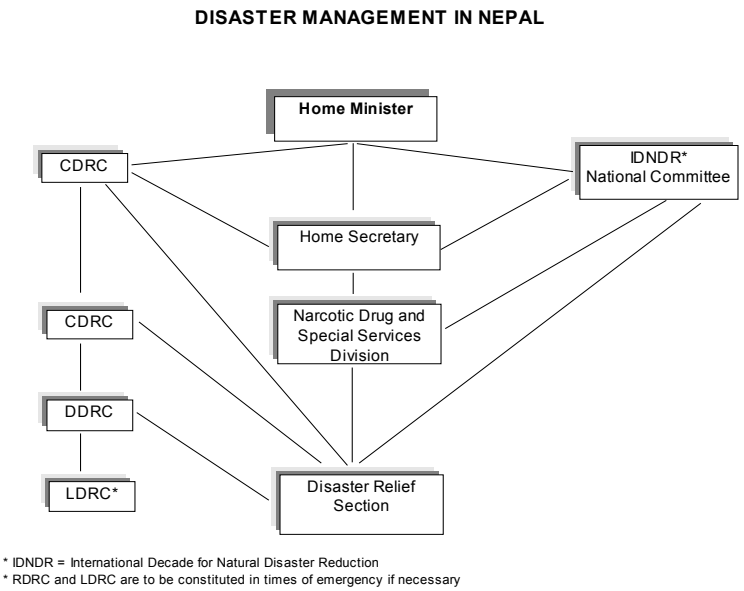


Fig. 6.7 Institutional structure for disaster management in Nepal
Source – ITDC 2000

6.6.2 Activities of various organisations and agencies

At present, various ministries, departments and NGOs of HMG of Nepal are directly or indirectly involved in disaster management. For example, department of buildings, Nepal Police Force, Royal Nepalese Army, Department of Water Induced Disaster Prevention, Nepal Administrative Staff College, Nepal Red Cross Society, Nepal Society for Earthquake Technology (NSET), Institute of Engineering, Tribhuvan University, Disaster Preparedness Network, Tri-Agency Initiative on Seismic Safety.

Among some noteworthy efforts in this direction are those of Nepal Society of Earthquake Technology (NSET), who have been undertaking several activities in the valley. Thse include seismic retrofitting of schools, especially in rural areas of the valley, conducting drills in schools to raise awareness on preparedness issues among children, making environment improvement plans for settlements such as Kirtipur and organising several activities like symposiums and seminars and observing earthquake safety day, which is the same day, the earthquake struck in 1934. NSET has also come up with several publications, posters and calendars to educate local people on seismic retrofitting and preparedness.

As part of the Kathmandu valley Earthquake Risk Management Project, NSET in partnership with Geo Hazards International USA, has also come up with the Kathmandu Valley Earthquake Risk Management Action Plan (January, 1999). The purpose of this plan is to assist His Majesty's Government of Nepal, concerned agencies, and the municipalities in Kathmandu valley to reduce Kathmandu valley's earthquake risk over time by identifying, coordinating and focusing risk management activities. As part of this plan, the current status is assessed in detail, with regards to figuring out actual or presumed responsible organization(s) for various mitigation and preparedness actions and their current status of programmes and activities. Various thematic maps on liquefaction potential, likely damage to infrastructure is also being prepared for metropolitan cities as well as for the whole valley in the event of an earthquake matching 1934 one. Further in this plan, eight long-term objectives define a comprehensive program for reducing the risk faced by the residents of the valley. These objectives incorporate the wide array of needs faced by Kathmandu valley and recognize the importance of addressing all major aspects of risk. An implementation strategy is also suggested further. Nearly three years have passed since then, but government does not seem to have taken much action on this report.

The social welfare department for Kathmandu metropolitan city has established Disaster Management section. Its ongoing activities include vulnerability assessment at ward level, awareness programme among local groups and

school children, developing local volunteer groups for rescue and emergency operations, producing educational materials and undertaking situation analysis of emergency services. All these efforts are mainly directed at reducing urban risk. (Refer map of vulnerability, Kathmandu ward no. 20)

In spite of these appreciable efforts on part of some organisations / government agencies, there is little difference on the ground and the vulnerability of people is on increase. Most of these efforts are piecemeal and directed mainly towards urban areas. Although, one must admit that NSET's seismic retrofitting programme of schools in rural areas has generated considerable awareness among rural people. However, still the overall reduction in vulnerability has been negligible. This is considering the huge scale of the problem and the limitations of NGOs specialising in 'disaster issues'. Moreover, providing technical solutions to reduce physical vulnerability against natural hazards such as earthquakes is one thing, but then there are underlying causes that increase vulnerability of rural people against such hazards, which are primarily linked to supposedly present 'development' processes and underlying perceptions and context governing these. Resolving these issues are clearly beyond the reach and capacity of 'sectored' NGOs and government agencies. Also, there is little or no involvement of the grass root organisations, institutions at village level (VDC).

6.6.3 Main Policy approaches

Government policies towards disaster management seem to have been formally initiated with the enactment of Natural Calamity Act in 1982. The Act made provision for the formation of Disaster Relief Committees at the Central, Regional, District, and Local levels. The subsequent amendments of the Act in 1986, 1989, and 1992 incorporated emerging issues in disaster management and gave more operational mandate to the Committees. The government has also specified objectives, policy measures, programmes and priorities to prevent disasters and minimize their adverse effects on the society (MOH, 1994).

The objectives are as follows: -

i. To prevent disaster occurrence and reduce its impact.
ii. To minimize the loss of life and damage by mitigating the impact of disaster through proper disaster preparedness, planning and effective rescue and relief operation.
iii. To rehabilitate the victims and reconstruct the damaged infrastructures.

In order to accomplish the above objectives, the following policy measures are to be adopted (MOH, 1994):

1) To identify the disaster prone areas and the extent of vulnerability, and formulate plans and programmes (on preparedness, response, mitigation, and reconstruction and rehabilitation) and integrate in with national development plan.
2) To identify activities to be undertaken by key disaster actors and make a Standard Operational Procedure.
3) To make necessary legal framework for land-use planning, water & forest management, building codes, etc.
4) To increase the awareness among the people and concerned authorities (Government organisations and NGOs) on the possible cause and effect of natural disaster including the ways and means to combat it.
5) To provide immediate rescue and relief assistance to the disaster victims.
6) To ensure the effective distribution and proper use of national and international assistance to the victims during emergency.
7) To explore the possibility of mobilizing resources and seeking foreign assistance in the field of technology transfer, human resource development, material acquisition, reconstruction etc.

6.6.3 Critical Review

In recent years, there has been a considerable increase in the level of awareness and understanding of disaster management among the policy makers as well as the general public due to education, training and awareness programmes conducted by the governmental and non-governmental organisations.

Some of the criticism of the current disaster management policies and institutional structure is as follows: -

1) These is too much focus on rescue and relief. Most of these organisations get activated during the occurrence of events and post disaster relief operation. Predisaster activities are left almost unattended whereas post-disaster activities are executed in a disjointed and piecemeal manner (ITDC, 2001, Subba, 2001).
2) Moreover, the prevalent national policy does not singularly apply to earthquake; instead it is put in the same basket with other natural disasters and is viewed alike. This general view reduces the complexity associated with the phonenomenon of earthquake (Subba, 2001).
3) Lack of coordination is cited as another main issue with respect to disaster management in Nepal. A number of NGOs and INGOs are working in the field of disaster management in the country. But there is no information about their objectives, institutional capability and role-goal conflict. Each organization is acting in its own way without giving due attention to the

works of other agencies and the inter-linkages that exist with the work of others. This has resulted in overlapping of activities in some aspects and little activities in other aspects. (ITDC, 2001)

4) Lack of collaborative approach – although most district based agencies are represented in the DNDRC, the current institutional scheme lacks a collaborative approach primarily involving the greater role of civil societies and private sector. The community and households who are essentially the nucleus of the disaster mitigation and preparedness are left un-emphasized (Subba, 2001).
5) At present, the major hinderance sighted in disaster preparedness is the scarce governmental resource.

6.7 EMERGING ISSUES IN DISASTER MANAGEMENT IN INDIA AND NEPAL

The existing institutional and administrative mechanism for disaster management in India and Nepal is well developed. It has proved to be quite effective in providing emergency relief. However, while analysing the current policies and the structure of disaster management in South Asia in general and India and Nepal, in particular, one can arrive at the following main issues; -

- It is highly reactive (concentrating on relief and reconstruction) rather than proactive (i.e. focussed on disaster preparedness and mitigation). In this way it is limited in time.
- It is primarily based on a 'command and control model'. As such, it is focussed more on making rules and guidelines based on universal parameters. The definitions of 'vulnerability', 'technology transfer', 'reconstruction' etc. are also understood as mainly technical ways and means to reduce physical susceptibility to natural hazards.
- The issue of reducing long term disaster vulnerability through sustainable development is not addressed.
- It is highly sectorial and top-down. The lateral links to various aspects of normal development that influence the vulnerability in the first place are not addressed.
- It does not specifically address the special needs of the most vulnerable groups in the society.
- It does not take into account the existing knowledge, skills and resources with the societies and build on these.
- The special needs of heritage, in its broader scope and definition are not considered in disaster management policies.

And most importantly, the existing policies have not served to decrease the social, economic and human impact of the disasters in the first place.

6.8 CONCLUSION - EMERGING ISSUES AND THE RESEARCH QUESTION

I have looked at the traditional systems that have characterised rural communites in the region, and assessed in brief their main characteristics. Later I have discussed main factors that are contributing towards their increasing disaster vulnerability. Lastly, disaster management systems that are currently in practise in the region are discussed. Their shortcomings are briefly described.

What comes forward is that disaster vulnerability is inherently linked to poverty. Bhatt (1999) has rightly pointed out,

> "Without reducing vulnerability and building the capacity of the poor to cope with, mitigate and be prepared for disasters, most disaster reduction and recovery or sustainable development programmes will in fact bypass loss of precious life and livelihood of the urban and rural poor across South Asia."

Besides those who are economically poor, other socially and culturally vulnerable groups also need to be addressed. These include concerns of gender and other socially marginalized groups.

However, at the same time, Twigg (1998) believes that the South Asian region has a wide range of knowledge, skills and initiatives, many of them innovative and vibrant, that aim and achieve reduction of vulnerability and building capacity at the grassroots level. The policy makers of sustainable development or disaster reduction and recovery programmes often overlooked these (Bhatt, 1999).

Bhatt also argues that institutional building is not high on the priority list of the governments in the region. He further states that local community based and community owned institutions, where built, reduce vulnerability and increase the capacity of the communities. He believes that when local knowledge, practice and activities are institutionalised, they provide better and greater results.

6.8.1 Argument for my Research

However, in all the discourses related to increasing vulnerability to disasters in general and South Asia in particular, a lot of stress has been laid on the negative aspects contributing to increasing vulnerability and decreasing capacity of urban and rural communities. Moreover, vulnerability is mostly put in the centre, while overlooking the special aspects of inherent (traditional) local knowledge, skills, resources and capacity, that have existed, still exist or have potential of existing in these communities.

Also, it is important to note that poverty and resulting vulnerability is not limited to institutional weakness, they are a result of many factors which are beyond the control of local or national governments (refer section of theory chapter). In fact, the outside pressures have been so strong that they are serving to weaken local knowledge and capacities and leading to deprivation of local resources and in this way, are affecting the sustainability of rural communities in general. It is worth finding out the dynamics of transformation processes in rural societies and asertain their impact on existing local knowledge, skills and resources.

Moreover, the question of disaster vulnerability is inherently linked to the question of 'development'. But development does not have a universal frame of reference. It is determined by different 'world-views' and 'perceptions' on what development implies for a particular community or group of people. Moreover it has implicit temporal dimensions, which determine whether it is short term or takes into account the long-term consequences of the actions in reducing disaster vulnerability. In this context, one needs to investigate changing disaster vulnerability and local knowledge and capacity by ascertaining what 'development' implies for rural communities of South Asia in terms of their 'world-views' and 'perceptions' and what is the impact of current development models on these. Lastly, but most importantly, the course of development cannot be devoid of the existing ground realities that are firmly rooted in particular social, economic, political and cultural context.

Here, one also needs to have a re-look at the traditional communities in South Asia, not merely from a static ethnological perspective but from a dynamic anthropological perspective and address the changing structural relationships, local perceptions and overall context. Therefore, the issue of disaster vulnerability needs to address rural communities in such a dynamic perspective and evaluate changing local knowledge and skills.

In the context of the above discussion, my thesis brings out the potential role of local knowledge, skills and resources of rural communities for reducing disaster vulnerability by putting these (local knowledge, skills and resources) in the centre. The existing institutional role and capacity to deal with disasters, at various stages preceding or after the hazard event (pre, emergency or post disaster situations) are analysed to find out the extent to which they build on existing knowledge, skills and resources and how they influence these, in return. In this context, post-disaster rehabilitation is seen as an opportunity to mitigate and prepare for the next hazard event, which is earthquake in my case. Therefore linking it to pre-disaster vulnerability situation and wider social, economic, political and developmental context does its assessment.

At the same time, it ascertains the traditional strengths and weaknesses of rural communities and also their present status. The underlying causes behind the existing status are analysed through assessment of the dynamics of

transformation in rural communities, (which is linked to the impact of current development processes). In this context, questions regarding the sustainable development and creating civic society and governance to reduce disaster vulnerability of rural communities in a long-term perspective are specifically addressed.

The research therefore poses the following main research question: -

What is the potential role of local knowledge, skills and resources for planning and mitigation measures to reduce vulnerability of rural communities against earthquakes in India and Nepal?

The sub-questions have already been detailed out in chapter 1.

PART V
CASE STUDIES

7. CASE STUDY AREA 1, MARATHWADA REGION, INDIA

In the early morning hours of September 30, 1993[1], an earthquake of magnitude 6.3 on Richter scale shook Marathwada region in the area in the vicinity of Latur, which is approximately 500 km east of Mumbai (Bombay). The epicentre was approximately 40 km south of Latur close to Killari village. As reported by the Government, the final death toll, which was presumably based on the number of death certificates issued, stood at around 9,500 and the number of injured at around 15,000 injured. However according to unofficial sources, the number of dead, was much higher[2]. (The Hindustan times, Oct.2, 1993).

In this case study, I will investigate how decisions taken after the earthquake, changed the existing vulnerabilities and capacities in the long run. This is investigated through assessment of the rehabilitation process that was undertaken after the earthquake. The impact of the decisions taken as part of this process is assessed, seven years after the earthquake in year 2000.

7.1 INTRODUCTION TO THE CASE STUDY AREA

7.1.1 Latur and Osmanabad districts in Marathwada region – geographical context

The region is called Marathwada, named after a famous race of warriors called Marathas. It is composed of five districts, out of which, Latur and Osmanabad districts are located in the eastern part of the Maharashtra state of India. Latur city is the district headquarters of Latur district and is located approximately 450 kms east of Mumbai. The present district of Latur was actually carved out of Osmanabad in august 1981. The district is bounded by Nanded on the east, Osmanabad on the Southwest, Beed on the northwest, Parbani and Karnataka in the north and it shares a boundary with Andhra Pradesh on the southeast. For the purpose of this case study, we will limit ourselves to Latur and Osmanabad districts only.

A district in Maharashtra state is divided into subdivisions, which are locally known as *talukas*. Each of this *taluka* has several villages. Latur district is divided into two sub-divisions, namely Latur and Udgir, each of which has

[1] The quake occurred in the early part of morning at 0356 hours on a night when every one was busy celebrating *Ganpati Pujan* (a popular festival in the region) and related festivities till as late as 0200 hours.

[2] The exact toll is unknown. The 30,000 figures may have been exaggerated, while the official figures may have neglected those who were cremated without official registration.

four talukas. The total numbers of villages in this district are 936 and it covers an area of 7,372 sq. km.

7.1.2 Socio-Economic Profile[3]

Before we look at the socio-economic profile of the area, it is important to note that these figures are based on the 1991 census. Therefore, they present the scenario before the 1993 earthquake. There have been significant changes in the region owing to developments after the earthquake. Now, there are many more industries in the region, especially those related to building. However the overall proportional distribution remains approximately the same.

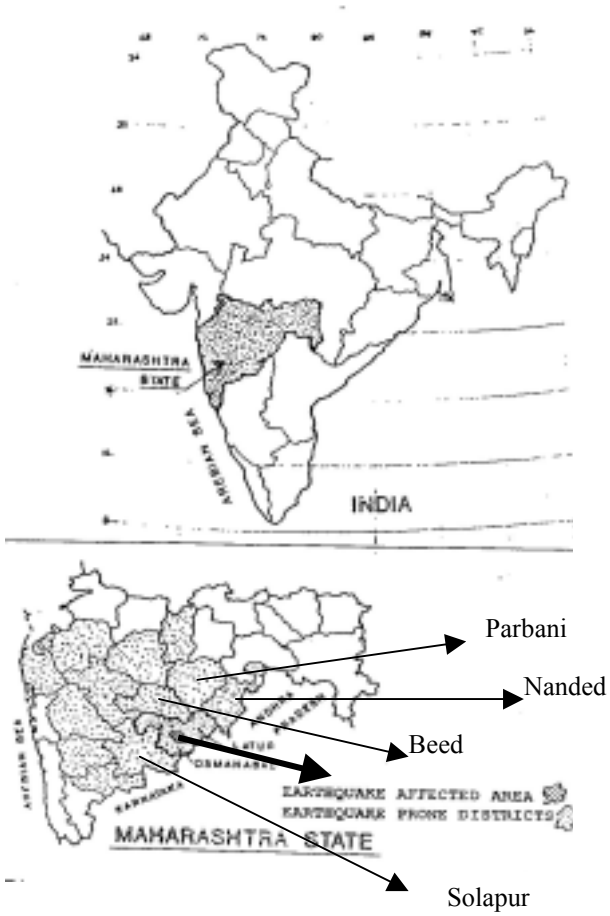


Fig. 7.1 Location of Maharashtra State in India

[3] Mainly adapted from Ahmedabad Study Action Group, "Strategy for Housing Rehabilitation in earthquake affected villages of Marathwada, state of Maharashtra, India", prepared for OXFAM (India) Trust, 1994

Demography

According to the 1991 census, the total population of Latur and Osmanabad districts is 1.67 and 1.27 million respectively. The rural and urban break down of population in the two districts is as follows:

This clearly shows that the majority of the population depends on agriculture for their livelihood. The proportion of landless agricultural labour is also very high, nearly 32% in Osmanabad (1991 census). In the non-agricultural sector, 3 % of the population is engaged in building. The proportion of the population engaged in industrial sector is uniformly low on account of little industrial development.

Table 7.1: Population Distribution in the Region

District	**Rural**	**Urban**	**Total**	**% Rural**
Osmanabad	1.08	0.19	1.27	85
Latur	1.34	0.33	1.67	80
Total	2.42	0.52	2.94	82

Source: Census of India, 1991 and CMIE, 1985

Occupation

The following table shows the occupation profile of the population in Latur and Osmanabad districts (1991 census): -

Table 7.2: Occupational Profile

	Osmanabad (% of total)	**Latur (% of total)**
Cultivator	32	44
Landless	32	38
Total in Agriculture	64	82
Household Industry	2	1
Other	31	13
Building	3	4
Total in Non-Agricultural sector	36	18

Source: Census of India, 1991 and CMIE, 1985

Agriculture is indeed the most common occupation in the region. However almost 35% of those occupied in agriculture are landless. In the non-agricultural sector, the house building activity provides an important source of employment to the artisans.

Literacy

The literacy rate in all the affected districts is uniformly low according to 1991 census with Latur on top of the list with 58% illiterates.

Agriculture

In Latur and Osmanabad districts, the main traditional crops are coarse millets, lintels and wheat, which are harvested at two times of the year (traditionally known as *Kharif* and *Rabi* season). The percentage of area under cultivation is 78% of the geographical area, whereas gross irrigated area as percentage of the gross cropped area reported was around 9% in 1981. With the advent of new crops like sunflower, safflower, sugarcane and grapes, the cropping pattern has changed considerably.

The role of ground water in agriculture has rapidly increased with the introduction of bore wells since the late 1980s. Sugarcane is grown wherever water is available, but is now being replaced by grape cultivation. Even though area under grape is hardly 1 % of net cultivated area, its role in the economy of the region is significant. Traditional crops have very low cash returns, but in order to meet food needs, these crops are still very important for this region. The food consumption pattern also shows that these cereals form the main component of diet, especially of poor households.

The crop residues from *toor*[4] are important raw materials for building construction for the poor. Wattle and daub houses in this region are constructed from *toor* stalks. They have a life ranging from 1 to 2 years depending upon the usage and exposure to the sun and rain.

The land holdings

The land holdings in this region are generally large, owned by powerful landlords. The small and marginal farmers (less than 2.5 ha.) form the bulk of the cultivators, working on these landholdings. Since the productivity from land is generally low[5], land holdings of less than 5 ha cannot fulfil the needs of a family. Many of these marginal farmers have to depend upon seasonal wages for meeting their cash needs.

[4] a kind of locally available lintels, which has multi-purpose use for the local villagers.
[5] Approximately, Jowar 8 qtls/ ha., tur 3.9 qtls/ha., wheat 7.3 qtls /ha., safflower 6.55 qtls/ha., sunflower 6.2 qtls/ha.

7.1.3 Regional Topography, soils, geology, tectonic setting and seismicity

Topography and Soils

The topography of this area in general is gently rolling with Terna River, dividing Latur and Osmanabad districts. There are a few variations among the soils found in the area. In many areas, especially those which are low lying, near river valleys, black cotton soil is the most predominant soil at the ground surface. This is underlain by Murum; a hard soil that is degraded bedrock called basalt.

Regional Geology, Tectonic Setting and seismicity of the region

The region, especially Latur and Osmanabad districts, are covered with Deccan-trap lava flows[6]. Thin alluvial deposits along the major rivers overlay these traps. The major rivers of the districts like Manjara, Terna and Mahar have deposited thin alluvium along their course. The alluvium consists of clay and sand and its thickness ranges between 10-15 meters. The extension of the alluvium belt is confined to 0.5-1 km.

The Deccan Traps, which cover an area of more than 600,000 sq. km in western and central India, consist of a number of flows ranging in thickness from a few metres up to about 100 m with the successive flows being separated by red bole or Inter-trappean beds.

A number of lineaments, which are fracture zones have been identified on satellite imagery as a linear pattern, exhibited by darker tone and straight drainage course. These lineaments are favourable for occurrence of ground water. The major lineament trends in Latur district are NW-SE, NE-SW AND E-W.

Seismicity of the region[7]

The ancient shields are, in general, stable except for the continental margins, rift zones and faults present in the continental crust. Thus, Peninsular India has long been described as a region of slight seismicity. But the Koyna earthquake of December 10, 1967, changed the long held image of slight seismicity of peninsular India. The earth scientists closely investigated the tectonics and related seismicity of the region in great detail prompting revision of the

[6] Hot molten lava which came out due to volcanic eruptions in distant geological past.
[7] Adapted from Geological Survey of India, "Killari Earthquake – 30 September 1993", special publication No. 37, 1996.

Seismic Zoning Map of India that draws heavily on the historical and recorded incidences of earthquakes and their relationship with the tectonic framework.

The seismicity scenario of the region as obtained from macroseismic investigation as well as instrumentally recorded events, helps greatly in understanding the spatial distribution of events as related to the structural or tectonic surfaces. Umesh Chandra (1977) synthesised these data and attempted to divide the Peninsular India into various seismic zones.

Such a seismic Zoning map of India depicts the area under study within Seismic Zone-I[8] and describes it along with a Shield unit that is generally un-seismic with localized faults that could be seismogenic. The ISI (Indian standard) code states that the Zone-I can experience occasional earth shocks of magnitude 5-6 and in exceptional cases, along local faults, the magnitude can go up to 6.5 (ISI Code Hand Book 1893-1975 and IS 4326-1976; 1982). This was because the area has had very few incidences of earthquakes in the past. It is reported that before the Latur earthquake of 30 September 1993, there were only a number of smaller shocks between August and October 1992. However, unconfirmed reports mention occurrence of earthquake shocks in the area in 1962, 1967 and 1984. *(Refer Seismic Map of India)*

7.2 TRADITIONAL SYSTEMS

The whole Marathwada region has a long history stretching from prehistoric times[9]. As a result, the region is rich in numerous heritage structures such as forts, temples, tanks, and caves, walls etc. that are surviving evidences of various time periods. However, the most significant part of the heritage are traditional settlements with 'vernacular housing' as an important component.

The region is dotted with numerous small villages whose traditional socio-cultural and economic structure is quite similar to the one in Kathmandu valley. These settlements are also primarily agrarian in nature. Traditionally, these villages were also self-contained units where the caste system determined the social and economic roles and responsibilities of the community to ensure mutual survival.

[8] According to Seismic zonation map of India, the whole country is divided into five seismic zones. While Zone-5 has highest probability of earthquakes , Zone-1 has minimum probability. Ironically, Marathwada regions was earlier placed in Zone-1.

[9] Chronologically history speaks of association of this land with various ruling dynasties namely Satvahans, Vakatakas, early Rashkutas, Vishnukundins, Kalachuris, Chalukyas of Badami (6th cent. AD), Rashtrakutas, later Chalukyas, Yadavas of Devgiri (12th cent. AD), Delhi Sultans (Medieval period, 1317), Bahamanis, Nizam Shahi, Adil Shahi & Barid Shahi Kingdoms, Moghuls, Nizams of Hyderabad.

Fig. 7.2 Traditional Housing in Marathwada

7.2.1 Settlement structure[10]

Location

Traditional villages are often located near riverbanks where water resources are accessible through shallow wells. Often they have been partially built on mounds of rubble, which may have been for defensive purposes or to avoid building on black cotton soil (Salazar, 1996). The village is usually located near the centre of its farmlands. Villages are around 5 km. apart and land holdings comprise between 2000-5000 hectare (TARU, 1994).

Growth of the village

Villages often develop through an incremental process where families settle in or near the old village. New homes may be put on unused village land, land may be sold from one family to another, or families who own land may simply subdivide their property among children and relatives. Many villages in Latur and Osmanabad district have *wadis*, established settlements adjacent to or near main villages, and *Laman Tandas*, nomadic settlements, 0.5 to 1 km away.

[10] Mainly adapted from Salazar, 1996.

Social segregation

Related families often share the same street or area in a village. In the central location are usually wealthier families and a large village space. Typically the Patil's house (the wealthiest family at least in older times) is located at the highest location. *Harijans*[11] and other scheduled castes and tribe families stay at the fringes or the village in segregated areas. Often a road will physically separate them from other parts of the village. Segregation is not only related to location. The size of homes, types of entries and temples, construction materials and street spaces all help distinguish one area from another.

Clustering

Family histories are strongly related to the character of community areas as well as the village as a whole. For example, villagers know that after this tree or around that bend in the road are the families belonging to one caste group. They know that the seven or eight doorways that open onto a particular street all share the same well or work in the same fields, or that in the evenings most of the families in a particular area come out and sit below the big tree that shades an odd shaped space below. This relationship between the "clustering" of related families and their use of common spaces helps create a sense of belonging in the village.

Street pattern and community spaces

Compound walls that enclose the street spaces surround the streets. They are staggered and rarely line up with each other. This is because plot boundaries are always oddly shaped and because people build their portion of street walls independently in an additive manner. This creates turns and bends that shade the street. Street widths vary depending on their use and/or location within the village. Around the perimeter of the village is a road for the movement of cattle and herds of goats.

As mentioned before, temples and big trees typically mark the main community spaces in the village. Besides, there are open spaces formed by clusters of houses.

[11] Harijans means 'the people of God' in Hindi. This name was given to the 'lower' castes by Mahatma Gandhi.

Fig. 7.3 Traditional Morphology of Village Kharosa

Scale not available from the source
Source – Latur Collectorate

7.2.2 Vernacular Housing

Typology

There is a distinct typology for the housing based on the economic and social status of the household, which mainly determines the size of the house. Most people live in a special house-type called *Wada*, which comprises nearly 80% of the housing stock (TARU). It is characterised by a courtyard surrounded by a colonnaded verandah in front of rooms. These houses are introverted with all covered and semi covered spaces opening into a central courtyard. When seen from a street one finds massive stone walls with dressed stone cladding punctuated only by an impressive doorway and a window or two. The doorway leads into a sitting room called 'dehlij' which consists of raised area on both sides of the passageway from the front door. The passage leads one into private courtyard (locally called 'chowk').

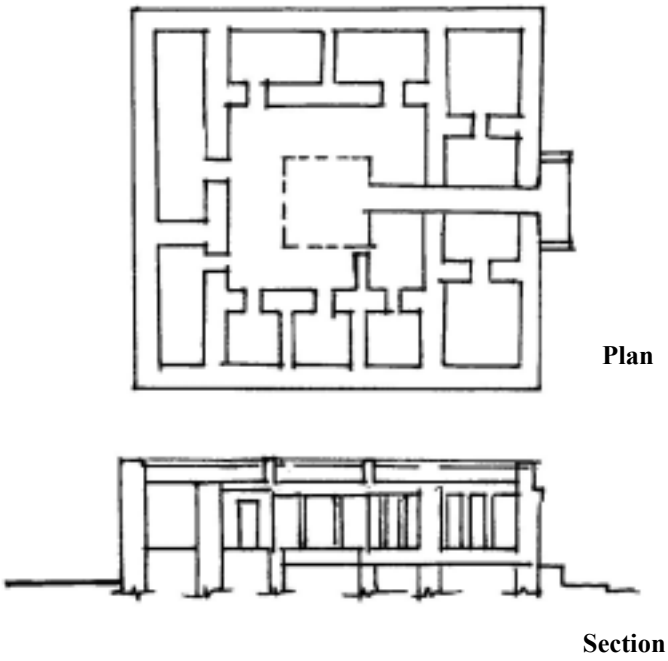


Fig. 7.4 Traditional House Design – Plan and Section

Construction materials and system[12]

The houses are traditionally built using materials that are most easily available locally, including stone, mud and wood. Typically, the walls are made of rubble stone masonry in mud mortar. Generally these are more than 60 cm thick. At times one comes across houses in which they are 120 to 150 cm. Some exceptional houses, which resemble mini forts, the wall thickness goes up to 240 cms.

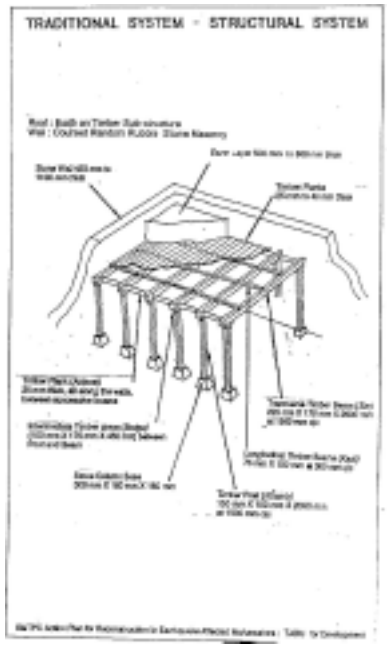
The most peculiar feature of these walls is that without exception the core is made of small round stones called 'gota' and lot of mud. The walls are constructed by first placing a course of stones along the inside and outside faces, and then filling up the core, however deep, with mud and stones. In poorer quality construction the outside faces are made out of relatively smaller (15cms) stones.

[12] For details, refer, Rawal, Khatri and Desai,1996)

The use of through-stones is rather rare and in only isolated settlements. This is a serious shortcoming as a result of which old walls get weakened due to entry of rainwater and then they crumble. Several other rules for good stone masonry are also traditionally not observed, nor are the artisans aware of them. Interlocking of stones is not possible since walls are too thick. In addition the stones are laid on their narrowest side with their length parallel to the wall's length. Since the core is filled with mud and small stones this type of placement speeds up the construction a great deal. But this results in weak masonry. In many old houses for affluent people, lime mortar is also found.

In the villages where there are large pockets of white clayey soil, walls are predominantly made of adobe bricks made of that soil[13]. The elders in the village say that until a few decades ago this soil used to be prepared thoroughly to ensure adequate performance against moisture. It involved adding of several organic ingredients and repeated wetting, and kneading for several days. Today one finds walls made out of such mud more than two hundred years old in the houses belonging to rich households. In a few villages, there exist small fortresses (called *Garhis*) which are as much as 8 m. tall and the walls are more than a meter thick at the top. Some of them are as much as 400 years old and are even inhabited today.

Fig. 7.5 Traditional Malwad Construction



[13] Some of the finest specimens of adobe bricks are found in some villages like Kharosa, Ter etc. These were made using special techniques of continuous ramming of 'white' soil and mixing it with hay etc. The exact technique has unfortunately been lost. Some of the very fine specimens of adobe bricks even float on water. These houses performed very well during 1993 earthquake.

Traditionally, the most commonly found roof is made of mud and timber. It is also called *"Malwad" or "Imlaa"*. It consists of a thick layer of mud roofing supported on extraordinarily heavy timber under structure. It is the mud or soil layer that keeps the rainwater from leaking down into the house. The under structure is built out of locally growing *neem* (a local species) and babul (acacia) trees.

The earth layer is more than simply placing some soil on the roof. Generally, it consists of two layers of 9"x 9" sun dried mud blocks 4" thick. After the placement of the first layer the joints are sealed with thin mud slurry. After drying the next layer is placed with all joints staggered. The joints in this layer are also sealed in the same manner. If adobe is made well, then it resists the rains very well.

This roofing is modular with each module (Khan) measuring approximately 120 cms. x 120 cm clear. The wood under structure consists of 15cm. X 15 cm timber beams at 120 cms spacing span across the rooms. These are topped by cross beams at approx. 22 cms followed by small planks. This is overlain by *Neem* leaves and branches, which act as an insect barrier against the timber under structure. The wood beams are generally supported on timber columns at both ends. Each column is kept approximately 15 cms above the ground by a stone base (ibid, 1996).

It should be noted that nails are rarely used in the under-structure. Dovetail joints and dowels are extensively used for connections between the various components. The timber workmanship is certainly far superior to that of the local masonry in their response to earthquake forces.

With timber getting expensive, many poorer households use Corrugated Galvanised Iron (CGI) sheets. Besides, thatched roof is used by the poorest such as the *Harijans* and the *Lamanis* (nomadic tribe) who cannot afford anything else. It is otherwise used in the cattle sheds.

7.2.3 The traditional artisans and their building processes

The traditional building process in the Marathwada region follows well-organised patterns that are defined by hereditary castes who undertake building in the area. This pattern is very strong and is clearly reflected in the structure of housing stock, which was still dominated by traditional buildings in the pre-earthquake period. The traditional roles and building processes of artisans[14] are described below: -

[14] For details on traditional building artisans, see ASAG, 1994

The Gawandi

The Gawandi are a Marathi[15] speaking community whose primary occupation is stone masonry. Most of them are landless and in addition to working as masons also work as agricultural labourers since the masonry work does not keep them occupied all throughout the year. Their work season is 5 to 7 months long during which they manage to get work for 20 days a month. Their traditional barter relationship with the village community is still in practice. A Gawandi provides services in a cluster of villages. Typical a Gawandi possesses good skill in random rubble masonry and stone flooring.

The Waddar

The Waddar community specialises in excavating the stone and cutting it. This community migrated from the adjacent state of Andhra Pradesh several generations ago. It is a landless community and the people generally live in clusters away from the main village.

The enterprising skill of this community is visible in the fact that they have broadened their field of operation from mere stone excavating and shaping to stone masonry, brick masonry and Shahabad stone roofing which were in the domain of Gawandis, and also road construction.

The Patharwat

The Patharwat decorates house entrance and does stone carving work.

The Suthar

The Suthar are the carpenters and the majority of them are Marathi speaking. Their main occupation is manufacture and repair of agricultural implements including village carts. Along with this they also carry out the building construction. Some of them also own agricultural land. They operate within a cluster of villages. The traditional barter system is still in practice under which a *suthar* gets food grain for an entire year from 5 to 6 families for maintaining their implements. For building construction, however, they do get paid in cash. The *suthars* fine craftsmanship can be seen in the construction of *Malwad*[16] roofing, which effectively survived the earthquake.

[15] Marathi is the local language in the state of Maharashtra in India.
[16] Malwad is traditional roof with timber understructure.

7.2.4 The status of traditional knowledge for mitigating against earthquakes / other disasters

Such a traditional system was in place, when earthquake shook the region in 1993. In spite of inherent weaknesses in stone masonry and heavy roofing, there are some striking strengths of traditional systems, which were particularly helpful in mitigating disasters. These are briefly summarised below: -

- The traditional agricultural base of the village ensures livelihood options in the event of a disaster. Notably, fields surround villages and these are unaffected in the event of an earthquake.

- The self-supporting and close-knit community structure is better able to cope with a disaster on its own terms, rather than depending on outside help. However, it is a slow process.

- Traditional *malwad* constructions are very effective in absorbing lateral forces of earthquake.

- Traditional adobe construction with binding material has also proved to be earthquake safe, at least they help prevent loss of life.

- The traditional systems permit easy recycling of materials, unless they have degraded badly. The earth walls can be simply converted into mud and reused after necessary preparation. The stone masonry in mud mortar can be dismantled with ease, the stones separated out according to their size and shape, and mud too can be cleaned, wetted and reused. The timber from the traditional roof is easily retrievable since there are no metallic fasteners. Things are simply and ingeniously fitted into each other, often with the help of wedges. Such traditional constructions prove to be economical, especially in the event of post earthquake reconstruction.

However, it is worth noting that it is not merely earthquake safe constructions that demonstrate the viability of a particular building culture. Equally important are the factors such as climatic suitability, affordability and ability to carry out changes, repairs and maintenance. The traditional systems in Marathwada surely demonstrate these qualities.

Climatically it would be difficult to find a more appropriate space planning and construction medium than the traditional system. The enclosed, introverted plan protects the houses from the hot swirling winds, which are common to this area in summer months. The domestic chores as well as the post harvest work on the grains can go on uninterrupted inside the *chowk (*private courtyard*)*

irrespective of high winds. Moreover mud layers on the *malwad* roof create thermal insulation, thereby keeping the indoors cool during summers.

However, the greatest advantage of the traditional construction is that it is economical, since it employs use of local materials i.e. stone, mud and timber. Moreover, it is relatively easy to maintain. Although it may require more frequent and regular maintenance, it costs very little to do that, and it requires little or no special skill.

In spite of the above-mentioned strengths of traditional building systems, most of them were in highly vulnerable condition prior to the earthquake in 1993. This was mostly due to poor bonding of stone pieces behind the facade of nicely dressed stones and extremely heavy mud roofs that could cause total collapse of structures.

But before we start to totally reject traditional technology we need to look back into historical time periods and look at the traces of surviving built heritage. A thing worth noting in the traditional constructions is that the older they are, the more superior is the workmanship observed in them. We find the finest specimens of stone masonry with 'through' stones (sometimes without any mortar), strong corner joints and adobe construction in white clay and wooden framed structures. This points to the fact that traditional knowledge and skills have degenerated or have been lost over time. One of the main reasons for this is the low frequency of earthquakes in the region. Technology that would have been developed indigenously following each earthquake would not have carried to the future generations.

However, there are other underlying reasons for increased vulnerability of rural societies prior to the 1993 earthquake, linked to the socio-economic conditions, which will be examined in the next section. In the sections to follow, we will analyse what happened after the earthquake, its impact on the local knowledge, and find out if post earthquake rehabilitation has served to reduce vulnerability. If not, what kind of vulnerabilities are created and which ones are reinforced?

7.3 PRE-DISASTER VULNERABILITY

To some extent traditional technology has degenerated mainly due to poverty, which led to pre-disaster vulnerability in the first place. Evidence of this is also seen in traditional settlements, which are not affected by earthquake. Behind nice front facades, the original built form of high quality has deteriorated to a very poor state due to years of neglect and alterations.

It is noteworthy that our rural settlements are essentially agrarian in nature. In fact a lot of our built heritage is due to the agricultural practices. However, prior to the earthquake in 1993, this region was already one of the most

Fig. 7.6 Behind nice traditional façade, the housing fabric has deteriorated considerably

economically poor regions of India. The primary reason was that agriculture could no longer meet the basic needs of the people. This was further aggravated
by years of neglect of the agricultural sector by the government. It seems to be the area of least priority compared with so called industrial development, which is reaping benefits for a select few, at the cost of majority of others. I got this impression while talking with many farmers and local leaders in the area.

Increasing marginalisation of the majority of rural community was also linked to the land ownership pattern. Though the *Zamindari* system[17] was abolished after independence, the big landowners continued to exploit the majority of poor small tenant farmers, who were getting increasingly weak and powerless socially, economically and politically. Other factors that were brought to light through a series of interviews with farmers was the presence of middlemen, who are great hurdles in getting the farmers right price for their produce. Over and above all these factors are the effects of globalisation, market capitalism and economic liberalisation, where many petty farmers are not able to stand competition from outside. *(Refer socio-economic profile of the case study area in section 7.1.2)*

[17] *Zamindars* were big landowners who employed lot of petty tenant farmers to work on their lands for meagre sum of money and exploited them.

One of the main consequences of the increased marginalisation was that many people changed their traditional professions. These included local craftsmen who were no longer able to support themselves through the traditional barter system, where food and other materials were exchanged for work. As a result, most of their knowledge was slowly forgotten (got lost) or got degenerated. Take the case of *Sutars* (carpenters, who make the unique roof pattern called *'Malwad'* as well as agricultural tools), *Wadars* (who were involved in extracting and breaking the stones from quarries and used to play a vital role in stone masonry work) and *Patharwat* (who used to decorate house entrances and do stone carving). *Sutars* continued to make agricultural tools but the practice of *'Malwad'* was mostly lost. This is because of a scarcity of wood due to increased deforestation and its high market value. Also, the local people no longer felt the skills of *Wadars* and *Patharwats* as necessary.

As a result, stone masonry gradually deteriorated in terms of the quality of stones used and their shape and size needed for proper bonding. Moreover, out of sheer ignorance the thickness of stone walls continued to increase and got associated with the status of the household. It was considered that the greater the wall thickness, the better is the status of that household. The wealthiest had such wall thickness that even a bullock-cart can run on it. Interestingly, while the thickness increased, the quality of stone masonry deteriorated considerably.

Fig. 7.7 Heavy traditional roof due to accumulation of mud layers

Fig. 7.8 Traditional walls with random rubble masonry in mud mortar are poorly bonded

Moreover, due to poverty, people were no longer able to maintain their existing houses. As an example, linseed oil used to be applied to wooden beams and columns so as to prevent them from rotting. However with poverty, people were no longer able to afford it and the practice was discontinued making wooden structures weaker. Besides deterioration, certain alterations in the fabric out of sheer ignorance also added to the physical vulnerability e.g. the thickness of roof increased as additional layers of mud were added on the top. Thus, behind seemingly nice facades of vernacular houses, the fabric had deteriorated or been altered to a significant extent. The result of all these factors was that the physical fabric became weak and more vulnerable to earthquakes.

When the earthquake struck the region on September 30, 1993, the rural communities were already socially and economically vulnerable. Equally vulnerable was their vernacular built fabric, with heavy roofs (mud) and thick stonewalls with weak bonding especially at joints.

7.4 1993 EARTHQUAKE – IMMEDIATE SCENARIO

7.4.1 Structural damage and human loss:

The earthquake in 1993 caused heavy loss of life and property for two reasons. First, since the earthquake took place early morning; most of the people were in deep slumber, especially after the festival. Second, the traditional constructions, which had already become very weak and vulnerable, could not withstand the shock of the earthquake. Such houses totally collapsed, burying the entire household including animals and all belongings causing heavy loss of life and property.

However, the '*Malwad*' roof performed remarkably well. Only where the roof rested on the walls, did it come down with the walls. This is remarkable considering the fact that it often carries as much as 60 cms of packed soil accumulated over the years on its top. In spite of this, an overwhelming majority of *Malwads* stood up, a few tilted, but even fewer collapsed. Here I must mention that reinforced concrete buildings were very small in number prior to 1993 earthquake and most of them remained standing without suffering serious damage.

In 67 villages that were most severely affected, some 30,000 houses were destroyed or badly damaged. These were within several kilometres of the epicentre. It was reported that the epicentre was in the vicinity of the confluence of two rivers, namely the Terna and its lesser known tributary[18]. Apparently ground movement was along the two faults lying in the beds of these rivers. As a result the villages in the vicinity of these rivers suffered the greatest damage. In fact, 25 of these villages, which were within only a few kilometres of the epicentre, were reduced to rubble. Although, the damage was reported to be concentrated in the districts of Latur and Osmanabad in the state of Maharashtra, it was also reported to have had affected three districts in the adjacent state of Karnataka.

Soon after the quake it was reported that in Latur district approximately 6% of the total housing stock or 16,145 houses had been damaged where as in Osmanabad it was approximately 5% or more than 11,000. The total number of damaged buildings in the three districts of Karnataka adds up to 7,000. After the quake as time passed, the information about the damage in a number of other districts also surfaced. Almost four months after the quake, it was found

[18] As mentioned before, historically, settlements have always been located along the rivers as these were the main modes of communication. In this context, Terna River holds very important significance as along its banks is located a village named Ter, which had immense significance as a Trade Town during the reign of Satvahanas. Trade was also carried out with Greeks as some archaeological findings illustrate clearly.

that 13 districts were affected in Maharashtra alone. As a result the total number of villages affected by the quake had reached a staggering 2519 out of which 1191 are in Latur and Osmanabad districts. The bulk of these is in blocks of Ausa and Umerga. In all 171,000 houses were damaged including 145,000 in Latur and Osmanabad districts. The quake also killed 2,100 heads of cattle and injured another 13,000 in these two districts, and destroyed 2000 cattle sheds.

7.4.2 Relief and Rescue Operations[19]:

Relief and rescue operations started just after the first news of destruction. On September 30, a crisis management group headed by the cabinet secretary was convened to mobilise supportive activities of the Central Government agencies and the Army to provide assistance to the earthquake hit populace.

Five medical units were rushed to the spot immediately and doctors, paramedics and medical supplies were mobilised quickly. The relief commissioner and Cabinet Secretary were in constant touch with relief headquarters in Bombay to assess the developing situation and organised personnel and relief supplies accordingly. Several earth moving equipment and recovery vehicles were rushed to the quake hit area to clear the debris and look for survivors. Voluntary organisations supplied several community kitchens to provide food for the homeless. The Chief Minister released money from calamity relief funds for carrying out immediate relief.

Initially the pace was slow due to the geographical extent of damage, and due to damaged communication systems. Bad weather also hampered the pace of rescue operations. Indian military personnel deployed for this work did hard work to overcome this problem. Mass cremation and burials of dead bodies was carried out near the devastated sites of quake-hit villages and in the open fields for a few consecutive days after the earthquake.

In the meantime, government received offers of massive aid in cash and kind from various donor agencies and several countries[20] on the appeal of the national and the state Government. All the relief material was sent to Mumbai, from where the aid was sent to the affected area. On October 4, the prime minister announced an immediate central aid of Rs. 50 Crore (approx. one million US $) after surveying the affected areas.

[19] Based on reports published in Hindustan Times, a leading Indian Newspaper from 30th September to 7th October, 1993

[20] The American Government sent aid worth over US $ 1,000, 000 while France gave about US $ 92,000, Italy US $ 312,000, Japan, US $ 25,000, Norway US $ 190,000, UK, US $ 540,000, Canada, US $ 225,000, Switzerland, US $ 145,000. The department of Humanitarian Aid of the UNICEF gave US $ 50,000 and CARE gave US $ 250,000. (From government sources as published in Hindustan times, October 3, 1993)

The prime minister stated that the immediate priority of the Government would be to ensure that the villages devastated by the quake were rebuilt at safer sites, a plea the villagers also made to him, and the work would commence soon in this direction. He also promised that the Government would embark upon a massive programme of seismological mapping of sensitive areas of the country to avert such a disaster. By this time, tin sheds, tents and other temporary shelters were set up in 30 quake ravaged villages in Osmanabad district and nearly 10,000 survivors were being fed twice daily, (HT, 4th October)

By October 5, the debris in most of the affected villages was still to be cleared. Efforts to locate more bodies buried under the collapsed houses took another turn with the arrival of a French team bringing trained dogs. By this time, the government also took note of the daunting task of taking care of all those who had become orphans, widows and those who were old. Also for the first time, the erstwhile chief minister of Mahrashtra state calculated that the rehabilitation of the earthquake victims in Maharashtra would cost Rs. 900 crore (approx. 183 million US$). He added that the rehabilitation of the quake victims, including the construction of new quake-resistant houses and townships would be started on the Dussehra (a festival) day, the October 24.

A week after the earthquake, rescuers continued to uncover decaying mutilated bodies, amid fast paced efforts by authorities to revive normalcy from the ruins. Reports said as the shell-shocked survivors were coming out of trauma, consignments of seeds of jowar, safflower and sunflower, major crops of the quake-hit belt, were rushed to the villages in the worst affected districts. While the relief and rescue mission was going at full blast, Army men were asked to erect tents as makeshift schools in several villages.

7.5 THE POST EARTHQUAKE REHABILITATION PROCESS[21]

The initial phase of emergency rescue and relief lasted until December 1993. In the next phase, the Maharashtra government evolved a rather comprehensive rehabilitation programme, which was the first of its kind in India. It was called Maharashtra Earthquake Emergency Rehabilitation Programme (MEERP). This was supported by the World Bank, United Nations Development Program (UNDP) as well as several bilateral donor agencies and was mainly conceived and executed with the help of a soft loan from the World Bank[22]. The

[21] Primarily based on Govt. of Maharashtra website http://www.maharashtra.gov.in/english/meerp/profile.htm and other official documents of GOM

[22] Although immediately after the quake, the government had estimated the cost of rehabilitation at around Rs.2 billion (40 million US $) , the programme budget at the onset stood at Rs. 12 billion (240 million US $). During its execution it went up by another 15%. The World Bank

Government of Maharashtra started implementing the reconstruction programme after June 1994, when the World Bank credit became effective (Vatsa, 2001).

The programme had some main components namely housing, infrastructure development, economic rehabilitation, social rehabilitation, community rehabilitation and technical assistance, training and equipment. Housing was the major component of the programme. Let us have a brief look at the activities proposed under each of these components: -

7.5.1 Housing

The Housing component would finance construction/ reconstruction of housing work. It is worth noting that permanent housing construction was given the first priority before any of the other components. Accordingly, the villages were divided into three categories, namely: -

I. Villages to be relocated - type 'A' Villages
ii. Villages to be reconstructed in-situ -type 'B' Villages
iii. Villages where repair and seismic retrofitting of existing houses would be carried out - type 'C' villages.

These categories were based on certain pre-defined criteria. Notably, relocation was adopted as one the main approaches. This was decided on the basis of a baseline survey of the most affected 67 villages conducted by Government of Maharashtra through the Tata Institute of Social Sciences, a social work institution based in Mumbai. The survey brought out the community's 'overwhelming' preference for relocation. According to the survey, the communities considered relocation as an opportunity to get "well-planned and neatly laid out new villages at new sites". (GOM, 1993, Vatsa, 2001).

It is important to note here that this survey was conducted immediately after the earthquake. At that time people were not out of the immense psychological impact of the disaster and were too scared to go to their old village sites, where so many of their family members and their friends had died. Also one should note that terms such as "well planned" and "neatly laid out" are dictated by over-riding official as well as public perceptions that tend to look upon 'modern and urbanised well planned development' as better than indigenous rural development dictated by traditional systems.

sanctioned a low interest emergency loan with a 10-year moratorium and 30 year payback period of Rs. 9.5 billion (190 million US).

'A' category relocated Villages:

The villages to be relocated were those where more than 70% of houses suffered category IV and V damage[23] and where the ground had black cotton soil up to a depth of 2 metres[24]. Where the damage was more than 70% but strata was good i.e. soil is less than 2 metres depth, it was decided to reconstruct those villages in-situ. On the basis of the above criteria, 52 villages were to be relocated with essential services and infrastructure and 16 villages were to be reconstructed in-situ. The relocated villages required construction of over 27,000 houses, associated infrastructure and civic amenities.

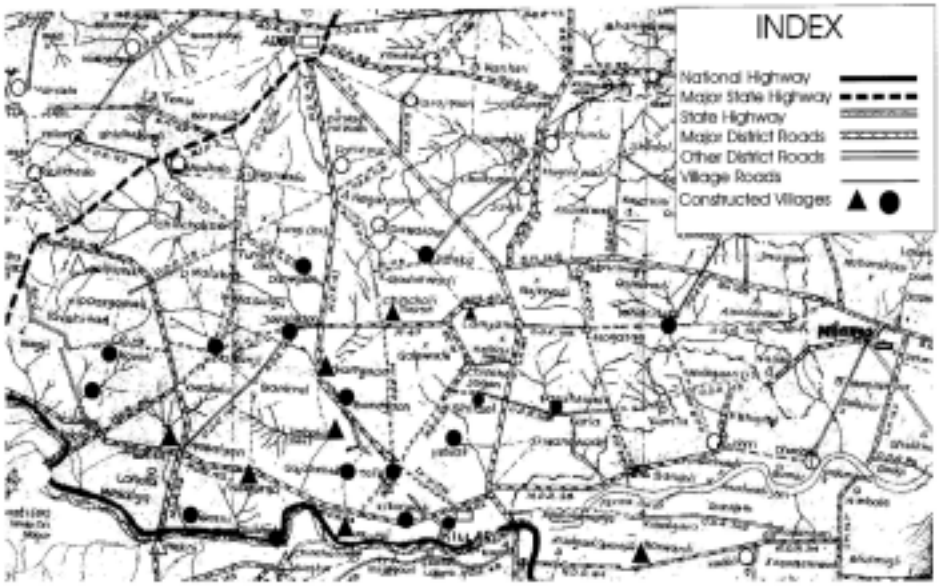


Fig. 7.9 Map of Latur and Osmanabad districts showing location of reconstructed villages *Source – MEERP, 1996*

The village plans were prepared by engineers in Maharashtra Housing and Area Development Authority (MHADA), who designed and detailed a set of construction documents within three weeks of the quake (Salazar, 1998).

The houses were again divided into three categories, on the basis of land holding with the head of a particular family. Accordingly, 'A' category houses had a carpet area of 250 sq. ft. These were provided to farmers who were landless or had land up to 1 hectare. 'B' category housing of 400 sq. ft. carpet

[23] International Association of Earthquake Engineering defines this categorisation of degree of damage from I to V.

[24] Geological Survey of India approved those sites, which were selected, after concluding that there are no main fractures underneath on the basis of satellite imagery.

area was provided to those having land-holding between 1 hectare and 7 hectares. All bigger landlords having more than 7 hectare of landholding got 'C' category houses of 750 sq. ft. The built up area for these houses was about 10% more than the carpet area to allow for future expansion.

Table 7.3 Construction of houses in 52 relocated villages at a glance (in year 2000):

	No. of Villages	**No. of Houses**	**Government (PMU)**		**Donors**	
			Scope	Comp--leted	Scope	Comp--leted
Latur	27	14,327	8,444	8,444	5,883	5,883
Osmanabad	25	13,616	11,065	11,065	2,551	2,551
Total	52	27,943	19,509	19,509	8,434	8,434

Source – http://www.maharashtra.gov.in/english/meerp/profile.htm

According to the status report of MEERP in February 2000 by Programme Management Unit (PMU), Mumbai, 27,861 (99.50%) houses are completed and 83 (0.5%) houses are under various stages of progress out of a total of 27,944 houses. 31 donor agencies took up construction of 8,434 houses, and have completed the same. The government undertook the construction of the remaining 19,510 houses and has completed 19,427 houses. The steady growth in the progress of the housing programme in the 52 relocated villages is shown in the figure given below: -

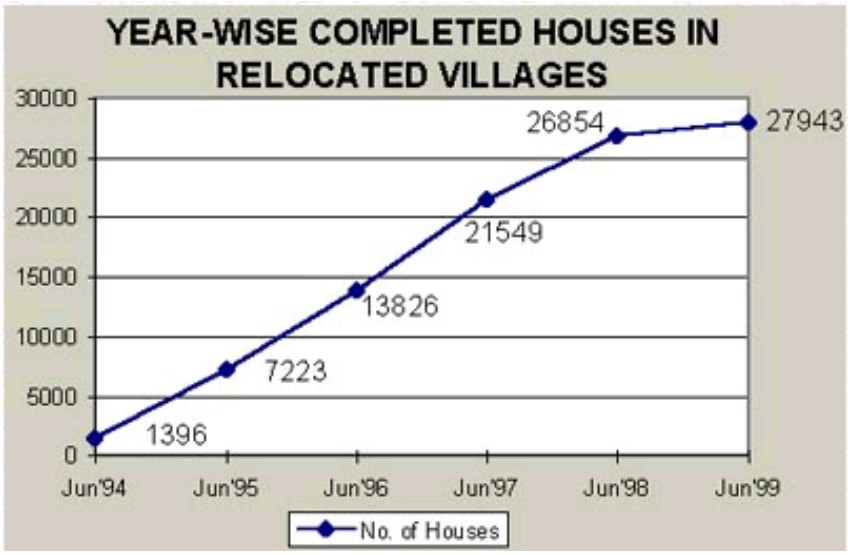


Fig. 7.10 Year-wise completed houses in relocated villages
Source – MEERP, 1990

The Government managed to get the participation of a large number of non-governmental agencies including commercial firms, international donor agencies, religious groups, political parties etc. in the programme. These agencies had the freedom to employ their own contractors and approve designs. This was all organised with an understanding between the donor agencies and the government, that in return, the government would provide all necessary infrastructure including water, electricity and telephone connections.

'B' and 'C' category villages

The 'C' category villages were decided on the basis of a detailed technical survey by a team of government engineers. These included all the remaining villages, where Government of Maharashtra provided two packages of financial assistance, depending upon the severity of damages for in-situ reconstruction, repairs and strengthening (called RRS Programme). This package included Rs. 17,000 (approx. 340 US $) for those houses which suffered damages of category I, II and III as defined by the International Association of Earthquake Engineering, and Rs. 34,500 (approx. 690 US $) for those which suffered damages of category IV and V.

The component involved reconstruction on existing sites of about 10,000 houses that were destroyed or substantially damaged and the repair of 180000 partially damaged houses, construction of 475 model houses or buildings, and a pilot strengthening programme for vulnerable houses and public buildings. In fact, repairing, strengthening and retrofitting in these villages was the largest component, which covered about 200,000 participants in more than 2,000 villages spread over 13 districts in the state.

The Government of Maharashtra did considerable spadework before the RRS programme. It prepared the guidelines for repair, strengthening and reconstruction of houses damaged in the earthquake (GOM, 1994B), which provided recommended technologies for RRS program. The government took several steps for its implementation, which included appointing 700 junior engineers, setting up material depots in the entire region, procuring construction material through international competitive bidding, setting up bank accounts for about 200,000 program beneficiaries, setting up procedures for payment of instalments, and issuing coupons for release of construction materials. Society for Promotion of Area Resource Centres (SPARC) was appointed as the community participation consultant specifically for this component. It also appointed communications facilitators *(Samvad Sahayak*) generally a woman, at the village level to provide all the information related to RRS component. A publicity campaign was launched by the government through constructing 'Model Houses', advocating the use of earthquake resistant features such as reinforced concrete bands at plinth, lintel and roof level.

Though the Government provided technical assistance towards repair retrofitting and strengthening (RRS) through junior engineers, the owners of damaged houses in 'C' category villages were supposed to carry out this work on their own from the financial packages that were offered to them (this was an owner driven programme).

According to the status report of MEERP in February 2000 by PMU, Mumbai, under Repair and strengthening programme, out of 201134 houses, 199207 have been completed and 1,040 houses are in progress. Perhaps many of these houses were more or less constructed anew rather than repaired or strengthened.

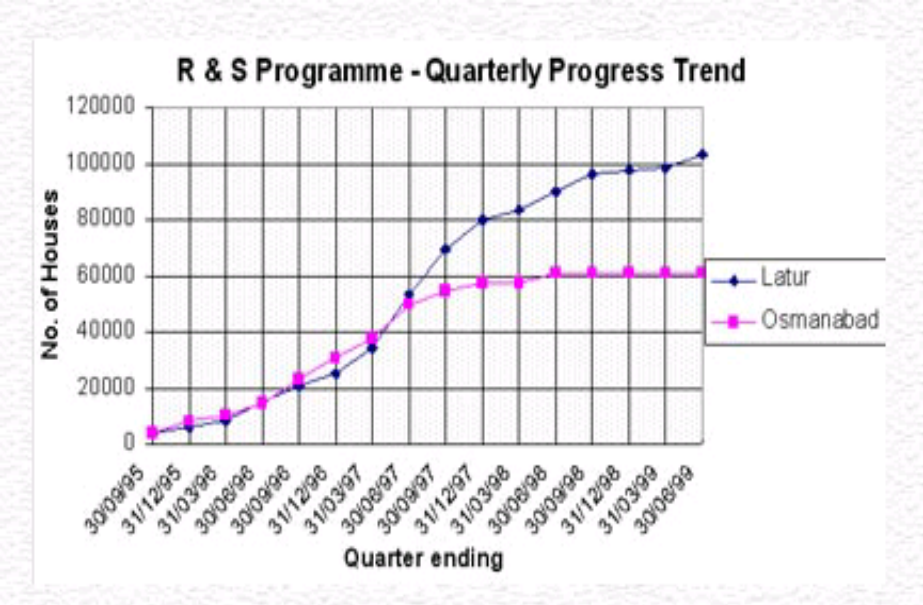


Fig. 7.11 Progress of Repair & Strengthening programme
Source – MEERP, 1999

Building Technology

Long before the World Bank arrived on the scene with its first mission, much had already happened in regards to decisions about setting new standards and relocation for seismic safety. On the basis of quick damage assessment immediately after the earthquake, the traditional techniques of vernacular housing were deemed have been the major cause of loss of life and were considered to be 'unsafe' for future habitation.. All local construction practices were rejected by the 'official expert agencies.' Local people who saw their loved ones die under the heap of stone rubble also developed an acute fear of

these constructions. In this way, the physical vulnerability was simply ascribed to 'faulty' traditional construction practices, without probing deeper into the actual socio-cultural and economic reasons for this.

These new standards were based on the principles of 'earthquake resistant construction' of masonry buildings and the premises of "fail-safe" approach. The buildings constructed under this approach were expected to prevent casualties, but may not be fully "earthquake-proof". The donor agencies came up with variety of building technologies to demonstrate seismic resistance. All of them primarily advocated the use of cement with heavy reinforcement. These included pre-cast concrete panels, geodesic domes with ferro cement, insitu reinforced concrete, hollow concrete blocks etc. The key features of the new construction were installation of reinforced concrete bands at the plinth, lintel and roof levels; replacement of mud mortar (used in the constructions prior to the earthquake) with a lean (1:6) cement/sand mortar. Interestingly, the use of improved stone masonry was also recommended[25]. However, whether this was actually implemented, remains to be seen. This will be discussed in the following section on current status.

A couple of viable technology packages were offered in the in-situ rehabilitation component of the MEERP (mainly to be implemented in C category villages), namely;

- Reconstruction of the existing houses or the portions thereof, and
- Repair and strengthening of the existing damaged houses. The key features of repairs and strengthening were removing existing heavy roofs and replacing with lighter structure or, alternatively reducing the roof weight considerably, installing RCC bands (ring beams) at the lintel and/or roof levels to preserve integrity of the building, strengthening stone masonry by providing through-wall anchors at the prescribed spacing and providing knee bracing at the beam-to-post junctions to prevent lateral swaying of timber frames. Incorporating all these features will considerably strengthen the building in the event of an earthquake.

7.5.2 Other Components

Infrastructure

The infrastructure component covered reconstruction, repair and strengthening of public buildings and infrastructure (including schools, health centres, social service facilities, water supply system, roads, bridges, irrigation facilities,

[25] Improvement in stone masonry implied restricting wall thickness to 450 mm (18in.) and employing sound principles of stone masonry construction; i.e. stone interlocking, use of thorough stones, corner stones, and shaped stone boulders in the construction

public buildings, and historical monuments) and the improvement of transit shelters.

Social Rehabilitation

The activities covered under the 'social rehabilitation' component included provision for special facilities and activities to address the needs of women and children affected by the earthquake, and improvement or restoration of social facilities such as old age homes, child care centres, district trauma centres, homes for handicapped, community centres for women etc

Economic Rehabilitation

Towards economic rehabilitation the programme had made provision for repairs and reconstruction of dug wells, replacement of bullocks, replacement of major and minor farm implements, replacement of cattle and rehabilitation of artisans and small businesspersons.

Community Rehabilitation

The component of community rehabilitation covered the cost of works and materials required to re-establish essential services such as medical services, construction and provision of services for temporary transit shelters.

Technical Assistance, Training and Equipment

This component covered the design, supervision and monitoring of project components, other consultancy services and equipment, including the development of a disaster management programme for the state of Maharashtra and a seismic monitoring and research programme for the Government of India.

This component involved the consultancy services employed by the Government of Maharashtra for MEERP, and the assistance provided by the World Bank, the Asian Development Bank, and the Department for International Development (DFID), and the United Nations Development Programme (UNDP)

Under the training component, the government took up the training programmes of masons and rural labour in 'earthquake resistant construction' in order to make a sufficient work force available to undertake massive construction activity. Around 900 masons and 2800 labourers were trained in 20 centres in Latur district with the help of voluntary training officers through paying petty daily allowances. However this was only an initial activity limited

for one year[26]. Also in the period from November 1995 to February 1997, approximately 4,000 traditional masons were trained in the Latur and Osmanabad districts. Most of these trained masons participated in repair, reconstruction and strengthening (RRS) programme. A large number of women masons were also trained. (Nikolic-Brzev, et.al, 1999).

Preparation of Disaster Management Plan

As part of MEERP, one of the mandated activities of the Govt. of Maharashtra was the preparation of a comprehensive multi-hazard Disaster Management Plan for the state of Maharashtra. The World Bank, UNDP and DFID (Department for International development, UK) are supporting different complementary components of this multi-faceted effort. It is an ambitious plan, with emphasis on disaster management response and disaster awareness and education. It has a state plan as the core and entire district plans of Mahrashtra forming the superstructure.

7.5.3 Community participation programme in the rehabilitation process

Since the commencement of MEERP, the World Bank insisted on complete involvement of earthquake-affected population in the rehabilitation process. This unique feature, the first of its kind on any government project so far, projected MEERP as a classic model for resettlement and rehabilitation of large groups of communities with provision of housing, infrastructure and other socio-economic facilities.

Active participation of the affected people for both pre-construction and post-construction activities was deemed essential to implement both the rehabilitation policy and the programme successfully. The objective was to extend the community participation beyond the consent of the *Sarpanches* (village leaders) and ensure that the views of all sections of the community were sought and understood. The involvement of the communities in the rehabilitation programme was also supposed to ensure that people's concerns and needs were better understood and incorporated in the plans and thereby permit the communities to develop a stake in the rehabilitation process.

[26] In June 1994, the Directorate of Vocational Education and Training, with the support of MEERP, launched training programmes for unskilled labour in the earthquake-affected areas. The existing network of 32 vocational training centres in the most affected districts was used for this purpose. The training lasted two months and covered four trades: masonry, carpentry, electric works, and welding. From 1994 to May 1995 over 6,800 individuals were trained under this program (Nikolic-Brzev et.al, 1999)

To act as the interface between the Government and various communities, the PMU (Programme Management Unit) appointed Community Participation Consultants (CPCs)[27]. The CPCs were involved in a wide range of activities, from building a strong enabling presence in the field, demonstrating the Community Participation process, building the capacities of the Government and Village Level Committees, organising a massive information dissemination campaign as well as monitoring and assessing the rehabilitation programme on an on going basis. The CPCs were active in a cyclical process of gathering people's views on the various rehabilitation packages, clarifying issues of concern to them, making periodic recommendations to the government and actively assisting the state authority in conflict resolution in the villages.

All this also meant understanding village specific problems, issues and social dynamics. Eliciting community participation and institutionalising it was by no means an easy process and many of the efforts aimed at securing a village level consensus on housing or socio economic resettlement were painstakingly slow.

The Tata Institute of Social Science (TISS) carried out pre-construction community participation activities in the relocated villages. They regularly interacted in the field to disseminate information to the villagers regarding the programme. Besides, they helped the villagers, the PMU, the Engineering Consultants and the contractors in finalising the beneficiaries list, plot allotment, village layout and house design. They also aided in formation and effective functioning of the village level committees, land acquisition and various other problems like bifurcation of villages and grievance redressed, which were encountered during the course of the work.

They also conducted rapid assessments for various departments and trained their field staff through demonstration, made village and programme specific recommendations to enlist community participation at the district and state PMU levels based on community feedback. Also they established and maintained periodic contact in the villages, identified key issues in each village, worked on these issues, established contact with all NGOs and Government officials working in the villages. TISS also conducted a baseline survey of the damages immediately after the earthquake to determine the rehabilitation needs of the people.

The repair and strengthening programme was supposed to be an explicit example of community-based mitigation in a post disaster rehabilitation effort. The SPARC's role in the Repairs and strengthening programme was broadly to

[27] Leading social organisations like the Tata Institute of Social Sciences (TISS), Society for Promotion of Area Resource Centres (SPARC), BAIF Development Research Foundation and Nari Prabhodhan Manch (NPM) were appointed as Community Participation consultants for the relocation villages and repairs and strengthening programme.

facilitate, build and strengthen capabilities of all actors, especially the house owners and the village communities, and the integration of the community participation especially within the district and local administration. As a capacity building exercise, SPARC trained the elected representatives of the Gram *Panchayats*, master trainers and resource persons in various R & S villages. They prepared guidelines for the local level officers to ensure community participation in the reconstruction programme and other developmental activities. SPARC organised massive information dissemination campaigns through information updates, Bulletins, *Panchayat* year planner and wall Bulletins. They organised exhibitions cum fairs, gram *sabhas* (village meetings), meeting with *Mahila* Mandals (women's group), and the village visits to facilitate the flow of information regarding the Government of Maharashtra's policies and programmes. SPARC though it's *Swayam* Shikshan *Prayog* (SSP), programme launched a self-education network of NGOs and women's groups.

BAIF and NPM carried out various post-construction activities in the newly constructed villages in order to build up awareness amongst the beneficiaries with regard to public health and sanitation, water conservation and management, use of smokeless *chullahs* (stoves), environmental conservation and use of earthquake resistant technology for extension work and maintenance of infrastructure facilities. They motivated the people belonging to all sections of the society, including women, to form village level voluntary organisation (VO) in each village to take up various developmental activities for the upliftment of the community. They trained the VOs to adopt development approaches and evolve need based income-generating activities through participatory methods. The VOs were also trained to manage the development activities and thereby ensured their self-sufficiency. They also established a forum to solve various social, economic and cultural issues.

Thus information dissemination and education by the consultants about the role and entitlements of the beneficiaries in the rehabilitation process, their emphasis on women's participation, and the use of earthquake resistant technology were some of the outstanding features of the community participation programme. The CPCs were supposed to work with people, recognised and supported their initiatives and created opportunities for the women to participate in the rehabilitation programme.

In the following sections, we will analyse the effectiveness of the community participation programme in a long-term perspective. This will be based on assessing the current status of relocated villages and those villages where the repair and strengthening programme was implemented.

7.6 ASSESSMENT OF THE SITUATION AFTER 7 YEARS[28]

In the year 2000, the 'rehabilitation process' is nearing completion. The construction is complete in most of the 'A' and 'B' category villages and people have moved in. While in a few villages, people moved in as early as 1995, others have just occupied. So at present these relocated and reconstructed villages present the habitation process in various stages and it is interesting to study the processes initiated since then. Similarly the 'C' category villages are worth an evaluation of the status of 'strengthening and retrofitting measures'.

The observed processes are not looked at for mere physical changes but also the social, economic and political dynamics that have caused them. After that, we will analyse the impact on these processes on the local knowledge (traditional systems / cultural heritage) of the place in its broader understanding and evaluate the status of vulnerability against future earthquakes.

7.6.1 Status of In-situ reconstruction ('B' category villages)

First of all, in-situ reconstruction ('B' category villages) never took place. In fact, all 15 villages, which were supposed to be reconstructed in situ, got relocated. According to the rehabilitation policy, the Government of Maharashtra was to provide Rs. 62,000 each to the households in these villages to reconstruct houses. The participants would organize the reconstruction themselves. However, all these villages demanded relocation. The Government had not planned for their relocation, and had not made provision for community infrastructure such as roads and drainage since they already existed in these villages. However these villages refused to construct on the old site. For almost two years there was a stalemate. Finally the government allowed the reconstruction on the condition that the government would not acquire land or pay for the new plots. The villagers pooled resources through the NGOs and their own sources to purchase land for a new village site, and the reconstruction finally commenced (Vatsa, 2001).

One wonders why the villagers refused to reconstruct their houses in situ. This was mainly due to mis-perceptions in the local communities that their sites were unsafe from earthquakes. This in turn was because of wrong signals sent out through the decision to relocate some, immediately after the earthquake, when local people were still in psychological trauma. Actually, even the established criteria for relocation is in doubt since many of the villages that were originally located on black cotton soil suffered much less damage as a result of the earthquake.

[28] This assessment is based on the field work implemented by me from August to October, 2000.

Fig. 7.12 Traditional social structure reinforced in a relocated village.
Source – MEERP, 1999

So strong was the urge to get relocated, that in addition to these 16 villages, there were six other villages that demanded 'A' category assistance and relocation. These villages were not included in category 'A' on the basis of damage assessment. They went to court, and there was protracted litigation for three years. The Government of Maharashtra opposed the re-categorization and relocation on the ground that these villages did not meet the criteria of damages and that it would open the floodgates for similar demands from other villages. There was a strong demand for re-survey of damages and re-categorization of villages in the region, and it was fiscally impossible to meet these demands. However, these six villages abandoned their old site and lived in temporary shelter for five years, which rendered their old houses completely

uninhabitable. Finally, the government agreed to resettle them in terms of 'B' category entitlements. (Vatsa, 2001)

Did relocation do any good to these people? We will find that out by noting the current status of relocated villages.

7.6.2 Status of Relocated villages

Self-initiated transformations

In most of the relocated villages, it is fascinating to see how villagers on their own have initiated changes and additions to the physical fabric that was tailor-made for them. We notice various changes in house structure e.g. addition of rooms, outdoor kitchen, courtyards, access points. However, the most noteworthy is the change in materials. Hardly any of the villagers have used reinforced concrete (except for those who are very well off). Some have used bricks but most have used corrugated tin sheets, even bamboos / twigs. In many of these houses, people have used salvaged materials from their old houses. These include their beautiful front doorways, dressed stone masonry and in some places, wooden beams and columns (though in most cases, these are being sold or used as firewood).

Aug. 2000

Fig. 7.13 Later additions to the reconstructed houses as observed in year 2000

Fig. 7.14 Later stone constructions in relocated villages observed in year 2000
Aug. 2000

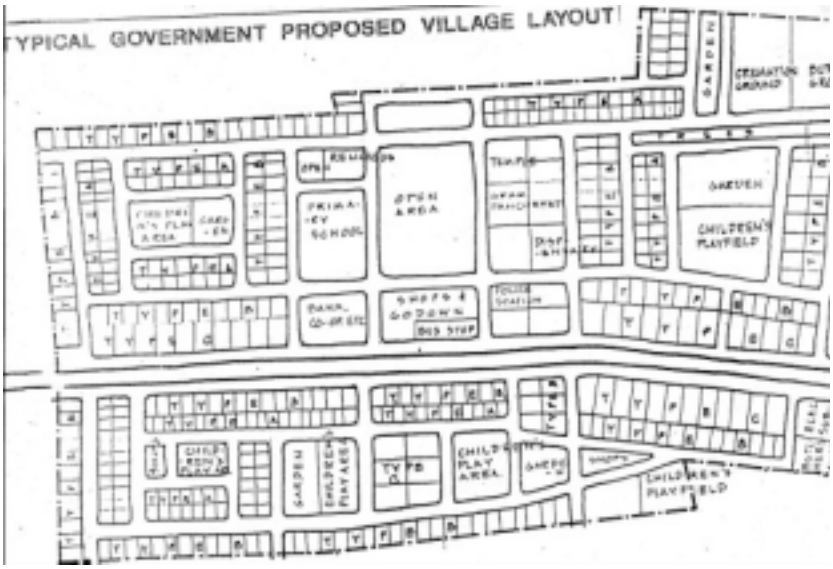
Such processes present an interesting case of how people adapt themselves and also change the surroundings to suit their 'way of life' (which in this case is essentially agrarian). Most interestingly, after initial hesitation, people revert back to traditional techniques, especially stone masonry for boundary walls and in some places for walls up to sill level. In spite of all the changes, people still maintain religious association with their old village sites through daily visits to temples.

Effect on relationship to land and sustainable livelihood source

However, in spite of the processes of settling into their new habitat, relocated people have no dearth of problems, most of which are the result of relocation itself. As mentioned before, traditionally, their agricultural land surrounds villages, and the whole rural ecology is sustained on this delicate relationship of people to the natural resources around them, which also form sustainable source of their livelihood. However, the relocation was done on agricultural land acquired from other villages. As a result, some of the relocated villages either lost their land to relocation for other villages (thus becoming landless forever, even though some financial compensation was offered to them) or were themselves located far from their own agricultural lands, sometimes more than 5 kilometres.

Incompatible 'urban planning' for rural communities:

Besides this, the spatial plans for the relocated villages were totally incompatible with 'way of life' of the villagers. Traditional settlements were characterised by narrow streets, a hierarchy of public and private open spaces used for religious as well as other activities, clusters of housing of distinct types characterised by traditional occupation patterns etc. However, what was designed for them was a complete 'city-like' plan with wide streets forming grid pattern and row housing. The 'designers' sitting in the town planning office perceived that 'city-like' planning would ensure 'development' of 'backward' rural areas. Ironically, many local people, for whom they represented the beginning of modernity for the local people, also share this view. People had strong aspirations for urban life and accompanying civic amenities. This also explains the public pressure for relocation and new planned settlements in the program as mention in the previous sub section (Vatsa, 2001).



Not to scale

Fig. 7.15 Typical government proposed village layout
Source – ASAG, 1996

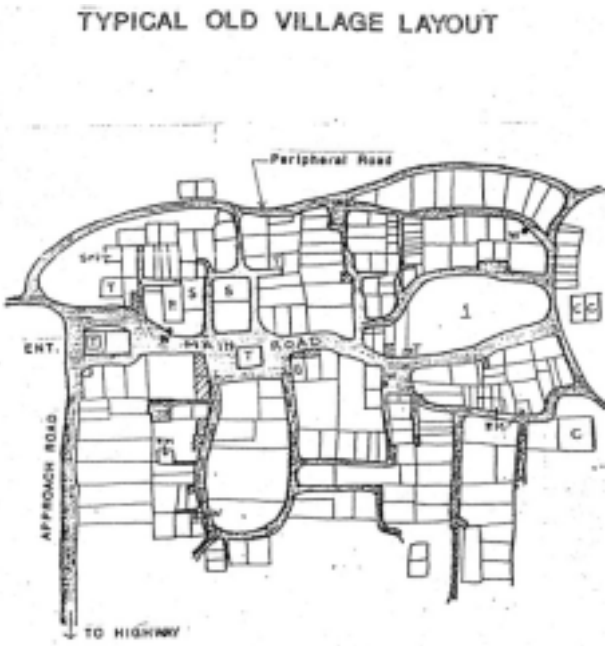


Fig. 7.16 Sketch Plan of a typical traditional village layout
Source – ASAG 1996

In the new set up, there were no spaces for several traditional activities especially those of service sector people like artisans. Moreover the new villages were many-fold larger in area than the old ones (up to 10 times larger). This meant expensive infrastructure, which was again 'provided' by the government. What was not thought of was the lack of the village committees' financial resources to maintain this huge infrastructure in the future. This has been a source of great difficulty now since the local village committee had to increase taxes to cover the costs for maintenance of this infrastructure and the poor villagers are unable to afford it. E.g. in one village (*Jewli*), the poorest who formerly had to pay Rs. 135 (approx. 2.7 US $) per house per year are now made to pay Rs. 1200/-(approx. 24 US $). However due to their inability, only 10 to 13% of estimated revenue is being collected.

The criteria of house allocation on the basis of size of land-holdings has created new economic disparities and completely destroyed the traditional social system based on neighbourhood units and dependencies that ensured mutual sustainability. In some cases, people vacated their allotted houses and moved back to their family members or neighbours by initiating house-extensions.

Due to this house allotment criterion, traditional artisans[29] suffered the most. As mentioned before, traditionally, artisans are believed to act as a support system for the village and are not supposed to cultivate their land. Therefore, they remain landless or marginalized farmers. However, according to the house allotment criteria, the smaller the landholding; the smaller the size of house provided to the owner. As a result, the houses occupied by artisans are smallest where there is no space for them to carry out their activities.

Fig. 7.17 Many craftsmen did not get reconstructed houses because they were landless

The house designs were also very urban with no link to people's traditional life-style. An interesting example of this is the provision of attached toilets in houses. Traditionally, these people are not even used to having toilets in their houses (they use the fields). Now we find these toilets being used to store grain.

One needs to question this notion of 'modernity' that has gotten so deeply embedded in the minds of the planners as well as local people. Each society needs to develop on its own terms and not blindly follow a yearning that is not comprehended in its reality. At the same time, one cannot romanticise traditional way of life and overlook its weaknesses. The old village character symbolised the feudal and socially segregated nature of rural societies.

[29] As mentioned in previous section, the traditional building artisans in this region are *Gawandis, Sutar, Wadars and patharwat.*

However, one cannot think of getting rid of this order merely by ‘modern’ and ‘urban’ spatial planning, without changing the deep rooted thinking processes. This is demonstrated by the fact that traditional social segregation has been superimposed even in these relocated villages.

The appreciable efforts of some agencies and individuals towards incorporating traditional patterns in the new village-plan cannot be overlooked. Worth mentioning here is the role of HUDCO (Housing and Urban Development Corporation Ltd., India). HUDCO adopted four villages and incorporated a number of traditional features like clusters of houses in the new plans.

Particularly interesting is the case of one village, *Tembhe*, where for the first time in-site-reconstruction was done on the foundations of old houses. So the whole village was recreated as it was before. Even the front facades of houses used stones salvaged from old houses. However, there are some problems with this approach. Except for front facades, the rest of the building was comprised of 'cement blocks', and in this way do not allow future changes. Moreover, the whole re-construction was tailor-made for them.

However one very interesting example is that of in-situ reconstruction of village *Pardiwadi* by one local NGO called 'Manavlok'. Here after a long participatory process, the villagers themselves have reconstructed the whole village, with suitable changes such as widening of roads.

However, in all these efforts, there was little or no involvement of the locals in the whole process. The attitude was that of 'adoption and provision' rather than 'facilitation' which made villagers dependent, besides raising their expectations.

Technology for earthquake resistant construction – how effective and sustainable?

Comment is needed on the quality of new 'earthquake resistant' construction in these villages. In most of them, leaking or dampness was occurring though porous concrete blocks without proper pointing. However, the most serious was development of 'through cracks' in some houses due to a recent earthquake of mild intensity of Richter Magnitude 4 in June 2000. In one village, *Rebe Chincholi*, people have vacated some of these houses out of fear. If such a moderate intensity earthquake can do such damage, then one can imagine the consequences of an earthquake equal to the intensity of 1993 quake. Had these been traditional houses, people would have had the possibility of finding a courtyard to escape into, but the modern designs have a single entry and exit. Therefore, in spite of people's extraordinary capacity to adapt to the environment over time, 'relocation' in some situations might have increased the vulnerability of the people.

Fig. 7.18 Cracks in reconstructed houses due to earthquake in June 2000

Shocking consequence – people moving back to old villages and reverting to traditional techniques

As a consequence of the above, another very interesting trend is now being seen. In one village, Sayyed *Hipparga*, people have decided to vacate the relocated village and move back to their old site. In fact, people have started to clear the old site of vegetation and started to re-construct their old houses employing traditional techniques in their entirety. Unfortunately, they are again not employing any 'earthquake-resistant' features in their new 'traditional' constructions. So again, all the efforts of the Government and various NGOs towards 'information dissemination' and 'technology transfer' are wasted. We are back to square one.

7.6.3 Repairs, Reconstruction and Strengthening Programme in 'C' Category Villages:

Let us look at what happened in 'C' category villages, where strengthening and retrofitting of existing houses were to take place. As a matter of fact, no one died and not much physical destruction happened in most of these villages. Some were beautiful traditional settlements with long historical continuity resulting in various heritage components such as fortress houses (*Garhis*), fortifications, and water structures besides vernacular housing. As the government was so much involved with new construction, measures such as

repairs, strengthening and retrofitting, which were in fact the major component of the programme, got sidelined.

There was little technical assistance forthcoming and these people were simply provided with money and were expected to carry out these measures on their own. For each village the government allocated two junior engineers to provide technical assistance.

From the inception of the RRS programme, it was apparent that retrofitting and strengthening was not a preferred technology package for the beneficiaries. According to the Quality Assurance and Technical Audit consultants, only 0.1 percent of the beneficiaries decided to repair and strengthen their houses (Vatsa 2001). There were several reasons for this.

First, these engineers were trained in 'western' education and perceived the traditional housing as 'outdated' and 'weak' and thus strongly advocated local people to vacate them and build 'modern' housing in brick and concrete. Poor villagers who had suffered great trauma were too scared to risk their lives in any way and thus submitted to the 'expert' views of these engineers who also played an important role in strengthening the attitude of local people against the use of stones and wood. It is interesting that 'wood' was perceived unsuitable for construction, while in reality; wood-framed structures behave much better in earthquakes. As a result, most of these villages were slowly vacated and people demolished their own houses and sold well-dressed stone blocks and wooden beams and columns at petty prices. Secondly, the beneficiaries who did not accept repairs and strengthening of houses, also supported the perception of engineers. The beneficiaries saw this assistance as an opportunity of adding to their living space and ‘improving’ their houses (Vatsa 2001).

Vatsa in his paper ‘Rhetoric and Reality of Post-disaster Rehabilitation after the Latur Earthquake of 1993’ which was written as a rejoinder to the paper based on my findings (Jigyasu, 2001) has countered my arguments for failure of RRS programme. He cites the following reasons for the failure. First, at the time of the earthquake, many houses in the affected villages were in a deteriorated condition due to aging, adverse weather conditions, and lack of maintenance. Second, there were cost considerations to retrofitting houses using stone masonry. Stones had to be cut and shaped, and the stone masonry used a higher volume of cement because of the larger spaces between stones. Third, before the 1993 earthquake, a majority of low-income beneficiaries owned hut-like (“*Kutcha*”) houses, for which strengthening was not a feasible rehabilitation option in any case. Fourth, a large number of houses were originally constructed to shelter smaller families. As the size of the families increased, the need for more built-up house area was more pressing, which could have been realized only through reconstruction. Finally, in those villages that were closer to the relocated villages and where the villagers had

experienced more extensive damages, strengthening was an unacceptable option. In these villages, reconstruction was the preferred option. Vatsa further argues that strengthening was more complex and time consuming compared to reconstruction, which was easier for the project engineers. It was the owners who exercised their choice of technology and materials on the basis of these considerations (Nikolic-Brzev, et. Al. 1999)

However, it can be argued that no matter how deteriorated the traditional houses may be, their strengthening and retrofitting proves to be a much cheaper option considering the local availability of materials and craftsmen *(Wadars and Patharwats*), who can cut and shape the stones and in this way, utilise their traditional skills. Moreover, strengthening and retrofitting need not be a highly technical job; several indigenous methods can be developed based on the available resources and skills. As far as the traditional housing types are concerned, which Vatsa says were mainly 'hut-like' or Kutcha, one can say that it is quite possible to strengthen or retrofit them with cheaper and indigenously developed measures[30]. In response to his argument that strengthening was unacceptable to people near relocated villages, one can only wonder at the 'false perceptions' nursed by the 'experts' as well as local people, for various reasons which have already been explained before. These got further strengthened through the decision to relocate. This leads us to ask again and again, if the decision to relocate was timely and foresighted.

However, as a consequence of the failure of RRS programme in 'C' category villages, local people started settling down just outside the old villages and used the money allocated by the government to construct new houses. With the little money that they got, they could hardly afford to construct one or two rooms in poor quality bricks in mud mortar and corrugated tin sheets for roofing. Besides being of poor quality, they are totally unsuitable for the local climate, as the tin sheets get oven hot during summer days. The traditional mud roofs kept inside temperature cool enough so that even fans were not required. Moreover, the new houses are much more vulnerable to earthquakes.

It is indeed ironical, how the existing perceptions and resulting actions of 'experts' and local people turned this 'natural' disaster into one of the biggest 'cultural' disaster that the country has witnessed after independence. So strong were these perceptions against the use of traditional technology and materials that people demolished age-old temples of finest stone and woodcarvings and made imitations in concrete. This still continues though they could hardly afford the use of concrete due to expensive cement and scarcity of water, thereby resulting in very poor construction quality which is much more vulnerable to earthquakes. Some of the 'modern' reconstructed temples and other public buildings cracked and have seepage of water.

[30] Ahmedabad Study Action Group in Latur, Chamoli and now in Gujarat has demonstrated these.

An NGO named ASAG, Latur unit (Ahmedabad Study Action Group), in spite of various difficulties, actually demonstrated innovative techniques in 'strengthening and retrofitting'. ASAG along with some other NGOs got actively involved in 'information dissemination on simple repairs and retrofitting techniques' to the villagers right from the early stages. They were also involved in initiating mason training programmes as well as construction of model houses[31]. However, in spite of the sincere and persistent efforts of these NGOs, not much difference could be seen in the overall situation.

7.6.4 Technical Assistance, Training and Equipment

HUDCO Building Centres – how sustainable?

The success of this component can be judged by considering the status of ten 'Building Centres' in Latur and Osmanabad supported by HUDCO (Housing and Urban Development Corporation) and also assisted by the Government of India. These centres were supposed to promote construction activity and generate employment through training programmes for construction artisans, labour and unemployed youth. The centres supplied building materials to construction sites and educated people with respect to earthquake resistant technology. This was a very good idea and would have ensured sustainability. Unfortunately, at present all these ten centres have been shut down for three to four years. Today they appear like ruins, with unfinished concrete blocks, dry tanks and rusted machines.

Why did this happen? There are several reasons. First, the technology, which was supposed to be inculcated, was alien. Secondly, the centres were established with outside financial resources without a proper management plan for internalising the whole process in the local community. Thirdly, there was considerably less involvement of traditional artisans, who were made to neglect their existing skills and learn something totally alien. 'Earthquake resistant technology' was taught as rigid design packages, without any scope for experimentation. As a result, most of the 'Model Houses' that in fact were supposed to educate for the use of such technology are today in ruins.

[31] Interestingly, Government of Mahrashtra has come up with a well designed manual on earthquake resistant construction and seismic strengthening only in 1998, when most of the rehabilitation process is in its completion stage and much of the damage to traditional constructions has already been done.

Fig. 7.19 Building centre lying vacated with unused concrete blocks Aug. 2000

Fig. 7.20 Model house to demonstrate seismic resistant adobe construction lying in ruins Aug. 2000

Adverse Impact on Traditional Artisans

As mentioned before, under the training components, large number of training programmes were organised to train the masons and also impart vocational training. In fact, that really helped in the reconstruction process by making cheap labour available. However, one wonders if this training has been able to do much good in a long-term perspective. Has it been able to generate sustainable livelihood options for these artisans? One is in doubt considering their present status.

Since the training focussed largely on 'modern' techniques of 'earthquake resistant construction', these masons could not really make use of these techniques for indigenous constructions. Once reconstruction activity was over, many of them had to migrate out to nearby cities in search of jobs. This is ironical since these trained masons were no longer available for the local rural people for whom they were supposed to have been trained. Already prior to the earthquake, many of these artisans had left their traditional occupations and this dealt a severe blow to those who were left. During my fieldwork, I happened to meet several trained masons, who were demanding jobs from the government, as they could not get any employment based on these training programmes.

Moreover, in this rehabilitation programme, there was no provision or policy measures for rehabilitating the local artisans apart from distribution of 'tool kits'. But what will tools do, if there is no work? The criteria for house allotment and how it adversely affected the artisans has already been discussed. In the entire programme, traditional carpenters and stonecutters were hardly employed since little wood and very little stone was being used. Fear of traditional techniques has further aggravated their plight. All this has been the death knell to already disappearing living building craft traditions, and many of the traditional craftsmen have already changed their occupations.

7.6.5 Community participation – rhetoric or reality?

Community participation was projected as one of the highlights of MEERP programme at the insistence of World Bank. For the purpose, community participation consultants were hired. As desired by the World Bank, the plans were supposed to be prepared in consultation with the villagers. How much of community participation could actually be implemented, considering the nature of these consultants and the basic social and economic conditions. Was it a reality or rhetoric? In order to find out this, I did some interviews with people of relocated villages and their responses speak for themselves.

Real community participation does not come without equitable participation of all sections of the societies. However, the rural societies in Marathwada are

socially segregated. Marathas and Patils are the rich and powerful castes, socially, economically as well as politically. They also mainly control the local *gram sabha* (village committee). When 'community participation programmes' were initiated by the hired consultants, these powerful groups managed to voice their opinions at the cost of many others who were weak and marginalized. According to one respondent, "In practice, there was no consultation, rather these were just shown to the local *gram sabha* (village committee) and sought their consent for the name-sake."

This could also be done due to the fact that these consultants were hired from outside and had no understanding of ground realities, nor above all, trust and confidence of the local people.

Some of the NGOs like *Manavlok*, Housing and Urban Development Corporation (HUDCO) did try to involve communities in the rehabilitation programme by arranging regular meetings. However, this was limited to their involvement and not really participation, which comes only with true empowerment in decision making and entitlement of all sections of the society.

7.7 CONCLUSIONS

Interestingly, the findings based on a recent survey undertaken by CSSS[32] bring out the positive response of the people in favour of each housing category. According to this survey, 77 percent of the respondents in 'A' category are of the opinion that the new layout plan of the village is safer. In 'B' category villages, 78 percent of the respondents are satisfied with the construction undertaken by the NGOs, while in 'C' category, 95 percent report overall satisfaction about the construction / repair of their houses. According to this survey, the owner-driven construction is the most successful category, compared to the government and NGO driven category

This is clearly contradicting my findings that came up during the course of my fieldwork. However, there is a major difference in the two findings. The first one is purely quantitative while I have undertaken a qualitative understanding of the situation based on several key informant interviews and on site observations. One is not clear about the criteria for judging the satisfaction of various beneficiaries. Is it based solely on the physical assets that they have gained as a result of the rehabilitation or does it include intangible aspects relating to their empowerment, sustainable sources of livelihood and 'quality' of life, which is beyond 'modernist' notions?

[32] Centre of Studies in Social Sciences (CSSS), 1999, "Survey of Rehabilitated Households affected by Killari Earthquake (Latur and Osmanabad Districts)", Vol. I & II, Pune, India

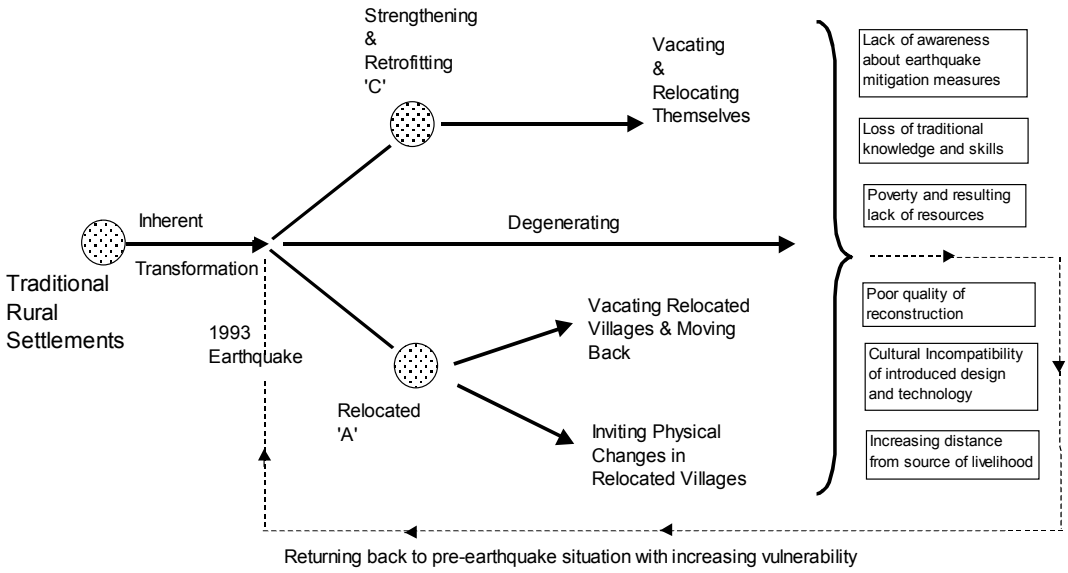


Fig. 7.21 Conceptual Diagram showing transformation processes in Marathwada – 7 years later

8. CASE STUDY AREA 2 - KUTCH AND SAURASHTRA REGION, INDIA

8.1 INTRODUCTION TO THE CASE STUDY AREA

An Mw 7.7 earthquake struck Kutch and Kathiawar region at 8:46 a.m. (local time) on January 26, 2001. This was the most damaging earthquake in the last fifty years in India. According to latest casualty figures from the Government of Gujarat (on 1st April 2001), 20,083 people were reported dead and 166,836 got injured. However, this only included those who were officially registered as dead. There were many others who were cremated without any records. According to some unofficial sources, the toll could be even higher than 50,000. But this could not be confirmed.

According to official figures (on 1st April, 2001), the total population affected by this earthquake was a staggering 16.04 million. 21 districts out of 25 in Gujarat state were affected to some degree. However the most affected were Kutch and Surendranagar districts. 7633 out of 18,356 villages of the state were affected, out of which 450 were totally flattened. Official records put the total number of houses damaged to be around 1.2 million out which 370000 are totally destroyed and 650000 partially destroyed.

While the previous case study of Marathwada demonstrated the vulnerability conditions and the status of local knowledge and capacity, seven years after the main hazard event, the Gujarat case, dwells in detail on the 'transition phase' from pre-disaster to post-disaster situation and from relief to rehabilitation initiated after the earthquake. It demonstrates the complex and dynamic scope and nature of a disaster where various socio-cultural, political and economic aspects are at play with each other, thereby contributing to the disaster.

Moreover, this case also enables dynamic understanding of disaster as a phenomenon that accrues both preceding the natural hazard (as a setting for the disaster) and is carried further on following the event as a product of various decisions taken in the immediate aftermath and in the long run (in this way it is no longer natural). Thus various aspects of a disaster are not understood in a static way in a specific time period. Rather they are studied in a time continuum to understand the various dynamics that are at play both in the immediate aftermath of the natural hazard and in the long run. The changing attitudes and perceptions of various stakeholders have a bearing on the consequences of both the internal response of the communities and the external decisions, both concerning immediate relief and rescue and long-term rehabilitation.

My case study area consists mainly of two historical and cultural regions, namely Kutch and Saurashtra (Kathiawar) located in the present Indian state of Gujarat. These two regions are very closely linked, geographically, historically and culturally. While I have studied a few areas in Saurashtra region, my study looks at Kutch region in a greater detail. There are two reasons for this. Firstly, the region has very distinct geographical, socio-cultural and economic characteristics and secondly, it was the worst hit by the earthquake.

8.1.1 Kutch and Saurashtra Region in Gujarat– geographical context

Gujarat is a state located in western part of India. The state was formed on May 1, 1960, as a result of the Bombay Reorganization act, 1960. The Arabian Sea bounds it on the west, Pakistan and the Indian State of Rajasthan in the north and northeast respectively, the state of Madhya Pradesh in the east and Maharashtra State in the south. The state has a total area of 196024 Sq. kms.

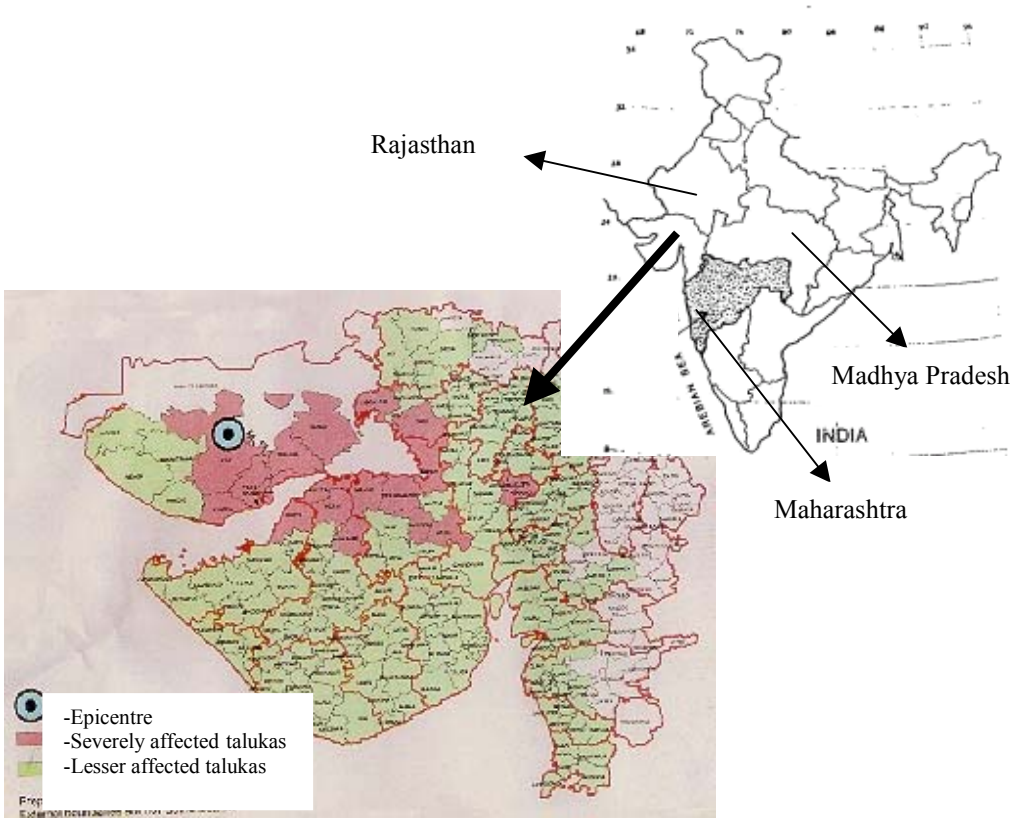


Fig. 8.1 Map of Gujarat State in India showing severely affected areas in 2001 earthquake. Source – EERI, 2001

Like other states, Gujarat is divided into 25 districts and each district is further subdivided into *Talukas*. Each of these *Talukas* has a number of villages. After Gujarat State was founded, Kutch was carved out as an independent district, while Kathiawar was divided into several districts, namely Surendranagar, Rajkot, Jamnagar, Junagadh, Amreli and Bhavnagar.

Kutch Region

The word Kutch is derived from its resemblance to tortoise (called *kachbo* in native language) in its geographical shape. The region (comprising present Kutch district) lies in the extreme west of Gujarat between 22'44'8' to 24'42'30' North latitude and 68'7'23' and 71'46'45' East longitude. It is bounded on the south by the Gulf of Kutch and on the west by the Indian Ocean, in the Northeast and Southeast by the districts of Banaskantha and Mehasana. It also shares long borders with Pakistan. (Jethi, 1999)

The total area of the district is 45,652 square kilometres making it the biggest district in the state of Gujarat. For administrative purpose the district has been divided into 9 *talukas* viz: Bhuj, Anjar, Nakhatrana, Lakhpat, Mandvi, Mundra, Bhachau, Raper and Abdasa. There are a total of 905 villages and 10 towns in the region (1991 census)

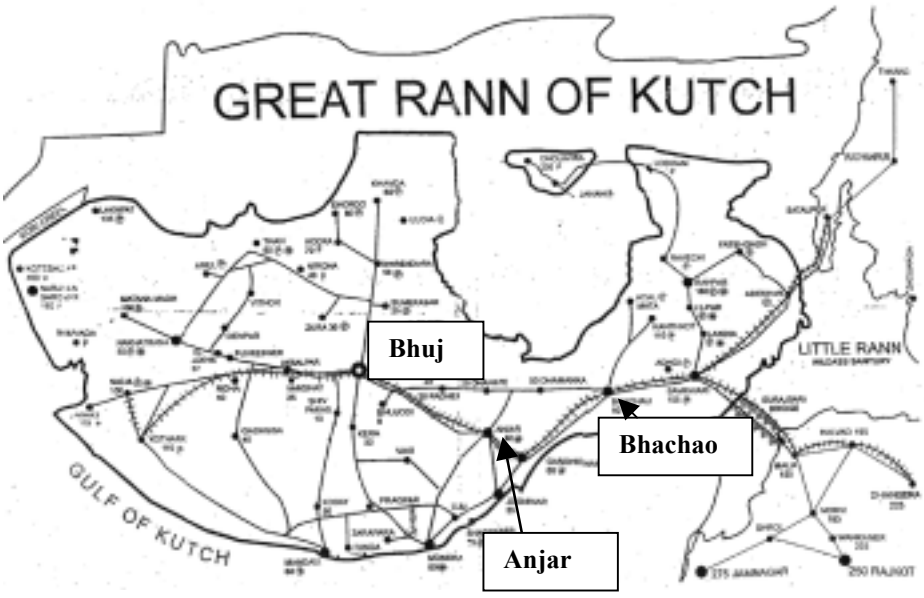


Fig. 8.2 Map of Kutch Region, Gujarat

Kathiawad (Saurasthra) Region

The word Kathiawad comes from Kathis, the only non-Rajput warrior clan[1], who had carved out their own little kingdoms in this peninsular region, prior to independence. The following table shows the main geographical facts about the region: -

Table 8.1

District	Area (in Sq km)	Taluka	Village	Towns
Surendranagar	10,489	9	661	11
Rajkot	11,203	14	855	13
Junagadh & Porbandar	10,607	14 & 13	1,069	23
Bhavnagar	11,155	11	881	17
Jamnagar	14,125	10	701	18
Amreli	6,760	11	595	12

Source – TARU analysis 2001, http://www.gujaratplus.com

Besides there are number of big and small cities in these districts.

8.1.2 Kutch and Kathiawad region - Demographic profile

According to 1991 census, the total population of the state was nearly 41,174,060 (41 million)[2]. Out of this, the population of Kutch district in 1991 was recorded as 1,262,507, which included 642,823 male and 619,684 female. A projected estimate is presented below, assuming a uniform growth rate over 1991-2000 periods:

Table 8.2

District	Population 1991 (million)	Estimated Population 2001 (million)	Percentage population Urban	Rural
Kutch	1.3	1.8	31%	69%
Surendranagar	1.2	1.5	30%	70%
Rajkot	2.5	3.0	47%	53%
Jamnagar	1.6	1.4	40%	60%
Junagadh	2.4	3.7	33%	67%
Bhavnagar	2.3	3.8	35%	65%
Amreli	1.3	1.8	22%	78%

Source; TARU analysis 2001; Census of India, 1991

[1] Traditional warrior caste groups in India were called Rajputs.

[2] The population has significantly grown since 1991. The total population of Gujarat is approximately 50,597,000 according to 2001 census. 62.65 percent of the total population is rural.

The literacy levels in the above districts are 52.75, 54.77, 66.96, 58.96, 60.33, 57.89 and 60.06 % respectively. (www.gujaratplus.com)

8.1.3 Kutch region – typical characteristics

Socio-economic pattern

Kutch region has a distinct socio-economic structure. Traditionally, Ahir and Kanbi are farming communities of Kutch. In the Banni area (marshlands of Kutch), the Jat, Mutwa, Node, Korar, Sameja, Sama, Sumra, Raishipotra, Halepotra and Bambha communities are engaged in cattle breeding. There is not much agricultural activity in the region since most of the area is desert and marshy. Lohana, Brahmin, Jains, Soni are the other communities in the district. Some communities like Rabaris are nomadic pastoralists. Muslims are the religious minority groups in the region.

The region is internationally well known for its handicrafts. This forms another source of livelihood for some, especially women. There are other special tribes, which are engaged in special occupations like *Vadis*, who specialise in performing street games.

Kutch is also home to a sizeable, wealthy business community that has social networks in other parts of the state, in Mumbai, and indeed in many parts of the world. Most of them live in towns such as Bhuj and Anjar and many have even migrated overseas.

The region also has a number of salt refineries, employing a large number of salt-farmers working in saltpans. Kutch alone accounts for 80 percent of India's salt output. These farmers are engaged in labour intensive extraction of salt from marshlands. Most of them work as daily wage labour.

Kutch is one of the least industrialised districts in Gujarat. It has one major port, Kandla and three minor ports, Mandvi, Mundra and Jakhau. Some part of the population is employed in these ports.

Relationship to Land

The relationship to land here is not so strong, if we compare with other case study areas. This is primarily due to the fact that the land is not very productive and therefore is not related to the primary occupation. However the land ownership is very much linked to the social and economic status that a particular household commands.

8.1.4 Regional Topography, geology, tectonic setting and seismicity of the region

Topography and Geology

The peninsular landmass of Kutch and Kathiawar, except the green southern coastal stretches, is mostly dry and semi-arid barrens often punctuated by low hill ranges. To the north of this lies a parched and sandy expanse of the great Thar Desert stretching all the way up to the plains of Punjab.

Though more than half of the area of Kutch is occupied by desert, the land bordering the seacoast in the south is fertile and well cultivated. The distinctive feature of Kutch region is the Great Rann and Little Rann, which are two vast expanses of marshlands.

Sedimentary rocks ranging in age from Jurassic to Eocene age cover Kutch region. These sediments have a zone of Deccan trap volcanics sandwiched between the Jurassic rocks of the northern part and the Eocene sedimentaries in the south towards the coast. Limestone, shale and sandstones are the most common types of rocks (Krishnan, 1982).

The Jurassic rocks have an estimated thickness of 1950 m and crop out in three anticline ridges trending East-West (E-W)[3]. Owing to an E-W fault the whole sequence is repeated.

Both Eocene and Jurassic rocks are fossiliferous. The Eocene rocks are exposed along the southern fringe of the Kutch peninsula as a thin band bounded by Deccan traps on the north.

Recent marine deposits on which Jurassic rocks form outcrops cover the northern part of Kutch peninsula. The coastal areas have thick alluvial and marine sediments of recent origins. This area seems to be undergoing some marine recession. A major paleo-rift valley lies along the east west direction passing through the Kutch region.

Sedimentary rocks of this region are generally well indurated and behave like hard rocks. The pore spaces are mostly cemented with calcium carbonate and therefore are mostly impervious. The Deccan Traps are exposed along the southern part of the Kutch peninsula.

[3] The northern range is about 160 km long and broken into four islands (Pachham, Karir, Bela and Chorar) in the Rann of Kutch. The middle ridge is 190 km long running ESE from Lakhpat on the west. The southern ridge, south of Bhuj, is 65 km long and forms the Charwar and Katrol hills. The Jurassic rocks are repeated in these two ridges. The main outcrop, of which they form parts, is cut by an E-W strike fault. An isolated but large outcrop, on which Wagur and Kankote stand, is about 80 km long, in NE Kutch. These anticlines show transverse undulations so that the domes like parts have been separated from each other by denudation. (Krishnan, 1982).

Both limestone and sandstones are used as building materials in this region. Many quarries exist in this region for mining good quality limestone for making slabs for flooring and covering walls. Several cement factories mine limestone in this region. Bauxite is also being mined here. Ready availability of good quality dress able stones led to traditional housing using these local materials extensively as wall and sometimes roofing material. (Taru, 2001)

Tectonic setting and Seismicity[4]

The tectonic setting of the Kutch is not well understood. It has been characterized as a stable continental region (SCR), but its proximity to the Himalayan front and other active geologic structures suggests that it may be transitional between a SCR and the plate boundary.

As discussed before, the Indian sub-continent is moving northward at a rate of approximately 53 to 63 mm/year, colliding with the Asian Plate, which is also moving northward, but at about half the rate of the Indian plate. The difference between the relative plate velocities produces an intercontinental collision forming the Himalayan Mountains and driving the eastward and westward movement of large crustal blocks away from the Himalayan region. The rate of contraction across the Himalayan Frontal Fault System (HFFS) and along the western boundary of the plate near the India/Pakistan border is approximately 20 to 25 mm/year. The rate of contraction across peninsular India south of the plate margin is about 3+ - 2 mm/year.

Within the Kutch region, major structural features include east-running folds and faults that deform Mesozoic, Tertiary, and possibly Quaternary units. The principal faults are the east-running Katrol Hills, Kutch mainland, Island Belt and Allah Bund faults, the latter being the source of the ~M 7.8 earthquake in 1819. The presence of folds along the Kutch mainland and Katrol Hill faults involving possible Quaternary deposits suggests that there may be an active fold and thrust belt in the southern Kutch region. However, the lack of prominent tectonic geomorphology suggests that the rate of crustal shortening is very low, on the order of a few mm/year or less. (www.taru.org)

Analysis of historical seismicity in the region shows a recurrence of approximately 200 years for large magnitude events such as the 1819 and 2001 earthquakes. Further, the presence of folds and faults involving tertiary and younger sediments stands in contrast to the marked stability of peninsular India east of the Khambat garden, and indicates long-term tectonic activity. The relatively high rates of historical seismicity in the Kutch region, compared to peninsular India, is reflected in the higher seismic hazard assigned to the area

[4] Mainly adapted from EERI, Special Earthquake Report, April 2001' and TARU Special Report, 2001

on the seismic zonation map of India. According to this, the region falls in zone V – the most hazardous.

8.2 TRADITIONAL SYSTEMS

8.2.1 Kutch and Kathiawad region – historical context

Kutch and Kathiawad share a very rich history. Kutch was inhabited from prehistoric times as is proven by stone implements found by explorations and excavations at various places. Some traces of the remarkable Indus valley civilization (3000 to 1500 B.C.) have been discovered in Dholavira-Kutch. In the historical past prior to the 9th century AD, the great river Indus marked the western boundary of the desert beyond which lay a long stretch of land between the coast of Makran and what is now Afghanistan. This harsh, inhospitable stretch was carved out between themselves by innumerable warrior tribes of mostly Yeduvanshi Rajput descent (a special caste group).

Around the turn of the first millennium when pressure from the Arab Army arraigned along the Baluchi range (a region now in western Pakistan) began to mount, the sustaining power of these small kingdoms gave way in the face of the organized might of the enemy, unleashing an unprecedented diaspora which continued for nearly four centuries. Many of the fleeing warrior clans chose the desolate southern route leading in to Kutch and peninsular Kathiawar through the salty wastes of the great Rann. Many of them went on to occupy much of Kathiawar between themselves[5]. The Kathis, the only non-Rajput warrior clan[6], too carved out their own little kingdoms in central Kathiawar, thereby adding to the ever-changing political mosaic.

Later on, the *subah* (district) of the Sultan (King) of Gujarat was superimposed on the already confused collage of feuding kingdoms. With Junagarh as his capital, he grabbed the fertile southern half of the Kathiawar Peninsula. Not to be left out, the armies of the Peshwa, (ruler of the present Indian state of Maharashtra), led by Damaji Gaekwad also penetrated the region in the later half of the 18th century, reducing many to the status of feudatories.

[5] Among the first to arrive were the clans of Jethwa and Chudasama Rajputs who, bypassing the desert kingdom of Kutch, went on to occupy much of Kathiawar between themselves. Subsequent waves of migration brought in the Jadeja and Jhala clans from Sindh (now in Pakistan) and the Gohil and Parmar Rajputs from southern Rajputana (present Indian state of Rajasthan)

[6] Known for their horsemanship and fierce loyalty, the Kathis had sub served as mercenary contingent in the larger kingdoms of Gujarat, sindh and Rajputana before finding a foothold in Kathiawar. Far more desperate than the earlier entrants, these later arrivals exerted tremendous pressure and pushed the ruling Chudasamas and Jethwas against the southern and western seaboard of the Kathiawar peninsula to create room for them.

The kingdom of Kutch ruled by the Jadejas since the 10th century largely stayed aloof from the goings on in Kathiawar. However, the renegade branches of this important royal house blazed their way across the little Rann in the early 16th century to occupy much of north and north-central Kathiawar. Finally, the British trooped in on the trail laid out by the dominant Marathas. When Colonel Walker, the emissary of the British of the British crown, imposed the treaty on the ruling dynasties of Kathiawar and Kutch in 1818, there existed 218 small and big kingdoms in the region.

On the eve of Indian independence in 1947, out of a total of some 550 princely states in the whole of India, Kutch and Kathiawar alone had 220 kingdoms packed in a very small geographical area (Sanghvi, 1999).

8.2.2 Heritage Components

Due to the rich historical past, Kutch and Kathiawar have a number of heritage components that have survived until today, notably after many past earthquakes. These heritage components range from princely towns, fortified settlements with palaces, city-places (darbargarh) dominating the skyline. Other significant components include mosques, temples, cenotaphs (chattris), pleasure retreats, other civic works like club houses, local secretariats, educational facilities, European guest houses, bridges, railway stations, step-wells, water tanks and even the entire city layouts (ibid).

These heritage components demonstrate unique architectural character. The darbargarhs, besides donning clan-specific peculiarities, were considered the high-water mark of the architectural inheritance of the clan. Very often the motifs and lifestyle related layouts imported from Sindh and Rajputana were married to the local practices- combining the best of both to suit the adopted landscape. From their frequent trips to England and the rest of Europe, the princes brought back visions of the grandeur represented in the major cities of Europe and attempted to replicate them on the soil of their home states. Here, once again the stylistic imports were often crossbred with the indigenous composites to produce unique blends. The frenetic building activity that ensued at the end of the 19th century saw the rise of stupendous palaces and pleasure retreats all over the region, moulded after the neo classical and Gothic revivalist trends of Europe. Although largely inspired by European examples, most palaces, darbargarhs and civic works that sprang up in the last century combined very aesthetically the native craft with that of the occidental origins of the design vision.

Besides royal and public structures, the region, especially that of Kutch also has a very strong vernacular tradition, which is reflected in its vernacular housing and handicrafts. This will be dealt with in detail in a later sub-section.

Last but not least, much of the folklore, clan memories, oral traditions, distinct lifestyle patterns, habitats, ethnic cuisine, artefacts, art, occupational practices and even the intra-community equations are tightly intertwined with the built, historical legacy of the region. In fact, the entire past civilizational structure was propped up against the tangible backdrop of historical remnants. The region, especially that of Kutch, is famous for its embroidery work, hand block-printing, cotton and wool weaving, wood work, terracotta, mud wall painting and silver work. Some of these are elaborated in section 10.2.5

8.2.3 Settlement Structure

Interestingly, the settlement structure is similar to the ones in Latur in many respects. Most villages and some sections of the towns are organised into caste or community neighbourhoods. While this arrangement stems from traditional religious practice, it is also a basis of social capital. The homes of the poor 'lower'castes, tribes (castes like Kolis and Rabaris), and the Muslim minority, in particular, world be clustered together, as well as some of the better-off groups such as the Jains (ADB, 2001). Each of these clusters is comprised of various dwelling units, depending on the number of families in the cluster. In many cases, a twig fence surrounds the cluster. The village is spatially concentrated and well defined beyond which farm or pasturelands extend.

In many villages, the temple is the focal point of the settlement and the adjoining land serves as a village square, which is a hub of all village activity. Houses built around it define the cluster level open space.

The village is mostly organic in its street form due to accretive growth of built form over years. The streets are narrow and characterised by cul-de-sacs and bottlenecks. The street layout is defined by a continuous façade of built mass on either side of the street.

Some of the villages are linear in form, a central spine bisecting it into two halves. Shops, schools and other amenities are placed along it. Cross roads run perpendicular to the central spine, which sometimes terminates in chowks beyond which the farmlands extend .

Other villages are just like hamlets consisting of a few dwelling clusters.

Fig. 8.3 Village Ukhadmora – Organic form with narrow streets and common open spaces. Source- See Fig. 8.4

Fig. 8.4 Village Ludiya –hamlets consisting of a few dwelling clusters
Source: Vastushilpa foundation and Mc. Gill University, 2001

8.2.4 Vernacular Housing

General Rural Housing

The dwelling unit consists of multi-purpose rooms, a veranda, and an attached kitchen in front (locally the space accommodating the kitchen is called 'otta'). Houses are essentially arranged around an open space, forming clusters. The

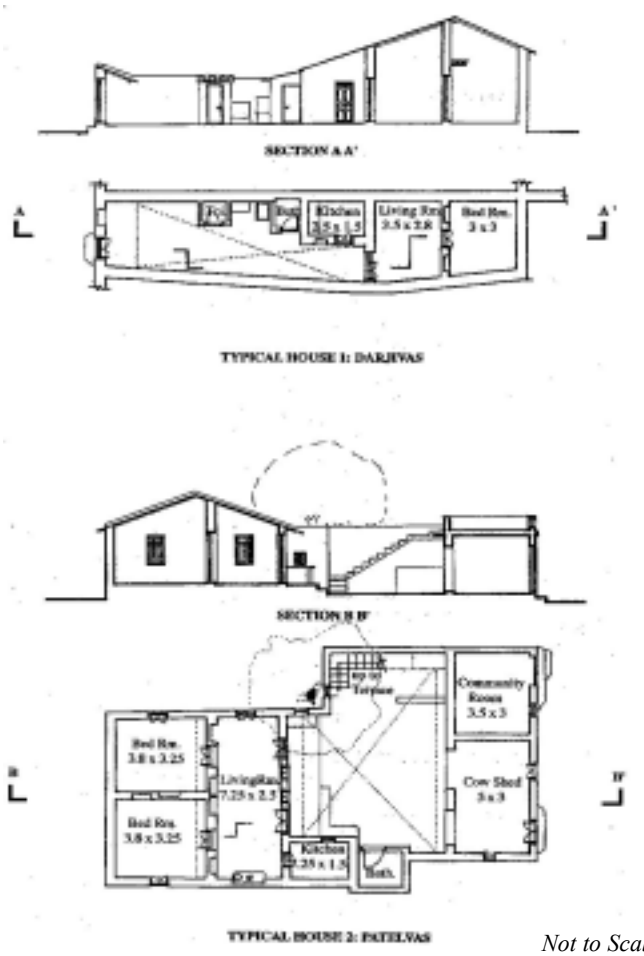
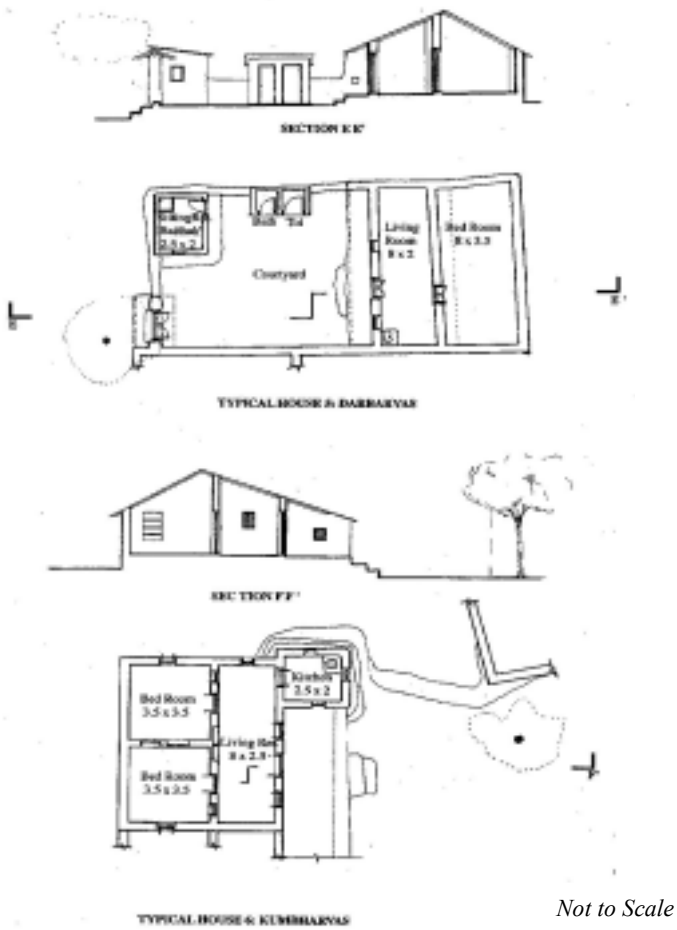


Fig. 8.5 Typical traditional house plans – village Modpar
Source: Vastushilpa foundation and Mc. Gill University,Montreal 2001

open space thus enclosed varies in size and scale. Largely it serves few typical daily functions. However its division and use is personalised by the individual house dweller to suit his needs and life-style. Characteristic and uniquely decorated elements of the existing houses aid the personalisation of space. These elements include doorways, wall paintings, niches etc.

The roofs are sloping, of clay tiles supported on wooden rafters and purlins. The walls are load bearing and are mostly;

i. In random rubble masonry bonded with mud mortar or sand, lime and red brick powder mortar (for buildings built more than 20 years ago), the newly built ones used sand and plain cement mortar.



Not to Scale

Fig. 8.6 Typical traditional house plans – village Modpar
Source: Vastushilpa foundation and Mc. Gill University, 2001

ii. Stone masonry in sand, lime and red brick powder (for buildings built more than 20 years ago), the newly built ones used sand and plain cement mortar.

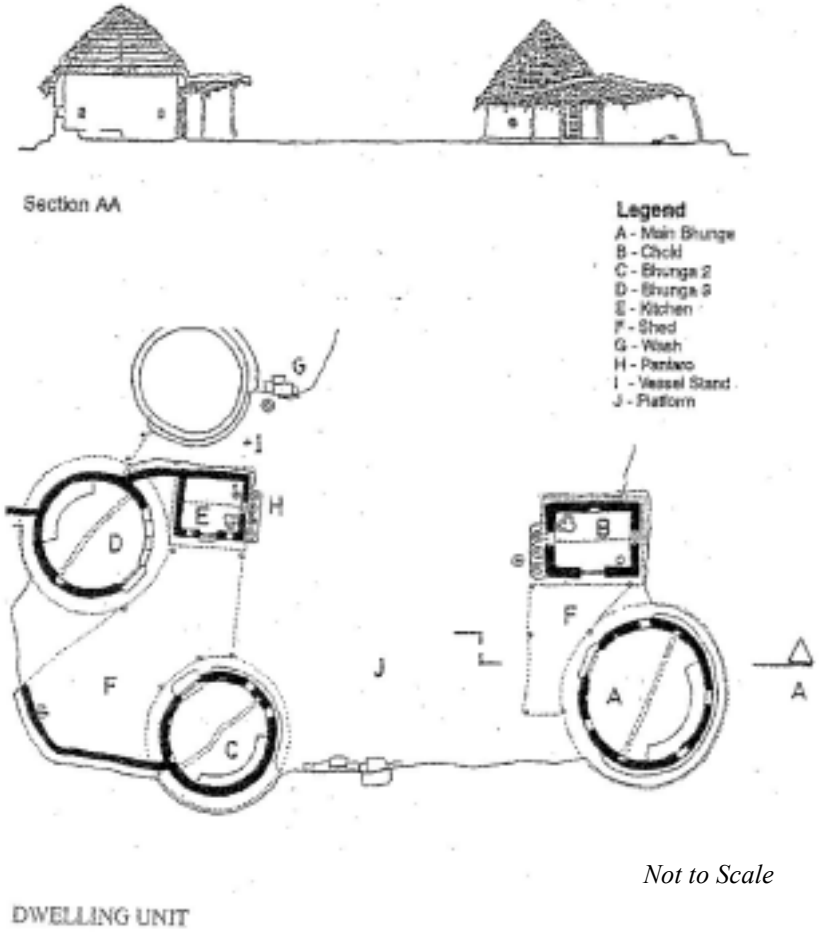
iii. Burnt brick masonry in sand, lime and red brick powder mortar (for buildings built more than 20 years ago), the newly built ones used sand and cement mortar.

iv. Unburnt clay bricks in mud mortar (adobe). (Boen, 2001)

Bhungas

The typical and most recognisable traditional dwellings of the Kutch region are called the 'bhungas'. Its typical features are circular plan, low plinth and compound walls. One of the characteristic features of these Bhungas is decorations and paintings on walls.

The dwelling unit for a family is made of several components. The bhunga and the chowki are the main components. The Bhunga is the primary living space and there can be several within the dwelling cluster. The chowki is a small rectangular building and is used for cooking. The plinth and face towards each other unite the various components. A thatch roof to create a shaded outdoor space covers the area between them. The main components in the dwelling unit respond to the daily activities, which take place there.



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DWELLING UNIT

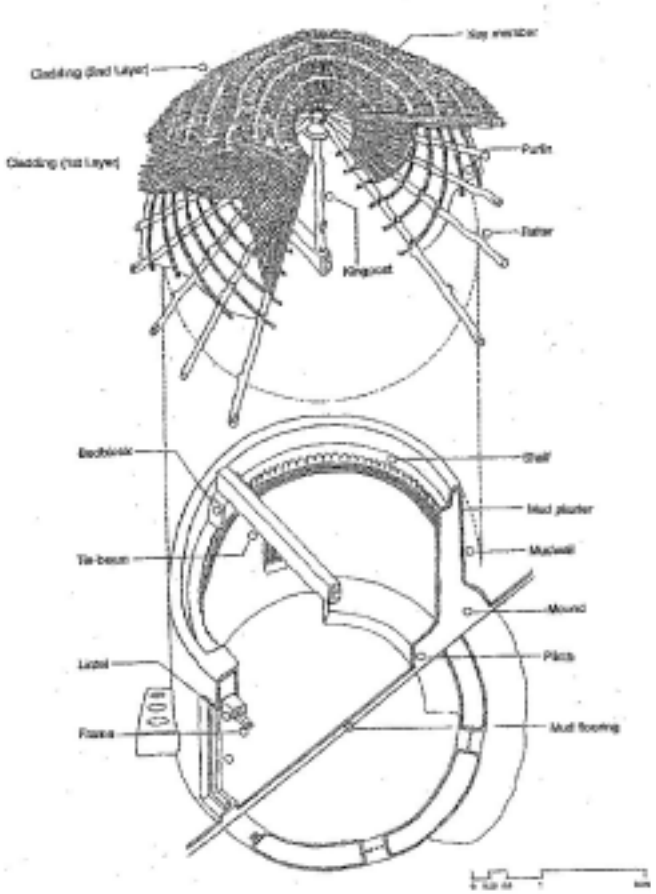

Fig. 8.7 Plan, section and axanometric view of a traditional Bhunga
Source: Vastushilpa foundation and Mc. Gill University, 2001

There are several variations in the building typologies in the area. Wattle and daub, lumps of clay (or in-situ) and mud block construction. All three variations produce strong monolithic walls, which insulate effectively from the desert heat. The principal characteristics of wattle and daub technique are that wood is used as reinforcing for the wall.

The top of a Bhunga is supporting a strong beam that holds up the conical shaped roof. While the edges of the roof rest on the wall, a log placed perpendicular to the beam holds it from falling.
Each of these houses is built according to a fixed measurement. The walls are six feet high with a foundation of one metre.

8.2.5 The traditional artisans and their building processes[7]

Stone Masons and Carpenters

As compared to my other case study areas, traditional building artisans are not so clearly identifiable as in other areas. This is primarily due to the fact that in rural areas of Kutch, people often make their own houses. Those who are better off, hire labour to do the job. However, there are some artisans who are more skilled in stone masonry. There are also some skilled carpenters, but very few of them are actually engaged in building practices, since wood is no longer affordable. They are mainly engaged in woodcarving and wooden block making (for hand block printing).

Mud wall Painting

Houses in the Banni area of Kutch are living museums of beautiful paintings. Rabari and Harijan (special caste groups) women are traditionally experts in depicting their dreams in painting.

The clay collected is mixed with camel dung and kept for a few days. Then it is kneaded to obtain sufficient plasticity and designs are worked on the mud wall using this clay mixture. Various motifs are depicted. To increase the aesthetic value, tiny mirrors are set in between the designs. After drying the wall is washed using white earth colour. Nowadays, walls of hotels and museums are decorated with these sorts of beautiful paintings.

Embroidery, Hand block-printing and Terracotta

The region is also very rich in other crafts such as embroidery. In fact, Kutch is famous for its variety of embroideries, which are traditionally practised by particular castes like Ahirs, Rabaris, Jats, and Lohana. Some of these have already become extinct such as *'Aari'*. Other varieties are called *Bavalia, Banni, Soof, and Mutva.* Artistic leatherwork is also a traditional craft of the Kutch district especially in the Banni area.

Hand block printing is another well-known craft of the region. Ajrakh, Batik and Bandhini prints (special kind of textile printing techniques) are well known internationally for their exclusive designs. Besides artistic cotton and wool weaving is another craft practised by Khatri Muslim community. Potters who are locally called 'prajapati' make roof tiles, terracotta pots and toys.

[7] Mainly adapted from P.J. Jethi, 'Kutch: people and their Handicrafts', 1999

8.2.6 The status of traditional knowledge for mitigating against earthquakes and other disasters

- The typical traditional dwellings of the Kutch region, the bhungas, have withstood the test of time for centuries and have withstood earthquakes thanks to their ingenious design and constructional qualities, that have been perfected over the ages.

  This is due to its circular form, which is very good in resisting lateral forces of earthquakes. Moreover, wattle and daub constructions especially where wood is used as reinforcement for the wall has proved to be very effective. Also, when they fall, they fall outwards, thus preventing the loss of life of those inside them.

  Bhungas are not only earthquake safe, they also demonstrate sensitive understanding of locally available resources, material and mastery of technique optimised to alleviate extreme climatic and physical conditions and design to accommodate for spatial requirements of traditional lifestyle.

Fig. 8.8 Traditional Bhungas with mud walls and thatched roof

- In many of the traditional structures in wood and masonry, built prior to 1950, floor joists extend through the rubble stonewalls to support the balconies. They are more successful at stabilizing the walls than where joists terminate in pockets.

Fig. 8.9 Traditional house with projecting floor joists supported by struts in timber located in Limbdi. These performed well during 2001 earthquake

- There are examples of excellent adobe constructions strengthened by locally available materials. These constructions though not earthquake safe, do not cause the loss of life as in random rubble masonry structures. Moreover, they can be re-usable in the event of an earthquake and thus prove to be economical in the long run.

- In many of the traditional structures, several earthquake safe features are to be found. These include knee-braces tied to wooden columns on stone base supporting the wooden beams and wooden trusses with tie beams at various levels. In some of the older constructions wedges and tongue and groove joints are also to be found.

- In Ahmedabad, many of the traditional buildings within the old walled city area had timber lacing in the walls, and exhibited other elements that have proven to be more resistant to earthquake damage than the stone construction found in Kutch. (Langenbach, 2001)

Fig. 8.10 & 8.11 Tie beams and knee bracing in traditional housing of Kutch are very effective in resisting lateral forces of earthquakes.

Fig. 8.12 Timber laced housing in Old Ahmedabad also performed remarkably well in 2001 earthquake

The local knowledge is manifested not only in physical fabric but also in the spirit of community and service, which is well known for Gujaratis in general and Kutchis (people from Kutch) in particular. Kutchis are known for their strong independence and resilience in the face of natural disasters. Strong ties exist within various sections of community. Moreover, Kutchis are known to do hard work. The extreme climatic and geographical conditions make them very tough. Such qualities help them to collectively cope with the disasters.

While all the above-mentioned qualities of traditional systems need to be recognised for their effectiveness in mitigating the impact of earthquake and also in coping with the aftermath, one must not romanticize about them.

These earthquake-safe 'building features' have not existed in all the buildings. Rather they have been limited to select buildings. And even if they have existed, they have not ensured safety of the buildings in past earthquakes. Also, to a great extent, their performance has depended on the magnitude of the

earthquake. Very high magnitude earthquakes will not even spare very strong buildings, which in any case, is an expensive proposition affordable by only a select few.

The process of destruction and evolution has been going on ever since civilisation came to inhabit this hazard prone region. This is illustrated by looking at the accounts of past earthquakes such as the one that hit the region in 1819.

One official account by captain J.Mc.Murdo written on 17th June 1819 from Anjar[8] describes the impact of this earthquake on the Anjar town,

> "The effects of the shock, which lasted nearly 2 minutes, have been the levelling of the fort wall to the ground. Not a hundred yards of the wall remain in any one spot, and guns, towers etc. are all hurled in one mass of ruin. The destruction in the town has been distressing and awful. Not one fourth of the houses are standing and those that do remain are all ruined. I cannot yet state the particulars of the losses, but I may in one word say that a flourishing population has been reduced in one moment to wretchedness and misery. I fear, we shall have to lament the loss of upwards of one hundred people besides those hurt. Reports from the country state similar disasters in all the villages round about, and letters from Bhuj inform us that the Fort is much in the same condition as Anjar. (p. 5)"

Another account from Colonel Milnes written on the same day describes the situation in Bhuj.

> "…The wall that surrounded Bhuj is almost levelled with the ground and the few towers which are left standing are merely broken remains; the houses generally unroofed; others in ruins, and most of the larger buildings including the Palace greatly injured. The wall of the Hill Fort down in many places and a complete breach near the gateway…I fear that a great many causalities have occurred there among the poor natives. Some hundreds are said to have lost their lives. There is at present so much confusion that the number cannot be ascertained. (p. 6)"

Needless to say that 1819 earthquake caused immense destruction and loss of life. Unfortunately we don't have any account of which buildings performed well and how communities and the erstwhile government recovered from this disaster. But, what we are sure of is that most of the communities did recover, on their own terms, and they recreated an architecturally rich physical fabric, employing local knowledge and skills. This is based on the fact that prior to the

[8] From Boards Collections, volume 620, Record Department, India Office Library. F/4/620. Bombay Public consultations, exams office Nov. 1820'. These documents are transcribed from hand written entries into the court proceedings archived in the India office library in London.

earthquake in 2001, the towns and villages had numerous components of built heritage, though in a degenerated form, the reasons for which are mentioned later.

Several earthquake safe features must have been introduced after the last earthquake like balconied houses and bhungas. However thanks to short-lived human memory, these features were slowly forgotten or neglected due to reasons mentioned in the next section.

One needs to recognise the fact that these small bits and pieces of knowledge do make a difference and it is the knowledge and recognition of these differences that may in the end be crucial for saving lives. At the same time, one needs to recognise their effectiveness in response to local conditions and importantly, in reinforcing cultural identity.

Besides, it is not only important how effectively built fabric survives the impact. Equally important is the local recovery process that can put the communities back on their 'normal' process of evolution and development. In this sense, we need to recognise the traditional systems for enabling local salvaging, recycling and reuse of resources such as wood, sand and stones. Besides they have scope for ingenious experimentation and re-creation with changes that seem to be the need of the hour.

Another important aspect of traditional systems is their associational value that has prevented these communities from moving away in spite of multiple hazards and extreme climatic conditions. This is reflected in the relocation attempt by the government in Anjar after 1956 earthquake, which destroyed significant portions of the old city area. This attempt to relocate, led to the construction of Naya (New) Anjar, nearby the old town. It was planned as an open settlement of small one-story houses on wide streets in contrast to a traditional Kutchi historic town with narrow streets and sub-urban planning. However this failed to attract most of the population of Anjar. Most moved back to the old city area, which was rebuilt without attention to the earthquake risk, only to be knocked down again.

In the following sub section, let us trace the status of vulnerability (both as a 'product' and a 'process') that existed prior to the earthquake of 2001 that had resulted in degeneration of building culture to an extent greater than ever before.

8.3 PRE-DISASTER VULNERABILITY

8.3.1 Physical vulnerability ('the product')

Let us first analyse the condition of heritage monuments such as palaces, pleasure retreats etc before the earthquake struck the region in January 2001. The maintenance and management of the heritage structures fared quite well until 1947, when the sovereignty of the kingdoms had to be surrendered to the union of newly independent India. However, more than fifty years after independence, most of these marvellous edifices were lying uncared for in varying degrees of decay and disrepair. (Sanghvi, 1999) In many structures, the binding power of lime had deteriorated due to age and made the rubble masonry walls weak enough to resist strong lateral forces of an earthquake.

Here, it also needs to be mentioned that many of these structures may have architectural value but they were structurally quite weak. Behind nice facades was poor rubble masonry in weak mud or lime mortar that had further deteriorated due to lack of maintenance over time.

Vernacular constructions existing in Kutch region were surprisingly most vulnerable. In fact, it seems that they were designed to fall down. The walls were constructed mostly of random stone rubble, laid up with mud mortar with little keying together at the corners and no through-wall bond courses. These walls sometimes extended over 15 feet in unbraced height. Floor joists were often laid into the walls in pockets only a few inches deep, so that collapse is inevitable with only the slightest of sway (Langenbach, 2001). All these weak

Fig. 8.13 Poor rubble masonry in vernacular constructions of Kutch prior to 2001 earthquake

construction practices coupled with lack of maintenance made these structures vulnerable.

Even Bhungas, which had the most earthquake safe construction, endured some changes, which made them weak and vulnerable. Some people had raised the height of the wall to nine feet from the standard six feet to accommodate a fan and these Bhungas developed cracks[9]. Also they were no longer affordable by many since the thatch for the roof had become expensive and people had to travel 25-30 km to fetch it[10].

8.3.2 Underlying causes ('the process')

Let us firstly analyse the reasons for lack of maintenance of big heritage monuments. The amount from privy purses, though negligible compared to pre-independence state revenues, allowed the royalty to somehow maintain their architectural inheritance. However with the abolition of these purses, the owners of these properties were left with no source of stable income to maintain them. The result was devastating. Sanghvi in his paper has cited an interesting example of a small princedom of Rangpar Bela with a radius of perhaps five kilometres. Under the Land Ceiling Act, the ruler was compelled to surrender much of the fertile stretch he controlled but he managed to retain the ancestral garhi or a mini darbargarh. All seemed well as long as his employment as a conductor with the state transport service lasted. After his retirement, the economic distress forced him to put his exquisitely carved stone and timber garhi up for auction. Two years ago, a kabadi (rag-picker) based in Ahmedabad paid him Rs. 500,000, razed the 19th century masterpiece to the ground and took away all the priceless, carved timber and stone jharokhas. Such an occurrence is not an isolated one. Increasingly, such instances are becoming common.

Today, the palaces occupied and maintained by ex-princes and their descendents have managed to preserve some semblance of their past glory. A few more have been converted into hotels to cater to the growing tourism potential. But most of the rest of them lie around vandalized and utterly neglected. Poor maintenance made these structures very weak prior to the earthquake. Ironically, many of the retreats and mini palaces in the outlying areas along with their exquisitely designed landscape and water works had to be knocked down and the land put to agricultural use to escape the estate duties levied on them. (Sanghvi, 1999).

Now let us discuss the underlying reasons for highly vulnerable status of vernacular housing in the region. One wonders at such a poor building tradition

[9] Based on an account by a local person in the article 'Banni's dwellers were secure in Bhungas as Bhuj crumbled', published in the Times of India, 21st February, 2001

[10] 'Recalling the quake from the epicentre', The Times of India, 28th February 2001.

especially since the region is well known to be an earthquake prone region and has already witnessed past earthquakes of very high magnitude, the latest one being in 1950, when the older part of Anjar was substantially destroyed. One needs to go back to historical time period and examine some buildings closely to look for the reasons for this.

During the course of fieldwork, I discovered that building tradition in the region had undergone a substantial change in the decades following independence (1950s onwards). Before that, there were substantial buildings, which were employing some earthquake-safe features, which have been explained in earlier sub section. I found out during the course of interviews with some people in the region, who had witnessed 1950 earthquake, that there was not so much loss of life at that time, mainly due to the fact that traditional building fabric was better than now. However, ironically, around the same time, people changed over to other building practices that were rather unsafe. There were several underlying reasons for this.

First, economy influenced owner's choice of materials and lowering of specifications. For example, wood was one of the primary building materials that made earlier buildings much more earthquake safe. However, wood had started to become unaffordable by common people. They started making alterations to their structures, which made them more vulnerable to earthquakes. For example, the walls were extended up to over 15 feet in unbraced height, simply to support the ridge of the roof to avoid the use of the wood necessary to build a roof truss. Also, the sophisticated joinery slowly got replaced with simple nailing of beams and columns, which could give way in the event of lateral forces of earthquakes.

Secondly, the overriding perceptions favoured the use of outside material like cement while overlooking the traditional use of mud, which was perceived as 'weak' and 'outdated'. Needless to say, some of the new specifications needed with the introduction of new materials and technology were not feasible owing to the local unavailability of resources e.g. appropriate curing of concrete was virtually impossible due to lack of water in the area and poor economy (the poor continued to make compromises in traditional construction techniques).

Moreover, with the introduction of new materials, the original strength of the traditional materials could not be used effectively to make the buildings stronger in withstanding earthquake forces. Certain materials such as brick, which were introduced later, were incompatible with traditional materials such as stone.

Also with change in materials and technology, traditional craftsmen suddenly found themselves incapable of using their skills e.g. local masons who were originally shaping stones were not trained to make brick or concrete walls. While on one hand they found themselves incapable of using new materials,

their own knowledge of stone masonry had degenerated to a considerable extent. One of the reasons for this degeneration was that many traditional artisans especially carpenter and masons, changed over to other professions.

Those who could afford to make better constructions used cement concrete. However, most of them did not keep up to the level of workmanship required for these modern building methods, primarily due to unavailability of labour skilled in these techniques.

Thus, this degeneration of traditional technology was partly due to negligence and partly due to general rural poverty, the reasons for which were pretty much the same as in the case of Marathwada. Ironically, both Marathwada and Kutch have the highest levels or rural and urban poverty in their respective states of Maharashtra and Gujarat.

Besides the above-mentioned reasons, there is another factor behind increasing vulnerability in this region, which is prone to other natural hazards such as cyclones and drought. The last decade has seen the region suffering from a continuous spell of drought besides a few cyclones. It was struck by a massive cyclone in 1998 and two consecutive years of drought in 1999 and 2000. This had further increased vulnerability of the people.

For example, the cyclone, which hit the region in 1998, killed 10,000 people. Many of them were unskilled labour migrants living in makeshift huts around the coastal areas, while others were working in salt refineries as salt farmers and in the ports that are located in the region.

The adverse impact of drought is substantiated by this account from village Loria. The villagers claim that for three years, there has been no produce from the fields since there has been no rain. “We do odd jobs like grinning cotton, masonry work and still have to pay our rentals for the tractors used in the fields”, Khanji laments[11].

The loss of traditional occupational base has led to economic marginalisation of certain sections of people. Gujarat is an economic powerhouse in India. However, its successful economy has come at the cost of having to accommodate a very large population of unskilled labour. This has involved a large immigration from the countryside into big and small towns and industrial areas. These people have migrated not only from within the region but also from all over northern India because their lives as landless labourers in villages were untenable (Wisner, 2001). These immigrants settle in hazard prone areas e.g. in Bhachao, many of the immigrants have settled in ‘illegal’ huts, encroachments and squatter settlements in the low lying areas on the outskirts of the town, which often get flooded during monsoons.

[11] ‘Recalling the quake from the epicentre’, The Times of India, 28th February 2001.

Also, there are social and cultural reasons due to which certain sections of the rural societies are more vulnerable than others. Social structures in the districts of the Kutch and Kathiawar region are typical of many regions in India, with the most vulnerable groups being the scheduled castes (SC)[12], other 'backward' castes, Muslims, scheduled tribes (ST), women and the landless. The land-owning Patels and related castes, the Jains (a religious minority) and other trader communities are generally regarded as being better off. Such a social segregation is also reflected in the settlement structure.

Importantly, the 'higher' castes also command strong political and economic power, while the 'backward' castes are marginalized, making them more vulnerable. Here it is interesting to note that most of the traditional skills are practised by these 'backward' castes.
Following is the table showing vulnerable population of Kutch and Kathiawar region based on their social and economic status and age group.[13] (Percentage of total population in each district)

District	**Socially & Economically Vulnerable**		**Vulnerable Age Group**	
	% SC	**%ST**	**Children (<15years)**	**Elderly (>60 years)**
Kutch	12%	7%	38%	7%
Surendranagar	11%	1%	38%	7%
Rajkot	7%	<1%	35%	7%
Jamnagar	8%	<1%	36%	7%
Junagadh	9%	<1%	36%	7%
Bhavnagar	6%	<1%	39%	7%
Amreli	9%	<1%	38%	7%

Source – TARU analysis, 2001; Census of India, 1991

Last but not the least, at the institutional and local governance level, the region, especially Kutch, appears to be weak in comparison to other parts of Gujarat state. Kutch does not have many of the producer (e.g. dairy) cooperatives for which Gujarat state is well known. Also sectored organisations and committees such as water users' associations, forest management committees and village education committees appear to be less developed than in many other states. In addition, the Panchayati Raj structure (grass root governance system in India) is currently missing its most important layer, the village level Gram Panchayats

[12] Traditional 'lower' castes are officially called 'Scheduled Castes' (SC).
[13] It is important to note here that while SC (Scheduled Castes) make 7 percent of Gujarat population compared to 15 percent of the ST (Scheduled Tribes). The situation in Kutch is in the reverse order with 12 percent of the population being made up by SC and 7 percent by ST. Children make up 36 percent of the population of the state, while the elderly make up 6 percent.

(traditional village committees). However, there are large numbers of community, religious or secular philanthropic organizations, and service or development oriented NGOs in the state. Some of these had joined to form the Kutch Navnirman Abhiyan (literally, the Kutch Reconstruction Consortium) prior to the 2001 earthquake to assist the drought-affected people of Kutch (ADB, 2001).

8.4 EARTHQUAKE ON 26TH JANUARY, 2001

8.4.1 Geological Aspects

It occurred less than 400 km from the junction of the Owens fracture zone, Makran subduction zone, the westernmost HFFS, and the Chaman fault, which forms the plate boundary. The epicentre of the quake was located on the north side of the Bhachau; anticline within the alluvial deposits[14]. The ground ruptures were over 16 km long and 0.5 km wide, trended east-northeast and were associated with extensive sand boils. Extensive ground failures in the area were also related to liquefaction and lateral spreading. *(Refer map of the region showing quake epicentre)*

8.4.2 Physical impact

The earthquake had profound effect on structures of all types, from ancient to modern, from traditional masonry to contemporary reinforced concrete. However, the majority of the collapsed structures in towns and villages were non-engineered structures in random rubble masonry, burnt brick masonry, block masonry. The collapse was caused mainly by the factors mentioned in previous section that had already made these structures highly vulnerable before earthquake hit them. The walls of those old buildings literally crumbled when shaken by the earthquake. In most cases, the 'old' section of the towns of Morbi, Limbdi, Rajkot, Anjar, Bhuj and Bhachau were practically destroyed.

The more recent buildings in the same area constructed with the same materials but using sand and Portland cement mortar survived with considerably less damage. Some new buildings in reinforced concrete failed because of other deficiencies, such as poor construction practice, violating one of the basics in

[14] The earthquake appeared to have occurred at depth beneath the eastern Kutch mainland fault. A series of anticlines occurs along the mainland fault for over 220 km. This fold belt may have uplifted Quaternary fluvial terraces on its north flank and formed anticline structures and domes in Quaternary sediments that underlie the salt flats in the eastern Little Rann near 23deg.17min. North and 71degree 14minutes East. (EERI, 2001)

earthquake resistant design principles and in some cases due to poor sand and cement ratio. (Langenbach, 2001, Boen, 2001)

What was most striking about this earthquake were the scenes of complete destruction in certain areas – one could turn 360 degrees and see nothing

Fig. 8.14 Poor modern construction fell like pack of cards
Feb. 2001

standing. In many cases, even the salvage of personal belongings was not possible, as the mountain of heavy stone and concrete rubble covered everything. In Anjar, 400 school children who had gathered to march in the Republic Day parade were killed as the walls of the buildings on either side of the street fell outward on them. Escape from the narrow street was impossible.

Besides damage to vernacular housing, the damage to other heritage components such as palaces (darbargarhs), temples, mosques, and cenotaphs was both severe and widespread. These crumbled mainly due to lack of maintenance.

This was the first urban disaster caused by an earthquake in India. As such, it hit the cities of Ahmedabad, Bhuj and Gandhidham and severely affected multistoried reinforced concrete structures, many of which had been constructed in the last five years. Many of them fell like packs of cards killing hundreds of people. This was mainly due to faulty construction practices and improper seismic detailing. One of the main reasons for collapse was the presence of a soft story at the ground floor level for parking, shops etc. A detailed discussion of various causes for the collapse and heavy damage to

these structures is beyond the scope of this case study, which is essentially focussing on rural structures[15].

Fig. 8.15 The earthquake caused severe damage to various heritage components such as historic wall of Bhuj Feb. 2001

However, a striking thing to note here is that in Ahmedabad, the loss of life was much higher in these structures than in the old part of the town. Only one building was reported to have collapsed in the old city of Ahmedabad, and the damage there was far less (although the shaking of the earthquake was significantly less than in Kutch, but nonetheless strong enough to collapse a number of reinforced concrete high rise apartment buildings of recent construction, with high rate of causalities (Langenbach, 2001).

Besides the timber laced structures in Ahmedabad, some other traditional structures also performed well in this earthquake.

One of the traditional building types, which effectively withstood this earthquake, was 'Bhungas' mainly found in the Banni region of Kutch. According to the locals, "These houses did sway and we could feel the floor getting torn out of the earth. But not a single Bhunga fell in Banni". The earthquake safe features of this type of construction have been mentioned in the earlier section on 'traditional systems'. However Bhungas with incompatible additions e.g. raised walls, developed cracks.

[15] For a detailed discussion refer, Mistry, Shah, Dong editors, 'Interdisciplinary observations on the January 2001 Bhuj, Gujarat Earthquake', World Seismic Safety Initiative and Earthquakes and Mega cities initiative. The author was part of this interdisciplinary team, which visited the region in February-March 2001.

Another type of traditional constructions that fared pretty well was a wooden balconied house in smaller towns such as Anjar, built prior to 1950. Some of these houses were strikingly standing in the midst of rubble everywhere else. While moving around the main bazaar of old Anjar and looking at the collapsed buildings, I met a middle-aged man, who wanted to show his house, which he proudly proclaimed to be one of the two standing houses in the area.

Fig. 8.16 Surviving balconied house in wood and masonry in Anjar after 2001 earthquake *Feb. 2001*

This was a two-storied balconied house in wood and masonry. His grandmother had told him not to tear down this house at a time when everyone was changing over to 'modern' techniques[16].

8.4.3 Social and Psychological Impact

This earthquake had a profound effect on the social fabric of the region. In addition to the immediate suffering caused, an equally large number of families had been torn by the death or serious disability of a member. This would have long-term consequences on the well being of other members, particularly widows (especially young women), single parent children, orphans, and the elderly.

[16]Based on an Interview with a local dweller in Anjar during reconnaissance visit to the region as part of interdisciplinary team in February 2001.

Another aspect of this disaster was that it affected everyone irrespective of social status that is traditionally defined by caste system. However, there were many instances where certain marginalized communities or groups who were already vulnerable, got further affected by this earthquake.

Take the case of Navlakhi, a village that was developed specifically for salt extraction and port-related activities, and all the people worked in these areas. The port authorities had been planning to expand their area of activity and thus needed more land. To this end, they needed these people to move out and had offered them incentives in cash (Rs.20, 000 which equals nearly US$ 425 each household) and kind. However, these people had been living here for at least two generations and didn't want to move out. To discourage them from staying, the port authorities disconnected their electricity and water supplies three years ago. So they even had to buy water, which was supplied from outside. There was no school or any public facility; the nearest health centre was 17 kilometres away. Besides this, they had been discharged from their traditional occupations in port operations and salt-extraction. They were relying solely on fishing for their livelihood. This community had been repeatedly hit by cyclones and now this earthquake just added to their troubles. Most of the housing was already very poor in materials and construction. Since this area was geographically and politically isolated, there was no help forthcoming for relief[17].

As a consequence of such a severe destruction, the psychological injuries of affected people were as strong as physical injuries. Fear trauma was one of the major problems to deal with. Many people especially children suffered nervous disorders and acute phobia of staying indoors for fear of another earthquake.

8.4.4 Economic Impact

Besides the physical damage, the quake had adverse impact on the local economy of the region. The livelihoods of many families were disrupted, particularly among those resident in the worst affected towns and villages. The loss of lives, and loss of or damage to homes and workplaces, productive assets and/or industrial units caused more severe disruption. However, the temporary disruption occurred in the wake of the shock and fear caused by the earthquake, and of disruptions in financial services, markets and distribution channels.

More than 10,000 small and medium industrial units went out of production. 50,000 artisans lost their trade and income sources. Among these nearly 19,000 handicraft artisans of Kutch appear to be the most severely affected group. Other artisans like weavers were also affected. In addition, several thousand salt farmers faced collapses of their brine wells and destruction of salt fields

[17] These observations were made by me as part of the interdisciplinary team to make observations on various aspects of the earthquake, February-March, 2001.

containing the salt of up to two years labour. Many salt refineries were also damaged, which hampered the export of salt from the region. (ADB, 2001)

Another important source of livelihood in Kutch is cattle- about 20,000 cattle deaths were reported. Economic recovery was further hampered by the outflow of people, including normally migrant workers, such as labourers on the salt farms in affected areas. (Ibid) The earthquake also caused extensive damage to public infrastructure including telecommunication, power, water supply, health, roads and railway links and civil administration. The direct and indirect loss of all this was estimated to be about 3.2 billion US $, which added to 15 percent loss in GDP (Gross domestic product)[18].

8.5 THE EXTERNAL RESPONSE: RELIEF AND RESCUE

8.5.1 External response – Government, NGOs and other organisations

The State Government Response

The government of Gujarat undertook large-scale mobilization of manpower, necessary equipment and earthquake machineries for initial search and rescue operations[19]. The State Government also managed to mobilize a big task force of 763 specialist doctors, 1834 medical officers and 2500 para-medical staff. Almost 166,000 injured persons were treated in the various medical camps organized by the State Government. A provision of free kitchen was also made. Rapid mobilization on the part of the Government gave large numbers of people access to food grain and some cash. The state Government also distributed relief materials like blankets, tents and other immediate shelter materials. The government also made a serious effort to start schools, often with the help of NGOs and in tents. (Gujarat government, 2001)

The Central Government Response

The Government of India in its immediate response to the disaster sent a team led by an additional central relief commissioner comprising 22 doctors along with life saving drugs, satellite phones, IMD equipments etc. to make an on spot appraisal of the situation. The prime minister of India announced an ad-hoc grant of Rs. 500 crore (approx. 100 million US $) and Rs. 330 crore

[18] The loss under the five categories have been put up as US $2100 million for housing, $300 million for social services, $100 million for public property, $550 million for livelihood, $150 million for infrastructure, adding to a whopping US $3,200 million (ADB, 2001).
[19] The relief operations involved 1152 cranes, 543 bulldozers, 2853 dumpers/trucks, 901 gas cutters, 2104 technical persons, 6213 non-technical persons and 13353 labourers (Govt. of Gujarat).

(approx. 70 million US$) subsequently from National Relief Fund. The government also deployed 23,500 army troops and 3000 paramilitary forces along with 48 aircraft and 3 ships. In order to restore communication with the disaster struck area, satellite phones, HAM radio and mobile phones were pressed into service. The telecom and railway services were restored by first week of February.

International Governments, International /national Voluntary Organisations, NGOs and corporates

Voluntary organizations arrived within hours of the earthquake to assist in the search of live victims. These voluntary organisations worked along with the Indian Army to search for any signs of life from the piles of rubble. A large number of non-governmental organisations including philanthropic groups, development agencies and private businesses, stepped in to provide food, medical services, clothes, blankets, utensils, basic supplies and tents. Very soon, international relief started pouring in from practically every corner of the world. All kinds of materials were donated for the victims.

Some organisations like Self-Employed Women's Association (SEWA) and Disaster Management Institute (DMI), which were engaged in relief operations in the quake-ravaged Kutch, worked out long-term programme. SEWA chalked out a livelihood security programme for over 15,000 artisan families in Kutch and Patan. SEWA is helping artisans earn their livelihood, through traditional crafts.

Corporate India offered their expertise of management and project implementation to expedite relief work in the quake affected Gujarat. While a large number of industry captains continued to donate to relief funds, many of them directly carried out relief operations in the affected areas.

Pepsi sent trucks of mineral water, food materials, tarpaulins and tents in the Kutch region. Confederation of Indian Industries (CII) and member bodies dispatched over a hundred civil engineers to assess quake-affected buildings. Larsen&Tubro and Hindustan construction also sent engineers to Gujarat. Trichy unit of Bharat (India) Heavy Electrical Limited (BHEL) flew in concrete cutting machines to Gujarat for rescuing people trapped under rubble. Hindustan Motors sent earth-moving excavators. Tatas joined the relief efforts at the village level to rehabilitate people[20].

[20] The information is based on various media reports collected by me

8.5.2 The issues confronting relief management

Several issues came into limelight in the relief and rescue operations conducted in the region after the earthquake. Many stories confirming these issues were brought into focus through print media in the initial months following the earthquake.[21] It is unclear how true or widespread stories like these are, however undoubtedly people perceived unfairness and this perception was most likely to intensify in the reconstruction period when larger resources are at stake.

Four days after a killer earthquake destroyed dozens of villages no help, not even food, has reached some of the affected villages. Moreover, despite a spontaneous outpouring of sympathy and readiness to help, coordination skill was sadly lacking. Even as people were running out of supplies, cartons of cooked food were lying at the airport with no one to distribute. Due to poor and skewed distribution, food, tents and blankets were not reaching the people who needed them the most.

Another significant issue was unpreparedness of the government to mobilise relief. In fact, the strong network of big and small non-government organisations reacted far better than official machinery, reaching the remote areas early and making contact.

An interesting issue was inappropriateness of relief material, especially food which in many cases was alien to the natives taste buds, the result being that for quite some days after the quake, the survivors were being 'force-fed' the most they could ever have imagined (The Hindustan Times, 9-02-01).

There were also complaints of social discrimination in the way relief was distributed. In many cases, even 'non-resident Indian' relief was distributed strictly on the basis of local social structure. So obviously there were many who were left out.

The above stated issues may not be strikingly new, especially after a disaster of such an enormous proportions. There have been several incidences in the past when similar mismanagement has been seen. However, all of them essentially bring forward a nearly total absence of pro-active measures for meeting the threats of natural disasters.

[21] I collected articles confirming these issues from various sources. Some of these are; "Chaos surround relief and rescue work" (Times of India, 30-01-01), "Unprepared government undermines relief mobilisation (Ibid, 4-02-01), "Red tape, poor distribution hit relief operation"(Indian Express, 5-02-01), "No bread? Let the quake-hit eat cake" (The Hindustan Times, 9-02-01), "Food is plenty, but hungry still going without it" (The Times of India, 14-02-01)

8.6 THE COMMUNITY RESPONSE AND ITS COPING MECHANISMS

While the outside response suffered from mismanagement, the response of local communities demonstrated some unique characteristics.

8.6.1 Social Response:

Community resources, outsiders and authorities, were serving the affected people but the word 'stoic' appeared to be most appropriate to describe their attitude towards this disaster and the future. In the immediate aftermath of the earthquake even before external help could arrive, friends and neighbours came to help each other in immediate relief and rescue, even though each of them had lost family members and friends. For the initial few months, they were the best supporters and helpers. Many of the neighbours also helped in cremating the dead, often directly outside the homes that had killed them. One man in Bhuj, searching through the rubble for retrievable objects from his home, found photographs of his family including his wife who had died in the earthquake. While members of the team stood with tears in their eyes, he said that no one has time to cry over their loved ones who are lost. They are supported by their faith in God, through which they have gained internal strength to fight against these tragic circumstances and reassemble their disrupted lives[22]. This incident brought me face to face with the harsh reality in the aftermath of such a disaster and also to the experience of the local coping mechanisms that have developed out of strong community and religious structures that characterise the local community in particular. Some interesting facets emerged from the community response after this disaster, which reflected their psychological needs rather than mere physical ones. As an example, many of the victims identified the rebuilding of temples as an urgent need to provide solace and support within families and communities[23].

Another example of self-esteem of local communities was the refusal of many of them to beg. "It is okay if some one gives on his or her own, but we will never beg". These were the words of a victim from once prosperous colony near Bhuj[24]. This demonstrated an expression of community solidarity and mutual support in a time of need, and was an indication of the will and ability of the communities to organize and get on with their lives using their own

[22] Based on interviews conducted by me and other members of inter-disciplinary team in February-March, 2001. Refer Interdisciplinary observations on the earthquake, April 2001, sponsored by World Seismic Safety Initiative and Earthquakes and Mega cities initiative.
[23] Based on interviews conducted by me and other members of inter-disciplinary team in March, 2001. Refer Interdisciplinary observations on the earthquake, April 2001, sponsored by World Seismic Safety Initiative and Earthquakes and Mega cities initiative.
[24] 'How can those hands which only used to give can rise to beg?' reported in the Bhaskar, a local daily newspaper on 11th February 2001.

resources rather than depend on outside charity. Another instance of this quality was evident by the fact that the Kutchi community refused to put orphaned children up for adoption. (ADB, 2001).

The independence and resilience of local communities was very much visible from the fact that within two and a half weeks of the earthquake, a number of communities had established their own temporary shelters in family or village groupings, and were beginning to resume economic activity. This could be seen even in the worst affected villages.

Social discrimination

However everything was not positive in the way communities responded socially. The caste segregation within communities led to social discrimination, in the way certain sections of the community responded. In one village, Lodia, Harijans and members of the minority community complained that they did not get their share of relief from the Ahir community, which dominates the village. Harijans and Muslims from nearby villages also complained about similar problems[25].

In Bhachao taluka's two villages, Vondh and Chobari, the landless were placed in vulnerable areas. In Vondh, they were living in the open plot of land belonging to an Ahir landowner, as no government land is available. The landowner also wanted the landless to vacate. In Chobari, they were shifted to a village pond area, which was prone to water logging during monsoon. Upper caste people, on the other hand, temporarily shifted to the agricultural land they owned[26].

8.6.2 Psychological response

However, one of the significant factors determining community response and behaviour was people attributing the events of life to divine rather than personal actions. Some interesting incidents reveal this aspect, which also determined the way the community responded towards recovery afterwards. The following was reported in a leading Indian newspaper[27]; -

> "In Teendarwaza, people took out their television sets and set them ablaze on the road to prevent recurrence of earthquakes. Around 24 sets had already been destroyed. Two Moulvis (Muslim priests) of the area had asked the people to destroy their TV sets which are spreading

[25] 'Relief discrimination irks Lodia villagers', Indian Express, 8th February, 2001
[26] 'Relocation dilemma continues to flummox state government', The Times of India, 9-03-01
[27] Adapted from an article titled "In Gujarat, they burn TV, the 'epicentre of evil'. Superstition follows the earthquake, Muslims told to destroy the 'devil's toys'", published in the Indian express

> 'obscenity and immorality' in the society and thus attracting God's wrath."

Scared and shaken, the traumatised people of the earthquake-hit areas were taking refuge in religion for solace. Temples and mosques have hardly seen so many visitors before but the fear of recurrence of the quake had turned the population very religious. First a wave of fear had gripped the entire area after an astrologer had made a forecast that another quake was to strike on February 3. And people abandoned even those houses, which had not even developed cracks in the earlier quake in fear.

8.6.3 Economic (livelihood) Response:

At a time when the 'formal' sources of livelihood were so severely affected in many areas and many households had lost their primary income source or earner, the local community discovered 'informal' ways and means to earn their livelihood. Most of these were linked to the ongoing rescue and relief operations. For example, many men were employed in demolishing structures and many women were removing rubble.

Many livelihood sources were linked to the socio-cultural needs of the people. Some of them in fact resumed their livelihood instead of queuing up for relief. This is revealed by an interesting account of barbers as reported in a newspaper article[28].

> Since their shops are now rubble, intrepid barbers have propped up chairs by the roadside…In Sukhapar, seven kilometres away from Bhuj town on the road leading to Nakhatrana, people are queuing up for mundan. Khalifa, in fact, has set up his makeshift shop just outside his one-time home, now a pile of concrete debris.
>
> …Another group of four barbers has set up shop beneath a polythene tent. "We are not asking for anything. Anybody who has any rokhda (money) pays. It's not we who demand, says Praveen Hareji. There's a shortage of shaving blades in town, he complains. "There are so many people still left for mundan that we need boxes of blades. If the government could arrange for shaving blades and shaving cream with the relief, we won't charge anything at all".

[28] "Barbers in Bhuj help survivors make a clean break with the past" The Indian Express, 5th February, 2001

8.7 THE REHABILITATION PROCESS

8.7.1 The Government Packages[29]

The government was eager to bring some concrete plans before the people, before it got criticism for its lack of response. Of course this was linked to refurbishing its political image, which had invited great criticism for the manner in which the government responded in the immediate aftermath. As mentioned before, the private initiatives had played a much greater and more significant role in rescue and relief operations. They had also managed to attract huge resources for the proposed rehabilitation process. Accordingly, government considered encouraging them to participate in the rehabilitation process, right from the outset.

As early as on 14th February, the government embarked on a large-scale rehabilitation programme designed in less than a month after the earthquake struck the area. The government introduced four main packages. The following are the main contents of three of these packages: -

Package I – Relocation of villages (public-private partnership programme) for the most affected villages

This package is for restoration and re-settlement of severely destroyed villages. It suggests relocation of villages where more than 70% of the houses collapsed. The Government identified 256 such villages, 172 of which were in the Kutch district.
The State Government would arrange for land if the Gram Sabha (local village committee) of each such village decides by majority and makes a formal demand.

12 hectares was assessed as the land requirement for a village of 200 households. Wherever a village is relocated, the old land will have to be surrendered to the Government. An important clause of this package is that wherever a village is relocated, all infrastructures would be made available at the new site only. The selection of village site is to be made with the involvement of local village committee (Gram samiti) of the concerned village and the NGO or agency involved. If some people do not wish to move, they will not be entitled to any Government assistance for construction at the old site.

The plot area and built up area of the new village will be divided in four sections as the following: -

[29] Adapted from http://www.gsdma.org/rehabilitaionPack.htm, the official web site of Gujarat State Disaster Management Authority.

Table 8.4 Criteria for house allocation

	Plot Area	Built-up Area
Landless farm labourers	100 sq. mtr	30 sq. mtr
Marginal farmers owning upto 1 hectare land	150 sq. mtr	40 sq. mtr
Small farmers, small businessmen, workers and others owning between 1 hectare and 4 hectares land	250 sq. mtr	40 sq. mtr
Farmers owning more than 4 hectare land	400 sq. mtr	50 sq. mtr

Source: GSDMA 2001

In case of points 3 and 4 above, 10% of the cost of the house will be considered as an interest free loan. After a moratorium of two years, the amount will need to be paid in equal instalments over a period of 10 years (including moratorium).

For rehabilitation and resettlement, voluntary organizations, industrial houses and public sector undertakings can adopt villages or contribute towards rehabilitation of villages. The State Government will contribute 50% of total cost. In case any organization wishes to fully adopt the village, it can do so in consultation with the Government and adhering to prevalent laws and bylaws.

In case any organization does not feel motivated to contribute or adopt, the State Government will undertake complete rehabilitation. All the houses will be insured at the rehabilitated place.

The Roads and Buildings department of the state will provide the new village layout, design, technical specifications, construction material details etc. For building private or public houses, construction bylaws and town planning rules will have to be strictly followed. Accordingly the new houses should be constructed with such a technique that can withstand the onslaught of the natural calamities and should have modern amenities. Earthquake resistant infrastructure facilities will be provided in the new village.

The package advocates active participation of the affected families in the whole process of rehabilitation.

Package No. 2 – Towards assistance in the Zone 4 & 5[30] and severely affected area for in situ reconstruction

This assistance is for those areas, which are severely affected by quake but where less than 70% houses have collapsed, and the owners want to construct

[30] These zones are decided on the basis of the degree of damage and the distance from epicentre of the earthquake.

houses at the original place. Here the villagers can avail the state Government's financial assistance or that provided by voluntary organisations, industrial houses, public undertakings and other state and International organizations. Completely destroyed houses and those which are affected and are to be reconstructed can take advantage of this scheme.

Accordingly, the financial assistance for totally collapsed houses is allocated according to the financial status (decided on the basis of people living below or above poverty line) and the existing built up area of houses. The scale of assistance for partially damaged houses is decided on the basis of degree of damage.

This assistance is made available to owner or actual possessor of the property. In case where the dwelling unit occupied by a tenant has collapsed or has been pulled down for safety reasons, the landlord of the house is given assistance subject to the condition of putting the tenant back in possession soon after the reconstruction of the house. In case of repair, assistance is to be disbursed to the tenant for carrying out the repair.

Package-3 – Towards Assistance in the areas other than zone 4& 5 for repairs and in-situ reconstruction

This package is for those areas which were quite away from the epicentre and where the impact of damage was less. Notably, here a distinction is made between a hut and a house, as temporary and permanent shelter respectively. However it is not defined. Here the scale of assistance will be mainly decided on the basis of these house types and the degree of damage.

The last package (no. 4) is meant for modern reinforced concrete frame structured buildings in urban areas like Ahmedabad, Bhuj, and Gandhidham. However, a detailed discussion on this is outside the scope of this thesis.

Mode of survey of damage and assistance

A team comprised of a Government Engineer, one officer from Revenue Department or Panchayat (village level body), a voluntary representative or in his absence a school principal, is supposed to assess damage. They will also take photographs clearly depicting the damage. This team will fill the assessment and application form for the beneficiary. The beneficiary will have to give a signed undertaking that in case any information furnished by him is false, he shall be liable to return the entire assistance.
The assessment form having clear opinion of the assessing team about the extent of damage and assistance amount will be given to the Collector/Additional Collector, who will scrutinize and make payment.

The assistance will be disbursed at different stages of construction in three instalments, 40% of the assistance will be disbursed at preparatory level, 40% at the stage of lintel level of the construction and 20% after the completion of the construction. The last payment will be made on production of completion certificate.

8.7.2 Developments (February to June)

This is an interesting sequence of decisions regarding rehabilitation of the earthquake affected.

On 8th February 2001, Government of Gujarat constituted Gujarat State Disaster Management Authority under the chairmanship of Chief Minister of Gujarat, as a permanent arrangement to handle the natural calamities. This was supposed to be the nodal agency to provide relief and coordinate the rehabilitation process and its 'spacious' office was located in Gandhinagar, the capital of Gujarat state.

On February 14th, the government introduced the rehabilitation package (elaborated in previous section). As mentioned before, the private initiatives in relief and rehabilitation have been encouraged for the first time to attract huge resources that are needed to undertake rehabilitation on such a large scale. The villages were supposed to be 'adopted' by big corporations and other NGOs and relocation was encouraged for all the villages with 70% destruction and more[31]. According to the Government, this would save the mammoth task of clearing the rubble. The Government also promised to construct 800,000 'permanent one-room houses' as early as June 30.

Experienced and enlightened people warned the government against repeating the mistakes of Latur and other rehabilitation work where relocation was promoted, which has failed to produce desired result in long run[32]. However the government continued to stick to its stand of relocation.

[31] Refer package one in the previous section. The Government also came up with lot of publicity material in the media, highlighting its resolve towards relocation. One such advertisement appeared in the Indian Express, a national newspaper on 19th February 2001. Package One was titled as 'Complete Village Shifting' to focus on this strategy.

[32] Some prominent activists have written to Chief Minister Keshubhai Patel to keep in mind certain basic principles of reconstruction and rehabilitation before handing over villages in Kutch to corporations and other organisations. Their main concerns are that the mistakes of Marathwada should not be repeated here.

…. In Marathwada, for instance, concrete boxes were built, completely useless to the people of the region and their lifestyle.

The signatories insist rehabilitation mean rebuilding entire villages and residents should be made part of the process, as their lives will be affected. "Already we are creating a community of dependants with the sort of relief mechanism we have. Instead, we should try and create self-reliant villages." **(***'Rebuild the right way, insist activists', The times of India, 14-02-01)*

Nearly a month later, the government went back on its promise to make permanent shelters by June 15th, realising the difficulty in actual execution[33]. Thereafter, the Government started to explicitly talk about providing temporary shelters in the same time. They promised that the temporary accommodation, to last through the monsoon would be "provided to the affected families by recycling usable materials from the debris of the collapsed houses and new construction materials with the participation of the people". Such structures were later defined as 'semi-permanent'. This concept was promoted by some NGOs who wanted to provide the victims with an intermediate shelter, till their permanent shelter could be finished. So in a way, there was total confusion regarding provision of shelters. Very interestingly, the deadline for permanent shelters was extended by one and a half years.

Another logic for relocation was then cited. It was stated the Government was thinking of integrating both the interim and permanent structures, which could only be achieved if the villages are relocated. According to one official in Gandhinagar (the capital of Gujarat state), "We have based our calculations on the presumption that most of the one-room temporary structures would use pre-fabricated material which would be used in the permanent two-room structures to be built at the same spot". If the temporary structures were to be made ready by June 30 at a relocated place and the permanent structures at the original site of the village, it would not only increase the cost and logistics but also the time taken. The Government wanted to show visible results in the shortest possible time, which was not possible without relocation. In the meanwhile, a number of voluntary organisations came forward to adopt the villages to be relocated[34]. This further encouraged the government to press for their relocation policy.

Meanwhile, I heard the news that 90% villagers have already rejected the relocation plans of the government[35]. There were several practical reasons for this. First, there was no government policy about legal rights of owners of destroyed houses and this created problems and even made many who earlier agreed to relocate to reverse their views. Other than the issue of land rights, the main reason for people refusing to shift was economic. For instance,

…There are two challenges. One, we need to get priorities right, that is, first focus on work and livelihood. Second, focus on water and community infrastructure. And third, focus on shelter and services.

…. Marathwada model can only be a starting point for Gujarat. Gujarat model must be far more progressive on social front, cost effective on economic front, and safer on physical construction front. Let us not mix up a baseline with end line. Relocation is a difficult area. Marathwada has much to teach. *(Mihir Bhatt, 'Orphans can be adopted, not villages', The Times of India, 14-02-01)*

[33] *'Houses for quake-hit by June may not be feasible, says Government', The Times of India, 28-02-01*

[34] *'Voluntary Organisations to adopt 24 villages', The Times of India, 21-02-01*

[35] *"90% Kutch Villagers reject relocation, upset rehabilitation plans", The Times of India, 28-02-01*

goldsmiths have been traditionally living above the shop they owned[36]. Besides, the cultural association of people to their land also played a role in this.

Even by the end of March, the rehabilitation process was yet to pick up[37]. The promised 800 million-dollar credit from the World Bank and Asian Development bank was still being awaited. Rehabilitation was also stuck as the Gujarat government was finding it tough to finalise a relocation policy. The Government still insisted on complete relocation of the four worst hit areas in Kutch district. There continued to be opposition from the local communities against relocation. Except in Anjar, the suggestion was met with stiff resistance from the people, who refused to be uprooted. Meanwhile NGO reports from Kutch suggested that the affected populace was still living in tents, many under plastic sheets. Debris was yet to be cleared from many affected areas. Sixty days after the earthquake shook, Gujarat was still unstable.

Finally, the government decided not to press for relocation and advocated 'owner-driven' reconstruction as its primary approach in contrast to the 'contractor-driven' approach that was followed in Marathwada. It agreed to provide financial assistance to all those who did not want relocation and full scale 'adoption'. Such beneficiaries were supposed to undertake reconstruction on their own.

It is very interesting to note how things started to emerge during this period. A large number of corporations and NGOs started visiting these villages and started promising different kinds of packages, which promised 'ready-made' villages with all the facilities (similar to Marathwada). The villagers listened to everyone. However, they became confused with the number of promises being made by the number of donor agencies. The villagers were left with two options – either to choose financial compensation offered by the government, or to let these donor agencies undertake full-fledged adoption and reconstruction. Finally, the majority of the people decided to go for financial compensation and expressed their desire to undertake construction on their own.

By the middle of April, we find first signs of dissatisfaction with the new shelters that have been constructed as part of rehabilitation[38]. Built by the Mayur Foundation, 108 houses were meant to house the village population of 573. Most of the villagers were awe-struck by the pomp and show put up by the foundation to give away the houses…About the houses without any flooring, some villagers said the foundation could have used the money spent for the minister's welcome for the flooring, which would have helped them in

[36] *'Relocation dilemma continuous to flummox state government', The Times of India, 9-03-02*
[37] *'Despite timely aid, rehabilitation slow in Gujarat', The times of India, 27-03-01*
[38] *'Quake Victims scoff at new shelters', The Times of India, 18-04-01*

the monsoon season. Several other villagers were of the opinion that it was not possible to stay in just one room. "We have a large family and all we have is this one room" said Shantaben

In the first week of June, the Indian Prime Minister paid a two-day visit to the earthquake-devastated areas to see for himself, the progress made in reconstruction[39]. Rebuilding work had started but an estimated 600,000 people were still living in tents. Many people there felt confused about the kind of help they could get and many showed frustration that rebuilding work was taking so long. Villagers were also confused about how to rebuild.
. "What's the point of getting angry?" asks Hansa. "We are helpless. The government says one thing one day, another thing the next. The people accused the government of failing to keep its promises of help.[40]

In many areas, clearance and rebuilding work started just a few weeks before the Prime Ministers visit. Many International and Indian non-government groups were supplying building materials free of charge and trying to persuade villagers to rebuild using safer, earthquake-proof designs. In many communities, there was an interim step of constructing semi-permanent shelters (which were more substantial than tents and could give some protection from monsoon rains). However several hundred thousand people were under the threat of approaching monsoon without proper shelter.

8.8 ASSESSMENT OF THE STATUS AFTER NINE MONTHS[41]

I made the following observations, when I visited the area nine months after the quake hit the region.

8.8.1 Situation in affected areas

Rubble had been cleared in main town areas and in some villages. In Bhachao, the core area seemed like a big open field. Likewise, in Bhuj and Anjar, one could also find such open voids in the built fabric. However, a lot of rubble remained, especially in villages.

The initial fear for the quake had subsided by then and most the villagers had moved back to their old locations. People had returned to their damaged shops and houses (in many cases!) trying to get back to life. In Bhuj, Anjar, Bhachao, Shopping streets had come back to life.

[39] *'Vajpayee to review Gujarat progress' BBC world news, 3-06-01*
[40] *'Gujarat: rebuilding shattered lives', BBC world news, 3-06-01*
[41] Based on the field work implemented by me in September-October, 2001.

Fig. 8.17 The core city area of Bhachao is open ground after complete rubble clearance Sep. 2001

In the old town (gamtal area), there was still ban on new constructions or repairs but people had initiated constructions on their own (in most cases, they were found to be not safer than before).

Fig. 8.18 Poor self help constructions in Bhachao using variety of materials. Sep. 2001

8.8.2 Semi-permanent to permanent

The majority of the people were living in temporary or semi-permanent shelters, right adjacent to their damaged houses (in most cases, on their own plots). The psychological stress was still evident even in those whose permanent houses were not so damaged. People were using them as storage while staying in the temporary / semi-permanent shelters.

Temporary Shelters – Formal and informal

Various kinds of temporary shelters were observed. These shelters were made of various materials and techniques. Some of them were formally provided by various organisations, while local people ingeniously developed others. Those provided from other organisations included tents made of plastic sheets and canvas, nailed wooden planks, bamboo and mats *(chatai),* tin or asbestos sheets nailed on wooden or metal frames, bamboo shelters. Most of these materials were imported from far off areas for example; bamboo used by one international agency was imported from as far as Assam (a state in the far east of the country).

Fig. 8.19 Temporary shelter in Bamboo and Chatai provided by an international donor agency in Bhachao Sep. 2001

Some of these temporary shelters were very expensive for example; the ones made by Indian Oil Corporation in Vadinagar (near Bhachao) have costed Rs. 24,000/- per shelter. Incidentally, these were unoccupied even three months

after their construction, thanks to their climatic and cultural inappropriateness. One also wondered about their future use.

Fig. 8.20 Expensive temporary shelters in cement sheets and metal frames made by Indian Oil Corporation Sep. 2001

The informal temporary shelters were made by using rubble from damaged houses while bhungas were made of thatch and bamboos.

Fig. 8.21 People staying in informal bhungas while their permanent homes were being constructed Sep. 2001

Semi-permanent shelters

The concept of semi-permanent structures has already been explained in previous section. However, I found that the process of their actual execution was delayed. Many of them were in fact finished after the monsoons were over. As a result, even before these could be erected, people had already started initiating permanent constructions on their own facilitated by various NGOs.

In villages like Bita Valariya, villagers were using materials paid for by the UK, organised by Save the Children and a local network, Abhiyan. The villagers were meant to be rebuilding semi-permanent earthquake-proof houses, with low stonewall and the top half made of bamboo and thatch. But many of the houses now going up were in the traditional style with high stonewalls. "We didn't get proper guidance," said village headman Govinder Ayer, "so we started building houses our own way. The monsoon is just around the corner and we have got to get on with it and provide shelter for everyone." In this way, many of these semi-permanent shelters were already getting permanent by raising walls as an 'extra room'. (Such additions are highly unsafe in many cases!) At the same time, their permanent shelter was being built.

The result of this was that in many cases, the beneficiaries ended up with three kinds of constructions (temporary, semi-permanent and permanent). I wonder, what would be their future use as lot of resources have been pumped into these.

Fig. 8.22 Semi-permanent shelter designed and provided by Abhiyan, an NGO consortium *Sep. 2001*

Fig. 8.23 Changes made to the semi-permanent structure by raising the walls making it unsafe. Sep. 2001

Fig. 8.24 Permanent, semi-permanent and temporary strucutures get added to make one house Sep. 2001

8.8.3 The progress of rehabilitation

After stiff resistance from the local people, the Government finally abandoned its policy of relocation and advocated the primary approach towards rehabilitation as 'owner-driven' in contrast to the 'contractor-driven' approach that was followed in Marathwada[42]. When I visited the region after nine months, I found that nearly everyone was provided initial sum of Rs. 12,000/- and the first instalment of financial assistance by the government. This amount was based on the category of damage assessed during the survey conducted by the government with the help of Abhiyan, which had set up a village level data collection unit called *'Setu'*. The concept of *Setu* is discussed later in this section.

The Role of NGOs

Because of the owner driven reconstruction policy, many NGOs came forward to help local communities. This is certainly a pioneering case of NGO involvement in rehabilitation. During my visit, I was very much impressed of the grass root work of lot of NGOs, other organisations, Govt. and individual volunteers who had been working with commitment and setting examples of 'rehabilitation process' not only in physical terms, but also in various social, economic and development aspects.

A number of NGOs, religious institutions, other voluntary organisations and state governments embarked on the process of rehabilitation under the public-private partnership programme. Meanwhile UNDP initiated pioneering 'transition recovery concept' through partnership with NGOs like Abhiyan. The key project aspects of this concept are vulnerability reduction and disaster mitigation initiatives through community-driven programmes. As part of this concept, the principal objectives of the shelter programme are to reduce vulnerability, build capacity, promote sustainable recovery, demonstrate seismic safety in housing and provide alternative accommodation for the rural displaced (UNDP, 2001).

The work of several NGOs was documented during the course of my visit in September-October. These include *Kutch Navnirman Abhiyan*[43], Unnati, Trust for Reaching the Unreached (TRU), Swati, SEEDS India along with NSET

[42] Based on the interview with the director of GSDMA, September 2001.

[43] Abhiyan came into being as a network of 22 grassroots NGOs in response to the devastating cyclone that swept through Kutch district in May 1998. The individual groups came together to ensure greater coordination and better impact of relief and rehabilitation. Since then Abhiyan has established itself as a network of NGOs in Kutch engaged as a collective effort in coordinated planning, advocacy and capacity-building activities in a range of development concerns. Following the earthquake, Abhiyan, now a 29-member network supports the work of member organizations in 300 villages in shelter reconstruction, dam repairs, livelihoods and community driven rehabilitation.

Nepal, Self-employed Women Association (SEWA), Disaster Management Institute (DMI), Centre for People centred development and planning (CPDP) and Veerayatan Trust. Interestingly, most of these NGOs were already working in the region on various developmental aspects before the earthquake struck. As such they had a good understanding of the social, economic and political realities. Some of them like Abhiyan were involved in developing sustainable water-harvesting measures for managing drought that had already severely affected the region. Organisations like DMI were involved in devising participatory approaches towards community based disaster management in the state.

Initially, many of these NGOs were involved in providing immediate relief to the victims and providing them with medical care, transport etc. However, at the time of my field visit nine months later, some of the NGOs like Abhiyan, Swati, and TRU were engaged in making semi-permanent houses, by using various kinds of materials. Some of them like Abhiyan and Unnati had already started construction of permanent housing by employing variety of 'earthquake-resistant techniques.

However, most of these NGOs were promoting self-help construction by providing the beneficiaries with construction materials like wood, bamboo spread sheets or concrete blocks, reinforcement bars etc. according to the structural design advocated by the concerned NGO. The local communities were involved in providing labour for tasks such as curing, block-laying etc. Masons and local engineers (Mistris) were hired from other areas to coordinate the construction activity. As part of public-private partnership policy, the government made available the building material needed for reconstruction in a subsidised way. However when I visited these sites, this was running into problems. For example, cement was provided at the rate of Rs. 105/- per bag against the original price of Rs. 150/- per bag. The government was however finding it difficult to provide it in a streamlined way. Nevertheless, the construction activity was going on in full swing.

While some NGOs were promoting modern technology employing use of concrete blocks with corner reinforcement or containment, others like Abhiyan were exploring various options for 'alternative' design and technology. Abhiyan was promoting construction of 'Bhungas' using precast 'compressed soil blocks[44] with or without interlocking dry stacked masonry system, ring reinforcement and wooden rafters. It had also set up a laboratory to experiment and test 'new' technologies. I discovered compressed soil block being

[44] The use of compressed soil blocks is advocated by Abhiyan by mixing 90-95% soil and 5-10% cement, dried in shade for 3 days and then cured for 20 days. The composition of soil is nearly 15% gravel, 50% sand, 15% silt and 20% clay. These blocks may or may not be interlocking. Special machines for interlocking are brought from Auroville (south India)

manufactured on a massive scale at the main campus of Abhiyan in Bhuj, which had become centre of NGO activity in the rehabilitation process.

Fig. 8.25 Modern traditional Bhungas in compressed soild blocks, ring reinforcement and wooden reafters, promoted by Abhiyan Sep. 2001

Many NGOs like Unnati and Abhiyan involved local communities in deciding the design and layout of new constructions, while others advocated standard designs. Some NGOs like Manav Sadhana along with Vastu Shilpa Foundation strongly advocated construction of bhungas using traditional designs and techniques. They also advocated recreating traditional village fabric and incorporating all the traditional decorative motifs. However, on visiting this village, I found it quite 'touristy' and somehow devoid of life. It seemed that everything was up for display. I was quite shocked when the villagers asked for money to get their reconstructed houses photographed.

Besides actual construction, NGOs like Abhiyan and Swati were engaged in training masons in earthquake resistant construction. Some organisations like CPDP (working under Abhiyan) and Swati were engaged in retrofitting existing houses, using low cost techniques. In this case, I found that many villagers were not convinced about retrofitting as an effective means to make their houses earthquake-safe.

Fig. 8.26 village Patanka getting reconstructed through an NGO, Seedsindia and NSET Nepal *Source: SEEDS India*

Fig. 8.27 Retrofitting of a vernacular construction in village Makhna through application of wiremesh for corner strengthening *Oct. 2001*

NGOs like Unnati and Abhiyan were also involved in regenerating livelihood opportunities for the victims and catering to the needs of socially and economically marginalized sections. Unnati was constructing work sheds for weavers and other artisans in Adhoi and Morgar. NGOs like Swati and SEWA were especially catering to the needs of women.

For the first time, some NGOs right at the outset of rehabilitation process had explicitly articulated development focus. This was certainly due to the fact that many of these NGOs were already involved in many development activities in the area at the time of the earthquake. The approach and intentions are worth consideration as for the first time, such a sincere and big scale effort has been made to use this disaster as an opportunity for development.

UNDP sponsored and set up earthquake rehabilitation support centres, known as *'Setus'* (meaning 'bridge'), which are village level information and coordination units. These were meant to serve as a bridge between NGOs, community and the government, set up through Abhiyan. For collective village level information and for coordination, Abhiyan has directed its collective efforts towards facilitating the implementation of people-controlled, equitable rehabilitation policies and creating transparent mechanisms for judicious use of resources (UNDP, 2001).

More than 20 Setus were created in the whole Kutch region, each catering to a group of villages. Each setu had a group of trained social workers and engineers, who were initially involved in collecting data at the grass root level pertaining to extent of damage, the kind of compensation, needs of marginalized sections such as widows etc. This data was then passed on to the NGO, which was supposed to interact with the Government to initiate action for grass root development along with rehabilitation. This was indeed a pioneering concept, thanks to the efforts of Sushma and Sandeep Virmani, who are spearheading Abhiyan.

'Full-fledged adoption' of villages

While the owner-driven approach was on the main agenda of the Government, it also paved the way for 'full-fledged adoption of villages' through contractor driven reconstruction programmes. In these villages, the labour was essentially hired from outside and local villagers had no say or role in the reconstruction process. In most cases, I found them as mute spectators to the reconstruction process.

In these villages, the 'city-like' village layout with grid iron pattern and wide roads and the government criteria of house and plot size according to land holdings (very much like Marathwada) was strictly followed. In many of these villages, highly over-safe earthquake-resistant techniques were being employed

using concrete with heavy reinforcement. These techniques included 'pre-cast' concrete blocks with pile foundations (Village Chandrani, Meetha Paswaria), corner reinforcement (village Bocha) and containment steel (village Morgar, Rajansar). The cost of construction of some of these was as high as Rs. 200,000 per house. This is in contrast to their houses before, many of which were made with even less than half of this cost. I discovered that in most of these villages, the construction work was going on in full swing

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Fig. 8.28 Permanent housing reconstruction in concrete blocks – 'Adopted' village Chandrani in Kutch Oct. 2001

Fig. 8.29 Pile foundation of permanent reconstructed houses in village Chandrani Oct.2001

It was found that several such villages had already been completed in much haste and inaugurated by some well-known politicians. One such village visited by me was Dudhai, which was renamed as 'Indraprastha' after the ancient name of Delhi. The name carries much importance as the main person, who adopted this village was a prominent politician from Delhi (name withheld). However, I found that the quality of construction in this village was very poor and some of the buildings had even suffered cracks within a month after they were constructed from the minor aftershocks that hit the region.

Moreover, I discovered that in some villages the reconstruction work had not even started due to some controversies such as selection of land for relocation, inter-government disputes e.g. the one observed by the author in village Vondh near Bhachao. Surprisingly, here villagers had been provided with temporary shelters in tin, by a voluntary organisation on the outskirts of Bhachao town. These shelters were totally inadequate for summer months and the villagers wanted to move back and start reconstruction on their own. However, they were forced to stay in those houses, due to ongoing dispute between the Government of Gujarat and another state government, which had 'adopted' the village at a relocated site, which was also controversial in many respects.

Fig. 8.30 People of Vondh are in the process of making additions to their temporary shelter in Bhachao. Sep. 2001

8.8.4 Livelihood situation

Livelihood emerged as the single most important issue for the victims. Even after nine months, most of them were without a sustainable source of livelihood. Initially, they were 'provided' with all kinds of help but now they were gradually left on their own. At this juncture, the importance of generating livelihood was becoming all the more evident. Many of them were working as daily wageworkers. From interviews with these workers, I found that most of them were paid not in cash, but given just food to ensure survival. Local businesses were not running to give enough returns. Still people were sitting in their shops, in the hope of better times. Informal activity could be seen in the midst of rubble…!

Livelihood was the critical issue for certain sections of communities, who were already marginalized, the elderly and the women who had lost their sole bread earner. I discovered that port authorities had driven out certain migrant settlements of workers employed in saltpans e.g. Navlakhi. This was because their job was no longer needed. The port authorities found that it was more profitable to import charcoal for factories. No one cared for their future livelihoods.

Fig. 8.31 Informal commercial activitiy in the walled city of Bhuj
Sep. 2001

I discovered that women were playing an important role in generating income for the family. During the course of some interviews with single women, I was impressed at their ongoing struggle for survival, in the face of such a trauma. A case history of a widow is elaborated here to substantiate this aspect.

This case history is that of Sarifa, whom I met sitting along with her neighbour (who incidentally was also a widow, due to earthquake) in the outskirts of Bhachao, occupied by 'low castes'. Before the earthquake, Sarifa had two children, one of whom she adopted from one of her relatives. Sarifa's husband was very sick suffering from cancer and she had to do hard day's labour to earn family's livelihood and to educate her children. In order to undertake a major treatment for her husband, he had taken loan of nearly Rs. 200,000 from a local moneylender (locally called Durbari). On the fateful day of earthquake, while Sarifa was away working as daily labour, both her children died under the rubble. However, her sick husband survived the disaster.

Sarifa got Rs. 200,000 as compensation for the death of her two children, with which she was forced to repay the loan. She was left with no source of livelihood, but a little money from the relief. She decided to take another loan of Rs. 15,000 and used her savings to buy a buffalo so that she can earn a livelihood. However that proved to be not enough to sustain her. Meanwhile her husband also died and poor Sarifa was left alone living with haunting memories, loan and meagre source of livelihood. Fortunately, one of the local NGOs, Unnati, provided her with temporary shelter and Sarifa was still struggling for physical survival after having undergone such an intense psychological trauma.

8.8.5 Coping Mechanisms

While working in the area, I came across countless examples of 'local coping mechanisms' that were in place and working quite effectively. As a case, I found people celebrating 'Navratri – a festival to worship Goddess of power'. For nine nights, people dressed in their colourful costumes dance to live music. And here Rabari women dressed in colourful attire were singing and dancing in the midst of rubble in Bhachao. The festival was in fact promoted by local organisations to initiate psychological healing process. It was surely an intense setting.

8.9 EMERGING KEY ISSUES

There are several key issues that emerged after my on-site assessment of the rehabilitation process after nine months. These issues are elaborated below: -

8.9.1 Social Polarisation leading to physical break-up

A shocking implication of owner driven approach is social as well as physical break-up of the villages. As explained before, social stratification is quite strong in Kutch. While some castes are rich and politically powerful, there are others, which are weak and marginalized (socially and economically). The middle class is not very strong here. With the gradual breaking of mutual interdependencies, the 'social polarisation' was already underway at the time of the earthquake.

Under the owner-driven approach, these villagers were supposed to mutually determine whether they want to be relocated or get compensation. However the villagers could not come to a univocal conclusion, because of the existing social segregation[45].

What happened as a consequence of this was that in many villages 'socially and economically powerful castes' got together and purchased their own land and in this way, decided to get relocated. The weaker groups were left with no option but to stay back.

In this way, a single village got split into as many as 4 parts, at safe distance to each other. This is very serious, as physical segregation will further deepen the polarisation. Moreover, due to 'good political connections', in some cases the powerful castes had even managed to attract infrastructure and investment, while the poor and the marginalized were now left as 'abandoned hamlets' devoid of even basic facilities. In a famous craft village, Dhamadka, internationally known for block printing, the Khatri community, who owned work-sheds and were economically well off, decided to relocate themselves and poor labourers, who used to work in those sheds were left behind…wondering how to cope! This is ironical since the owner driven approach was propagated as an answer to 'contractor-driven' approach, but it ended up increasing social vulnerability of the people at stake.

[45] Take the case of Loria Village, where this issue came up just one month after the quake. Initially, there were many villagers who would love to re-settle where there was some water resource, but the village was not able to come to a decision. While the Darbars (a caste group) were not too ready to leave their home ground, there were many who wished to move out, like the Muslims[45].

However at this point, I must appreciate the work of some NGOs like Unnati, Swati and many others who are exclusively catering to the needs of vulnerable sections of the community.

8.9.2 Rehabilitation or Compensation ?

The author found several complaints regarding corruption, inequitable or no compensation paid to the victims. Besides, it seemed that the whole approach was getting heavily centred on financial compensation, without working out and facilitating actual ways and means to achieve earthquake resistant features in physical reconstruction. In many cases, people getting the money didn't really know how to make optimum use of the little money (from the first instalment) to achieve best results for making safe structures. As a result, they ended up making new constructions of very poor quality. Since the condition of getting compensation was incorporation of earthquake resistant features, many of them became ineligible to get the second instalment. This was a funny situation since after inspection by 'official' engineers, many of them were supposed to retrofit the 'new' reconstructions, forget the existing ones.

Many people still remained in very damaged houses. At many places, people had barely managed to erect walls with whatever little they had, and for the roof they still used plastic sheets (quite innovatively).

Another issue had been the ways and means of getting compensation based on number of documents, such as ration cards, and papers showing house ownership. One wondered what about those living in huts (they don't need to get legal sanction), what about those living as tenants for 50 to 60 years…what about those whose papers had been buried in rubble…what about those who were illiterate? Needless to say, many of them had been left out of this compensation package. Most of them were already marginalized. Corruption was very evident for securing 'compensation'[46].

8.9.3 The question of sustainable 'technology transfer'

In many of the 'adopted' villages, the sustainability of the introduced 'earthquake-resistant technology' employing heavy use of external and expensive resources is put into question very much like the case in Marathwada. Even in those villages where various NGOs were introducing 'appropriate' technology, internalising such a technology with local communities seemed very much in doubt.

[46] This is based on various semi-structured interviews conducted by me with the victims nine months after the earthquake.

As mentioned before, many NGOs were promoting 'alternative technology' through use of local materials such as mud. Abhiyan is promoting the use of 'compressed soil blocks (not mud blocks, as wrongly understood by many!). However, such a technology also requires strict quality control and proper curing. Right now, this was being taken care of by these NGOs but there were questions regarding 'internalising' this technology with the local community, once these NGOs withdraw from the scene. Will such technology take roots with the building culture of the area…? Is it really feasible considering that this region is drought prone, while compressed soil blocks need proper curing? I have some doubts based on prior experience in Marathwada!

Fig. 8.32 The use of compressed soild blocks advocated by Abhiyan by mixing 90-95% soild and 5-10% cement, dried in shade for 3 days and then cured for 20 days Oct. 2001

However an interesting aspect related to this was that, thanks to the enterprising nature of local people, the manufacture of pre-cast concrete and soil blocks had become a small-scale industry providing livelihood opportunities. However, it was another issue that the villagers did not have the knowledge of making these so that they achieve optimum strength. Many of them were heavily economising on cement at the cost of strength to achieve more profit.

Besides unsustainable technology, house designs and village layout were also found to be incompatible to local cultural practises. It seemed that Marathwada mistakes were being repeated here in Gujarat also.

In contrast to this, local ingenuity was brought into focus by this account of Banni dwellers who were bringing in a number of innovations to further fortify their Bhungas for earthquakes of greater magnitude. "We are now planning to incorporate two metal rings within walls of the bhungas. These rings will be introduced when the walls are being built, one on the outer side and other in the inner side of the wall," said Gulbeg. "There is another plan to provide extra support to the main beam. We will be erecting two props outside the bhunga to hold up the two sides of the beam protruding out. This extra support will ensure that the roof doesn't collapse," added Gulbeg. (The Times of India, 21st February 2001)

8.9.4 "Wrong" perceptions

The issue of wrong perceptions is very much linked to the issue of technology transfer. Very much like in Marathwada, wrong perceptions on the issues of 'appropriate technology' were evident both on part of 'official engineers' as well as local people. The reinforced cement concrete or cement blocks (locally known as pillar constructions) were thought to be the only 'safe option'. Most of the people were changing over to these techniques, though the quality and techniques are indeed very poor (in many cases). Moreover, due to shortage of water (this is drought prone area!!), concrete might not be properly cured. In many villages, the author found that people had not even understood the basic features of 'earthquake resistant construction'.

Even wrong repairs were seen everywhere (there was no retrofitting, what so ever). People had filled up 'through cracks' with cement grout, increased cross section of soft storey columns and moved back to their houses. (This was seen not only in Ahmedabad, but also in Bhuj and Anjar).

Wrong perceptions were also evident in the way heritage structures are being pulled down, even where they are standing to make way for modern concrete structures. This was seen in historic towns such as Anjar, Bhuj and Morbi. Ironically, the new structures were no better, thanks to poor workmanship and unaffordability.

Fig. 8.34 The cracks, no matter how deep they are, are just filled with cement grout Oct. 2001

Fig. 8.33 The column in the new construction is of very poor quality- village Nani Cherai Oct. 2001

8.9.5 Community participation or community involvement

'Community participation' was undoubtedly the key word in the rehabilitation process initiated here by number of NGOs. It was the first time that the community was being involved in the rehabilitation process at such a big scale. The community was assisting in the process of rebuilding by providing their labour, skills and resources. Some NGOs like SEEDS India in cooperation with NSET Nepal and Unnati were involving communities in the rehabilitation process right from the start.

However mere 'involvement' of community may not evoke their true participation. True participation will emerge only if these communities are empowered to make informed 'decision making' otherwise they end up making many mistakes as seen in the self-help constructions. And needless to say, 'communities' means equitable participation of every section within the community. This sadly, was found lacking here as well due to existing social and political realities that have been elaborated before.

8.9.6 Increasing Dependencies

Some well-meant interventions actually shifted the focus away from self-help. One example of this was the supply of so many tents. "With tents coming in, people kept waiting for tents and stopped the process of self-rehabilitation," said Sushma Iyengar from Abhiyan. People had certainly become more dependent, thanks to the overflowing relief and presence of numerous NGOs, many of whom are certainly over-doing with all their good intentions. An interesting example is cited here to illustrate this.

At one place, an NGO was making work sheds for some block printing craftsmen in cement blocks with tiled roof. After the earthquake, they had been carrying on their work in very basic structures made of locally available weeds (vegetation) and plastic sheets. Even the sheds before were made of poor rubble masonry. When I visited the site of new construction (adjacent to their existing temporary sheds), I was shocked to find the owner complaining about a thin cross section of rafters being provided in the new shed being provided by this well intended NGO. However, I found the new construction very appropriate. The owner could not even have dreamt about getting such a structure, had there not been an earthquake. Such examples throw open the questions relating to what kind of assistance should be provided to the victims so that they do not lose their self-initiative and become dependent on outside help.

8.9.7 Development – challenges in bridging community, NGOs and the government

As mentioned before, for the first time, development focus was explicitly articulated by some NGOs right at the outset of rehabilitation process. However the challenges relating to long-term sustainability, governance and creating civic society were only beginning to unfold, when these good intentions were tested against the basic social, economic and political realities.

As mentioned before, Abhiyan with the help of UNDP initiated the concept of 'Setu' (meaning 'bridge') as village level data collection units. The idea was to create a bridge between NGOs, community and the government

However, while I was in the last stage of his field study, I discovered some challenges that were beginning to be encountered while initiating this approach. It seemed that these setus had in fact served to strengthen the link between the community and NGOs. However the link between the community and the Government was structurally so weak, that effective communication and action on behalf of the government, based on community feedback was missing. There seemed to be lack of trust (of the community) and lack of accountability (of the government). When the community did not see concrete actions based on what they demanded, they simply refused to cooperate[47].

This is also related to the fact that until now, grass root governance (i.e. local village panchayats) has not been given any roles and responsibilities in the rehabilitation process. One has gradually begun to understand that rejuvenating and empowering local governance is so crucial for effective grass root actions.

Another seemingly related issue is that of defining role and responsibility of the government vis a vis NGOs and other donor agencies. Many people whom I interviewed, complained that the government had been very slow in taking actions and in many ways, had shed too much of its responsibility, in the 'pretext' of owner driven approach, through heavy involvement of NGOs. Some people also complained that Govt. took too much time in 'damage assessment', which was made into a heavy bureaucratic exercise, ridden with corruption.

On the other hand, many NGOs had become too big in their scope and were beginning to suffer from bureaucracy and high-handedness, thereby making the work of grass root workers more difficult. This is ironical since because of official bureaucracy, many people had expressed more faith in self-help than government help.

[47] These are mainly based on my interviews with social workers who are running these 'Setus' and also members of the local community.

After having said all that, one must acknowledge that these Setus have been very effective in achieving social awareness, as I could sense while talking to the local people.

8.10 A YEAR AFTER – RISING PROTESTS

Incidentally at the time, I was initially writing this chapter, Gujarat earthquake completed one year. On its first anniversary, the rehabilitation was in focus once again and the media was filled with reports focussing on the rehabilitation process.

While on one hand, the Government was patting on its back by arranging functions highlighting its achievement, one could sense growing protests by the victims, social activists and NGOs against corruption and other anomalies in the rehabilitation process.

8.10.1 The government's claims

The Government is laying tall claims on its success in undertaking rehabilitation. "We have organised international level seminars on the subject and are now working on those deliberations."
The Chief minister of Gujarat is happy with the way rehabilitation work has shaped up in the state, but is cut to the quick by criticism that efforts have been tardy[48]. He states;

> "1200,000 houses needed to be built. 800,000 have been built in 365 days. Has anything on such a scale been done before anywhere? How does one measure pace of work in the face of such a calamity?" he asks.

He is also upset that so much is made of out allegations that many quake victims have not received compensation. The Gujarat government, he says, has made provision for a judiciary system, which can be approached by anyone with a grievance. He insists;

> "Any aggrieved person just has to make a simple application. We have received 39,000 complaints, of which 37,000 have already been cleared. Genuine complaints will always be dealt with forthwith."

In the run-up to the first anniversary of the earthquake, the chief minister has been busy highlighting the achievements of his government. He visited Delhi to make a sleek presentation before Prime Minister Atal Bihari Vajpayee on the earthquake.

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[48] *"Gujarat reconstruction doesn't please everybody", The Times of India, 25th January, 2002*

8.10.2 The victims' grievances

However, the victims have something else to say, quite contradictory to the claims of the Government.

According to Lalji Desai, executive director of Marag, a non-governmental organisation (NGO) that has been working in Bhuj for the past year[49];

> "Almost one year after the devastating earthquake that hit Gujarat, thousands of victims continue to be homeless, poverty-stricken and are struggling to make both ends meet amid a biting cold winter. The new struggle is bad climatic conditions, improper housing facilities for thousands and above all rising state-level corruption that is making rehabilitation difficult."

Further commenting on the effectiveness of compensation driven reconstruction, Desai states;

> "Immediately after the quake, the state government carried out extensive surveys and formed categories of compensations to be paid to the victims. " There are various categories. The worst affected by way of a completely destructed houses were put in the G-5 category, a slightly less one in G-4 and so on. It is exactly this formula that has given rise to massive corruption.
>
> "Local state government officials are claiming bribes from the victims, ranging from 5,000 rupees (105 dollars) to 20,000 rupees, in order for them to get their compensation from the government," he added.

Officials of various NGOs working in Gujarat said cases of unfair distribution of funds were being unearthed daily. A worker with another NGO, who did not want to be named, said;

> "Over Rs 10 billion have already been disbursed by the government for the rehabilitation of the victims. However, a proper study will point out most of the rehabilitated people are either rich or enjoy clout with the government and have received compensations fast."

Meanwhile these media reports suggested that in many affected villages, even the debris has not been removed and a large number of people either live in tents or makeshift accommodation made of tarpaulin. Even a year after the quake nearly 60 per cent of the people continue to live in tents. Houses for them have not been rebuilt, despite claims by the state government

[49] *"Poverty, corruption, cold drives Gujarat quake victims to desperation", The Hindustan Times, 20th January, 2002*

Many people complained that the first instalment was too little, not even enough to engage a mason and labourers. Then there is the high cost of water used in construction.

8.11 CONCLUSION

The Gujarat case has looked at the immediate aftermath of a disaster in a greater detail and assessed the sequence of decisions and their deciding factors. It has shown how existing basic social, economic and political realities ultimately shape the management of relief phase and its transition towards rehabilitation. Various issues regarding external response have also been brought forward. More importantly, it has demonstrated the strengths of local communities that help them cope with the disaster of enormous proportions, while at the same time, the inherent weaknesses of these communities are also shown.

Further, in this case, the rehabilitation process has been analysed in its initial stage and evaluated for its future impact, in the light of findings from Marathwada case (that elaborate on the long-term consequences of the rehabilitation process).

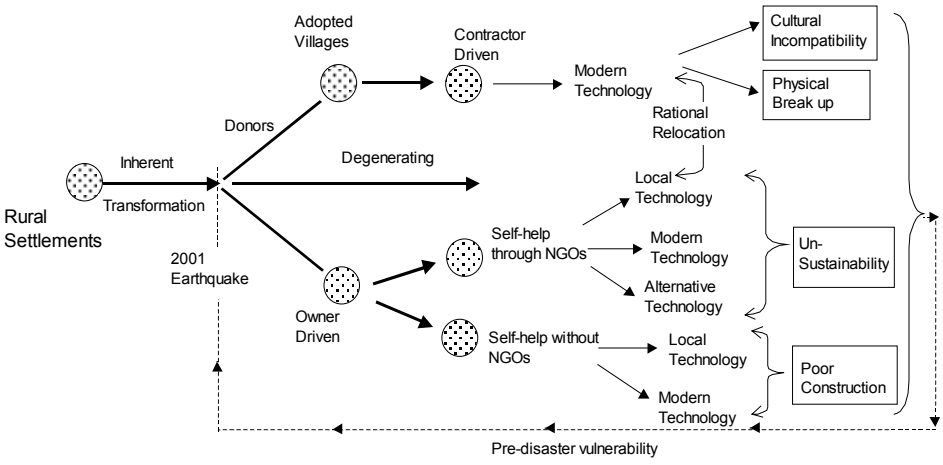

Fig. 8.35 Rehabilitation in Gujrat – after one year

9. CASE STUDY AREA 3. KATHMANDU VALLEY, NEPAL

9.1 INTRODUCTION TO THE CASE STUDY AREA

The earlier two case studies of Marathwada and Gujarat have clearly shown how vulnerability of rural communities is compounded by post earthquake decisions taken for relief and rehabilitation. In both these cases, I have attempted to link pre and post disaster situations to gain a dynamic and integrated perspective for assessing the link between local knowledge and capacity and vulnerability.

The third and the last case study will throw light on the underlying transformation processes, which in the first place create vulnerability of these rural communities. These are assessed for their link to the overall development process, which creates the conditions for these transformations. Such an understanding is crucial to know the contextual setting in which disaster and its management decisions take place and influence local knowledge on building and spatial planning, use of local resources especially land and other skills, all of which contribute to the capacity of these communities to mitigate, prepare and recover from the impact of natural hazards such as earthquakes.

An important point that I will like to bring forward here is that these transformation processes are multidimensional and a result of larger forces, which may not be directly linked to natural hazards such as earthquakes. Nevertheless, they are important to understand the causal links between various factors that contribute towards pre-disaster vulnerability of these communities and continue to negatively influence them after the disaster.

To understand the rural transformation processes in detail, I have undertaken a detailed study of one village, Bungamati, lying southwest of Patan in the Kathmandu valley.

9.1.1 Kathmandu Valley – geographical and geological context

Kathmandu valley is situated in the central part of Nepal surrounded by mountains, about twenty by twenty-five kilometres across. North of the valley are two of the most accessible passes over the Himalayas to Tibet. The Valley consists mainly of three cities, Kathmandu, Patan and Bhaktapur. Kathmandu is the capital of Nepal. Kathmandu valley is highly prone to earthquakes due to its weak geological foundation. In the past, a lake, some part of which may have existed at the

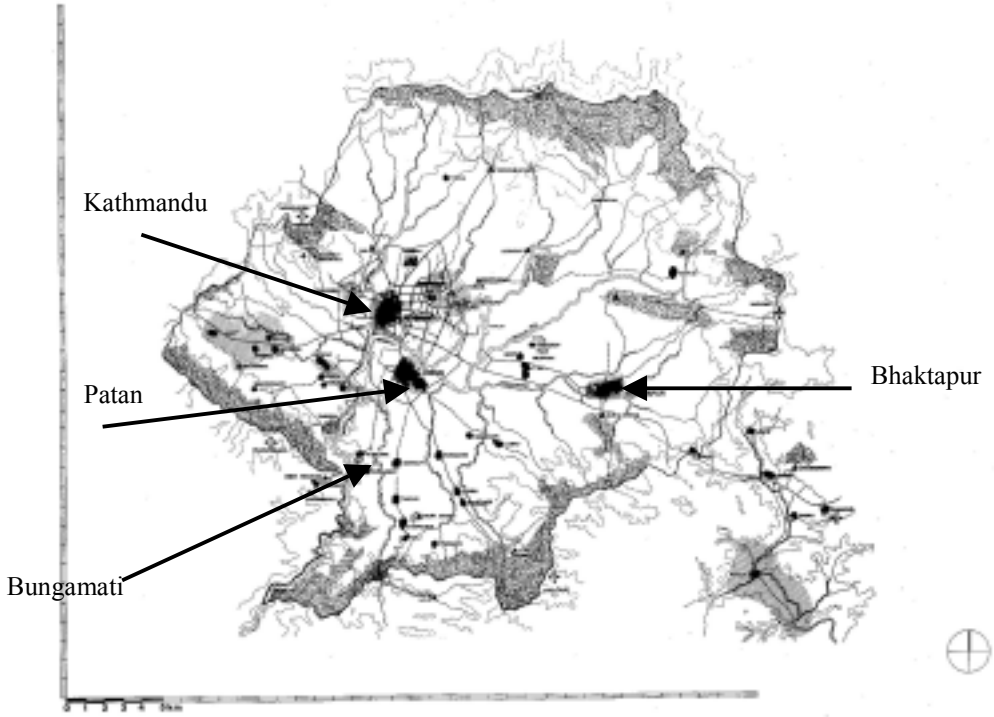

Fig. 9.1 Map of Kathmandu valley

Source: Gutschow, 1982

central part of the valley as late as 5000 years ago, occupied Kathmandu valley. The valley is therefore filled by lake sediments and river deposits. The filling sediments are made up of clay, sand and gravel. Recent drillings in these sediments have shown that the sub-surface soil of the central part of Kathmandu valley is very soft up to a depth of about 20 m. Buildings and other infrastructures built on such soft and thick soils are very vulnerable to the forces of earthquakes as compared to the structures built on top of hard rocks. Due to this thick soil cover, during an earthquake the valley is shaken more strongly than the surrounding hills with rocky base. It is estimated that during an earthquake, the central part of the Kathmandu valley may be shaken 6-8 times more strongly than in the surrounding hills (Pandey, 1999, DMG, 2000). (Upreti, B.N., 2001).

An earthquake in 1934 A.D. destroyed 20 percent and damaged 40 percent of the valley's building stock. In Kathmandu itself, one quarter of all homes was destroyed. Much of the building stock in the city of Bhaktapur, which included some historic temples was destroyed as well. However, this earthquake was not an isolated event. Three earthquakes of similar size occurred in Kathmandu valley in the 19th century; in 1810, 1833, and 1866 AD. The seismic record of

the region, which extends back to 1255 AD, suggests that earthquakes of this size occur approximately every 75 years, indicating that a devastating earthquake is inevitable in the long term and likely in the near future.

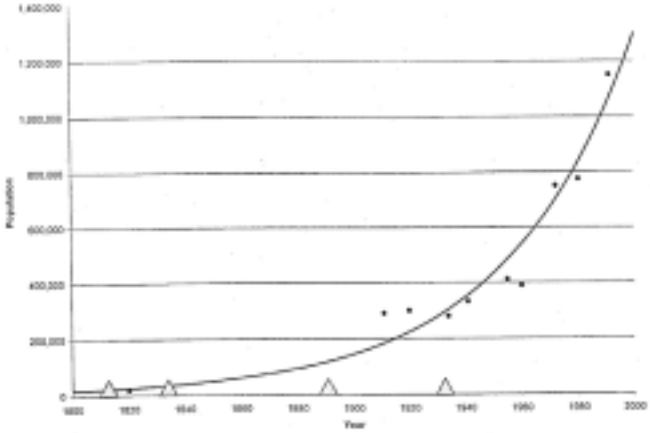

Fig. 9.2 Chart showing Kathmandu Valley's population growth since 1800. The triangles indicate major earthquakes in that time period

Source: NSET, 1999

9.1.2 Kathmandu Valley – historical context

In the historical period, the valley was earlier ruled by the Lichhavi dynasty from A.D. 300 to 879. Their power began to decline from A.D. 879 to 1200, which marked the transition phase, making way for the Malla dynasty, under whom Kathmandu developed as a cultural oasis between the 12th and 15th centuries. After the demise of grandson of Jayasthiti Yakshya Malla, who ruled until the end of the 15th century, the valley was divided into three independent valley kingdoms namely, Kathmandu, Bhaktapur and Patan (Slusser, 1982, Dixit, 1994).

Prithvi Narayan Shah, the king of the Gorkha principality since 1743 A.D. foresaw the need to unify the small principalities of Nepal as an urgent action for survival in the future and set himself to the task accordingly. All these principalities were subjugated fairly easily. His victory march began with the conquest of Nuwakot, which lies between Kathmandu and Gorkha, in 1744. After Nuwakot, he occupied strategic points in the hills surrounding the Kathmandu valley. He captured Kathmandu in September 25. 1768. He also captured Patan and Bhaktapur after some time. Kathmandu became the capital of the modern Nepal in 1769. This marked the beginning of Shah dynasty (Ibid).

The Shah dynasty was followed by Rana rule, approximately from 1850 to 1951 A.D. After the collapse of their empire, the decade from 1951 to 1960 was turbulent. Nepali Congress Party won the elections in 1959, but Nepal

remained a monarchy, with absolute powers. However, in 1991, multi party system was introduced in Nepal with King still as the state head with lot of powers.

9.1.3 Kathmandu valley – the built fabric

Exploiting the valley's agricultural abundance and trade between the Ganga plain and Central Asia, the Newars; one of the major ethnic groups of Nepal, developed an urban culture and townscape unequalled in the entire Himalayas, one quite distinct from cities of the plains.

An evolving mix of religion, ritual, art and architecture gave the valley a character of its own. Ranas who ruled till the middle of 20th century, made some drastic additions of exclusive palaces and grounds. However, the valley's mix of town and country was left alone (Dixit, 1994).

Today, the three main cities in Kathmandu valley, namely Kathmandu, Bhaktapur and Patan embody a very historic fabric; each having a main city square (locally known as Darbar Square) and a rich built fabric of houses, temples and shrines, with intricately carved roofs, doors and windows. Some of the buildings date back to the Malla period, having survived a great earthquake in 1934; others have been rebuilt, not always in their original form. Besides these main cities, there are numerous smaller rural settlements, many of which are very historic.

9.1.4 Bungamati Village – a brief introduction

Geographical context

Bungamati is a traditional village of Newars, one of the major ethnic groups of Nepal with very rich cultural traditions. The village is siutated southwest of Patan in the Kathamandu valley. It is surroundd by highly fertile land, which is used by the local dwellers for farming. The River Bagmati passes through the landscape, serving as main source of water supply and also for religious purposes.

Mythological and Historical context

The village holds high religious significance in Kathmandu valley because of the location of the temple of Rato Machchendranath; a celebrated God of the Newars. In fact the whole village has evolved around the temple. There is a famous story, which explains the logic of its location there. It is said that once there was a big famine in the area, making the king, the priest and a labourer to go to Assam in India, to fetch 'Rain God'. When the God was bought, there was enough rain, and it was decided to search for the most appropriate location

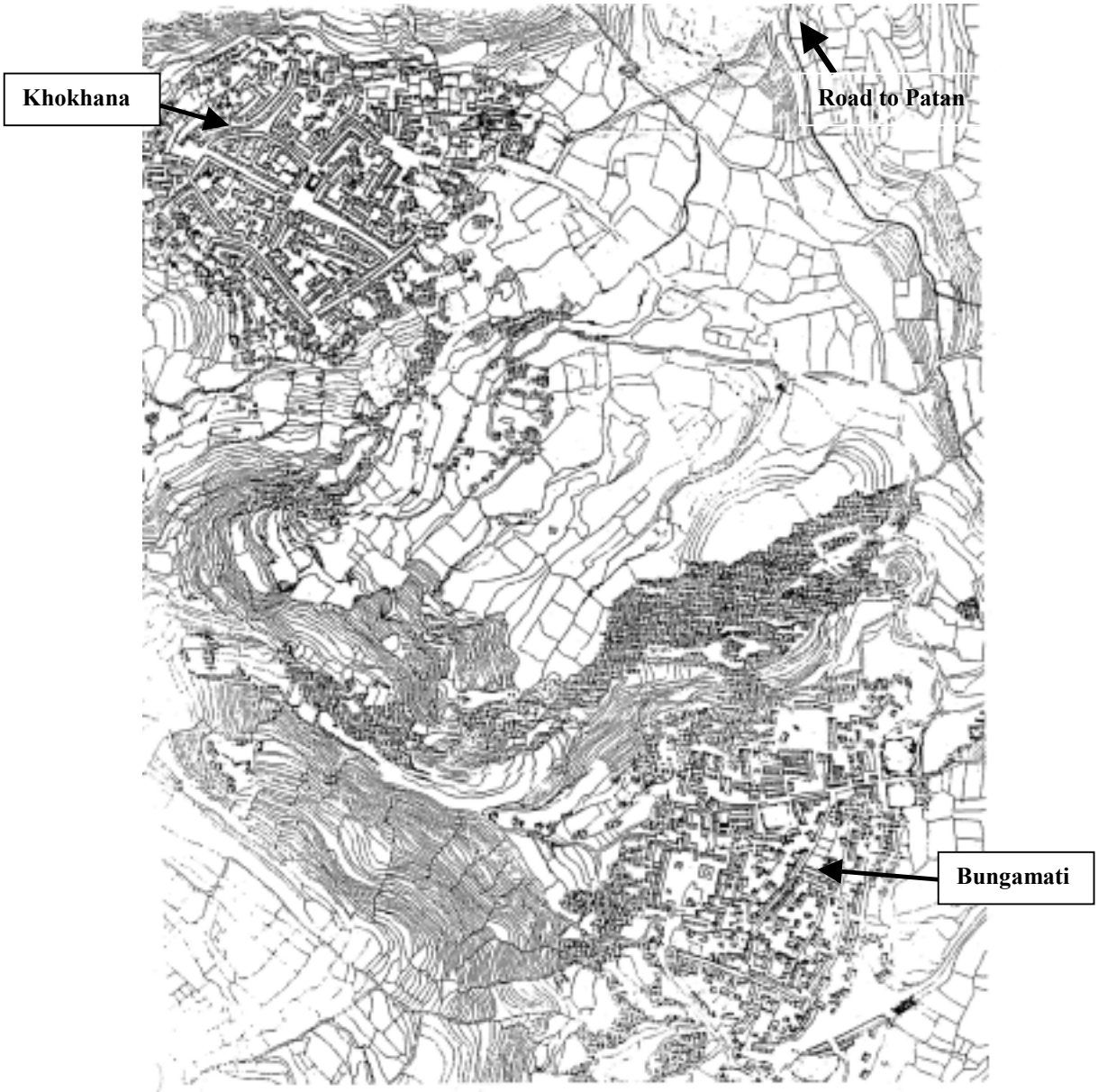

Fig. 9.3 Bungamati Village surrounded by agricultural land and neighbouring village Khokana in 1968
Source:Danish Study in 1968 but copied from the office of VDC Bungamati in 1998

for the temple devoted to the rain God. After very intense search, finally a dog, which was reincarnation of a local God, 'Bhairav', pointed a location by barking as 'bu', which in Newari means fields. It was decided to place the God there and call it Bugal, meaning settlement in the field. Accordingly, hundred people from Lalitpur, Kathmandu and Bhaktapur were placed for the service of the God and thus Bungamati got is origin and name.

In the recent historical past, most of the village was rebuilt on the same site after a destructive earthquake in 1934 caused heavy damage to its built fabric.

Main Demographic and Socio-economic Characteristics

The total population of the village in all its nine administrative wards in the Nepali year 2058 (2001 A.D.) was 5,650 *(refer diagram showing population distribution according to wards).* According to census of year 2001, 2519 people in the village are 20 to 49 year old.

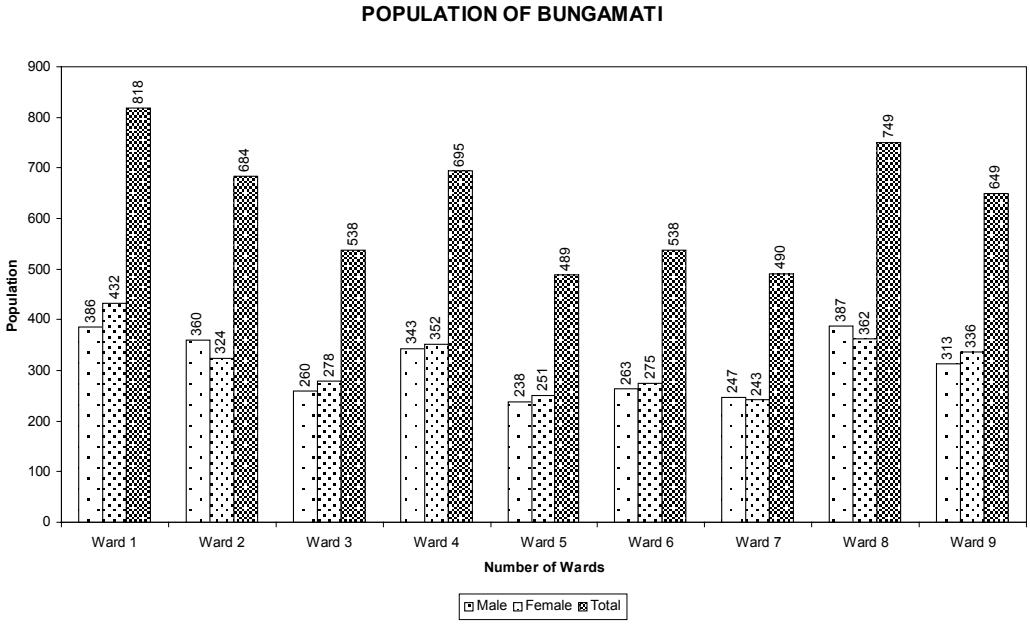

Fig. 9.4 Population of various wards in Bungamati

Source: VDC Bungamati, 2001

The traditional occupational base of the villagers is agriculture and secondary jobs are assigned according to castes. Recently however, the village has become very popular with the tourists for its vernacular built form and open spaces with a variety of daily activities demonstrating traditional Newari way of life, which has so far been more or less untouched by the forces of modernisation.

Institutional and Management structure

For the purpose of planning and management, the entire settlement is divided into wards. The land around the village is also divided into wards. Each ward is supposed to be looked after by the ward committee, which is elected by the people from each ward. It is important to note that each ward may contain a few neighbourhood units. However, their boundaries may not follow those of the wards, since the wards are always divided along streets, while neighbourhood areas are defined according to spaces.

The main local authority for carrying out planning and management in the village is the Village Development Committee[1], which works under the District Development Committee (DDC)[2]. The chairman, who is elected by the people, leads the VDC. Each ward is also represented by a chairman and four representatives, which include one woman. The people of the ward elect them all. However they may represent all the neighbourhood units in the ward. The ward committee does not have any power. It is supposed to suggest a development project for the respective ward to the VDC chairman who reserves the right to approve it and estimate the budget in consultation with the others. The VDC receives Rupees 100,000/- from DDC as the first instalment for carrying out these projects. The money is divided among the approved projects. The VDC does not have enough powers to regulate the development of the village. Importantly, it has no control over land transactions within the village boundaries and it cannot lay down and check guidelines for controlling the built form of the village.

A number of local NGOs operate in the villages like Bungamati. In many cases, different wards have their own CBOs, which may be traditional as Guthis or modern as Clubs or associations or cooperatives. Many of them are exclusively run by the village youth.

Conclusion

But is the future of Bungamati safe in the hands of its inhabitants? What is the impact of forces of modernisaton? Is the self-sustainable nature of the village under threat from within or from outside? If yes, how and why? And lastly, but most importantly with respect to my research, what is the implication of all these processes on the vulnerability of Bungamati to natural hazards such as earthquakes? My research looks at the local knowledge, skills and resources that have potential to mitigate the impact of natural hazards such as earthquakes and assesses their current status. It also shows the transformation

[1] All the villages with population less than 20,000 inhabitants are under VDC and not municipality.
[2] Every year DDC allocates 600,000 lakh rupees (12,000 US $) for VDC of Bungamati. The rest of the money is generated through local taxes.

processes that are currently underway in the village and assesses their implications for increasing vulnerability of such rural settlements to earthquakes. The existing institutional capacity to prepare such rural societies for impending disasters is also analysed at the village level.

9.2 TRADITIONAL RURAL SYSTEMS IN KATHMANDU VALLEY- Case of Village Bungamati

9.2.1 Spatial, economic, social and cultural characteristics

Spatial Organization, Size and extent

At the physical level, the Newari rural settlement has always been compact and well defined through boundaries that have been traditionally set[3]. The village is organised into various neighbourhood units, which group together to form *toles* and are linked by a hierarchy of streets and open spaces, some of which are processional routes for various festivals and rituals.

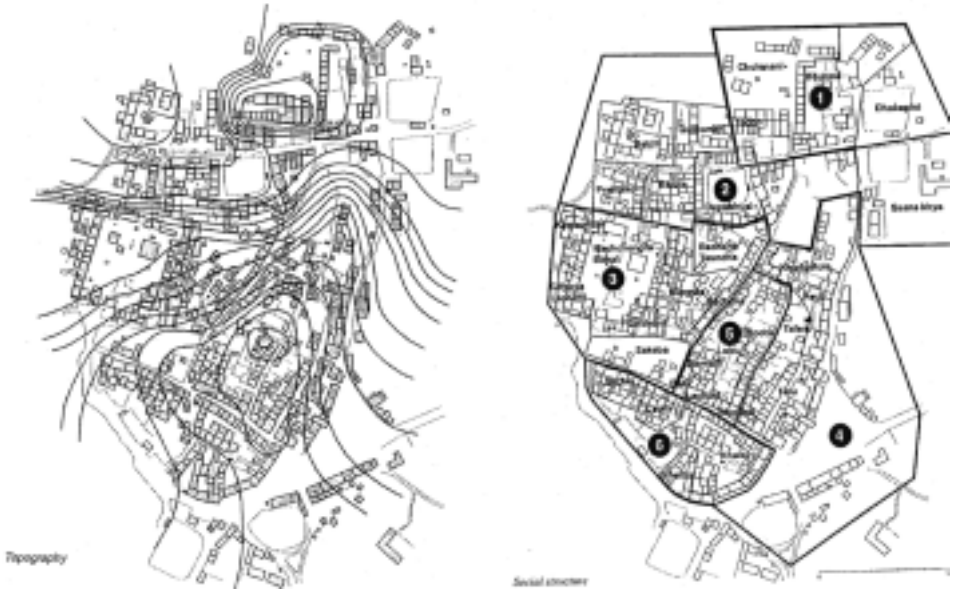

Fig. 9.5 & 9.6 Topography and neighbourhood units *Source – Jigyasu et.al. 1998*

In Bungamati, the entire Newari settlement is divided into three parts or *'toles'*, each containing a few neighbourhood units, which are around forty in total.

[3] Traditional neighbourhood boundaries have been defined according to open spaces, which are linked to a particular social group within community and their association with a local landform, through which they physically identify themselves with that space.

The *'toles'* are organized around *Machendra Bahal*; the main temple square[4] and are inhabited by various caste groups, namely Shakyas, Shreshtha, Maharjan, Tuladhar and Khadgi. As mentioned before, the present social structure of Bungamati is probably derived from these caste groups.

The spatial extent of these neighbourhood units can be defined by various characteristics; for example by a series of houses joined wall to wall along the street (e.g. *Bachche*), by a built form surrounding a water structure (e.g. *Dephukhusi*), by a built form at a characteristic location (e.g. *Choche* at the highest level), or by a built form enclosing an open area (e.g. *Cholenani*)[5]. The processional path for the yearly Machchendra yatra (festival) has traditionally defined the extent of the settlement. Coming from Patan, the procession partly circumambulates the settlement before entering the *Machchendra Bahal*. The natural slope of the land limits the north and northwest side of Bungamati.

The traditional morphology of Bungamati represents a hierarchy of public, semi-public and private open spaces, which is typical of a Newari Settlement. They are defined by built forms of different types and linked together by a network of streets. The open spaces are often named according to their function; for example, courtyards of monasteries are called "bahals" and "bahils". There are some special public lands within the village belonging to various caste groups of the community or to temples and monasteries. They are called "guthi[6]" lands, which are usually used during festivals or funerals for holding community feasts and for maintaining temples and monasteries. The open spaces are very much part of the life of the people for carrying out daily activities and rituals.

Relationship to land

Significantly, the traditional relationship to land has been very special. It was not viewed as just a resource for exploitation; rather it has symbolic, sacred and social associations or meanings for the community. As such, the whole community or various social groups within it jointly own large parts of the land in and around the village. This includes big religious squares (*bahals and bahils*), *Guthi* lands, *chowks* (semi-public courtyards jointly owned by the families living around it) and lastly, private residential plots. The upkeep of

[4] It is said that 100 people each from Kathmandu, Bhaktapur and Lalitpur settled in these toles around Machhendra Bahal namely Kotatole, the central tole and Sata tole respectively.

[5] It is important to note that, traditionally, the streets are not named in a Newari settlement, and rather the defined spaces are named. As such, each of these neighbourhood areas is called (in Newari) according to their landform (especially height) or any other special characteristics.

[6] The village community or various social groups within it, who form a religious trust called 'Guthi', collectively own a large parcel of land, known as Guthi land. Such land, which exists within the settlement and around it, is used for farming as well as for carrying out religious practices.

such land was their collective responsibility and the benefits from it are being used for the overall welfare for the community[7].

Such villages are traditionally surrounded by agricultural and forested land under different ownerships[8]. In Bungamati, as late as in 1968, around 20,000 rupanees of land[9] was under various Guthis, people from nearby towns of Patan and Kathmandu owned most parts of the fertile land along Bagmati River and the local community from Bungamati owned most of the hilly land around the village. However, the local people were cultivating in most of these lands. Whatever they produced was enough to sustain the people without relying on outside resources.

Socio-cultural and Economic Aspects

Bungamati is primarily a Newari settlement. Wards 1 to 6 are mainly inhabited by Newars who are essentially Buddhists, but many also follow Hindu religion. Hindu Kshatriyas and Buddhist groups of Tibetan background (Sherpas and Tamangs) mainly inhabit ward numbers 7,8 and 9. Internally, the Newari community has been socially segregated through castes, which occupy specific locations in the village.
Farmers locally known as Jyapos mainly inhabit the village. The main caste groups are Maharjans, Shresthas and Tuladhars. Due to the presence of Machhendra temple in the village, some caste groups like Shakyas, Bachracharis and Brahmcharis provide religious services. Other traditionally 'marginalized' castes include Malis (gardeners) and Khadgis (butchers). There are some castes belonging to non-Newari communities such as Gorkhas, Serkis and Tamangs.

Agriculture has thus been the traditional occupational base of the village and a source of sustainable livelihood, while secondary jobs were to be assigned according to castes. Agriculture has been so closely associated with lives of people that they derive their cultural identity through it.

The village community has always been close knit and characterised by strong inter-relationships and mutual support systems, many of which are reinforced through the caste system[10]. These include special skills and knowledge that is

[7] Besides *Guthi* land, there are large amounts of land, which are under private use. However it has never been under equitable ownership. Traditionally there have been big landowners, who may be from outside. They employed tenant farmers, who belonged to the village themselves.
[8] Land is classified in many ways, according to the productivity of the soil. This depends on the irrigability of the plot and on the system of tenure.
[9] One rupanee = 74 x 74 ft./ approx. 600 sq. m
[10] However, here it worth mentioning that in spite of all the benefits, the caste system left certain section of people totally marginalized, to be exploited by the 'higher' castes. However, these marginalized sections were nevertheless important for the village community and served them with essential functions.

mainly derived from optimum use of locally available resources e.g. carpenter, pottery, oil pressing, gardening etc.

Such a community (or various social groups within it) has undertaken collective initiatives and decisions on matters of common interest. Religious and cultural practices govern many of their collective actions that consciously or sub-consciously serve a common purpose for the good of the community as a whole. For example ritual paths have defined the village boundary for centuries and as such preserved the local ecology. Many of these complex processional routes pass through most of the main streets and enter most of the neighbourhood areas, thereby linking all the parts of the settlement and each social group. Bungamati has several processional paths for various rituals, related to birth, death and festivals. These can be divided into three main categories, namely processional route for Machhendra yatra, religious procession during main festivals and funeral routes.

Fig. 9.7 Procession routes in village Bungamati *Source- Jigyasu et. al. 1998*

Fig. 9.8 Free standing houses

Fig. 9.9 Wall to wall houses

Such traditional social, religious and economic systems operating within the village enabled it to be self-contained and sustainable to a large extent. In the event of a natural hazard such as earthquake, the village had at least basic resources, skills and a livelihood base to ensure community survival in the time of a disaster[11]. Also in the long run, these served to lessen the impact of the hazard through local collective coping initiatives ensured through mutual support systems.

After having said all that, however, it will not be appropriate to romanticise about traditional rural systems by overlooking their weaknesses. The caste-system and existing land-ownership pattern already marginalized some social groups within rural communities. Moreover, such communities lived in isolated shells, cut off from the developments happening around them, which made it extremely difficult for them to make fruitful exchanges of knowledge with outside world.

9.2.2 Traditional architecture and built form

Building types

The traditional rural settlements like Bungamati contain built structures of various types. These include temples, Buddhist monasteries, public rest houses *(Patis*); residential structures, water supply *(Hitis, Pokharis and wells*), shop houses (*Bazar)*, workshops (*Karkhanas*).

There are mainly two types of traditional domestic architecture: free standing and wall-to-wall houses. The freestanding structures are regular shaped i.e. square or rectangular. The wall-to-wall structures may be of a courtyard type or a row house. In the former case, three or four household units enclose a semi public open space called chowk, while in the latter case, a single household unit is repeated wall to wall along the street to form a row.

Building design

Mostly, the internal organization of the houses is very simple. These are vertically divided. A straight flight of steps connects each floor level. There is generally a multiple of two rooms on each floor. Each floor has a definite function; the ground floor is used for storage or as shop / workshop, the first and the second floor are used as bed and living room, and the topmost floor is used as kitchen. The attic is used as storage or for drying grains etc., or later

[11] The available resources can be wood, hay, mud (for reconstructing houses), the skills can be related to rebuilding houses and infrastructure using traditional techniques. Agricultural produce will form the sustainable livelihood base during disaster. Even if there is not enough to sell the produce, it can ensure community's own survival, which is crucial at that time.

converted into a kitchen. There are no toilets in the house as people generally go to the fields.

Façade

The main feature of the façade lies in the symmetrical arrangement of traditional wooden carved windows with or without balconies. These windows have wooden trellis (*Jallis*) for cross ventilation. It is interesting to note that the windows are much larger on the second floor level than on the first floor level. Another main feature of the façade are the exposed brick walls and the plain wooden brackets jutting out of the wall. They are meant to support the hanging eaves of the roof and drain the water from the roof off the wall. There is generally a single doorway, which is sometimes profusely carved.

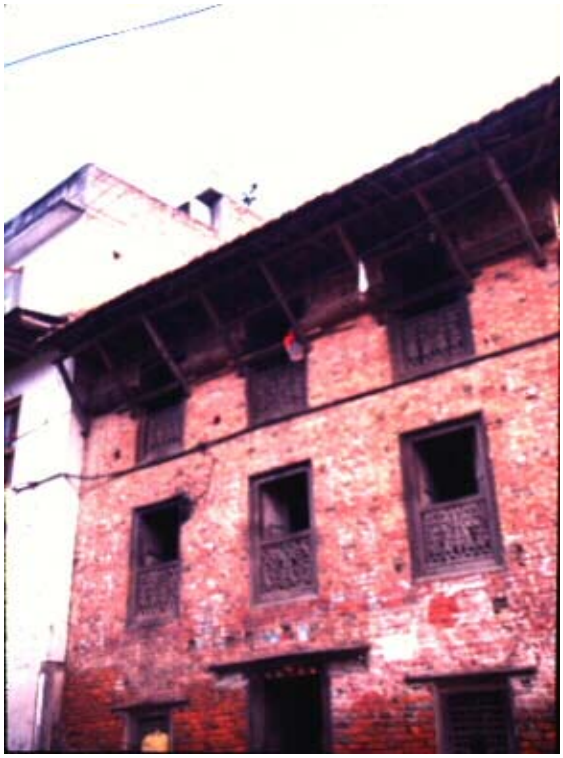

Fig. 9.10 Traditional facades of Newari housing

Material and Construction Techniques

There are two basic materials for construction of traditional Newari buildings, namely mud and wood. Mud is used as mortar, bricks and tiles and timber as posts, joists, rafters, struts, doors and windows. The great technological achievements in brickwork and timber for exposed and unexposed as well as structural and decorative members and their joinery and carvings, all go to

show that the Nepalese builder had amassed a wealth of know-how to deal with the elements of nature (Tiwari, 1998)

The structure system of the walls is always load-bearing and 30-45 cms thick. The roofs are sloping with wooden rafters supporting the joists and beams, which are laid over by a thick layer of mud and tiles fixed over it. These rafters protrude out of the wall and are supported by wooden brackets resting on the wall. The jointing system for wooden fixtures including doors and windows is mainly tongue and grooved. Windows and doors are small openings in the wall, constructed with two lintels, one at the top and another at bottom forming a part of the wall construction. The whole structure rests on foundations and the plinth is made of rubble stone masonry. This type of wood reinforced masonry construction can absorb small earthquakes and give the houses enough strength to counter such situations.

9.2.3 Traditional knowledge and capacity for mitigating against earthquakes

Traditional systems embodied various aspects that contributed towards mitigating, preparing and recovering from the impact of earthquakes. These are comprehensively explained below: -

Spatial structure

The presence of public, semi-public and private open spaces in Newari rural settlements like Bungamati is crucial for emergency escape in the event of an earthquake. It is important to note that the local people mainly use these spaces for carrying out daily religious and other activities. Escape during earthquakes may or may not be the conscious design factor behind evolving such morphology. Nevertheless, they are crucial for highly earthquake prone region of Kathmandu valley.

Traditional boundaries

Ritual paths have defined village boundaries, which have remained nearly constant for generations. This has helped preserving agricultural land, thereby maintaining rural ecology and protecting primary occupational base of the local people. This has helped the villagers in basic survival in the event of an earthquake and recovery afterwards

Traditional buildings

Sudarshan Tiwari in his paper (ibid) has mentioned some details and design methods used in traditional Newari buildings that have been developed over

the years to deal with earthquakes. One or more of these features are found in many houses and temples in Bungmati.

Plan configuration: the traditional buildings derive a fair level of earthquake resistance through use of symmetrical plan configuration. Use of the square plan, in case of temples, give these buildings perfect symmetry in terms of distribution of mass and rigidity. This has given equal strength to the building in response to any direction of ground wave and lateral forces. Symmetry in position of openings not only avoids location of openings too close to building corners but also effectively make the centre of mass and centre of rigidity one and the same. This factor has helped reduce torsion during earthquakes. In the case of street facing residential houses, although the centre of mass and rigidity are coincident, the general overall proportion is a 2:3 rectangle. The courtyard house, a preferred form, is also a square, but the whole building acting as one unit is difficult to be achieved practically.

Triple wall structure of residences; the residential building structure has a central spine wall parallel to the two exterior long walls and the sidewalls are non-load bearing. The layout of floor joists and continuous wall tie or plate and the way they are connected to the wall effectively distribute the stresses over the whole building.

Double framing of openings: Use of double wood frames going all round the opening on both sides of the thick wall and use of cross ties also effectively counter the earthquake forces. This type of detailing is seen in doors also.

Roof tied to wall: The traditional buildings use timber ring plates and wedges to hold the sloping roof tightly to wall to avoid sliding off during quakes. Apart from the reduction of wall thickness in upper floors due to lesser load carrying requirement and the use of light partition walls, second and third floor central walls in residential buildings are often total timber frames. This method has not only reduced dead load of upper floor but has also given more shear strength to the spine.

Ring ties; The brittle failure and collapse through mass action associated with heavy brick wall in mud mortar, which must have been observed by the builders early on, appears to have led the builders to use timber ring ties held tight by tightening wedges. This has contributed in adding shear strength to walls on the one hand and on the other effectively split the brickwork into several masses, both aspects reducing the vulnerability of brickwork to earthquakes.

Use of wedges; the wedge is one of the most remarkable and extensively used features of traditional construction. Whether at the joint of cross ties between opening frames or at the joint of floor joists and rafters to walls and ring plates or between the beam floor and upper walls, the use of wedges in single or

double pairs is seen in innumerable cases. These wedges, while allowing the tightening of joints effectively act as pin joints allowing movement within joint tolerance in the case of action of lateral forces. This designed flexibility and consequent movement of thousands of wedges at critical joints leads to a good deal of earthquake energy absorption.

Struts: Another salient architectural feature of the traditional construction of the valley is the struts supporting the large roof overhangs. These struts are freely rested on a cleat or cornice on the wall and are bird-mouthed to support the eaves beam, where also its horizontal restraint is two wedges on the sides. This pinning support curtails the possible pull or push of the wall during vibrations and roof ends are not subjected to jolts.

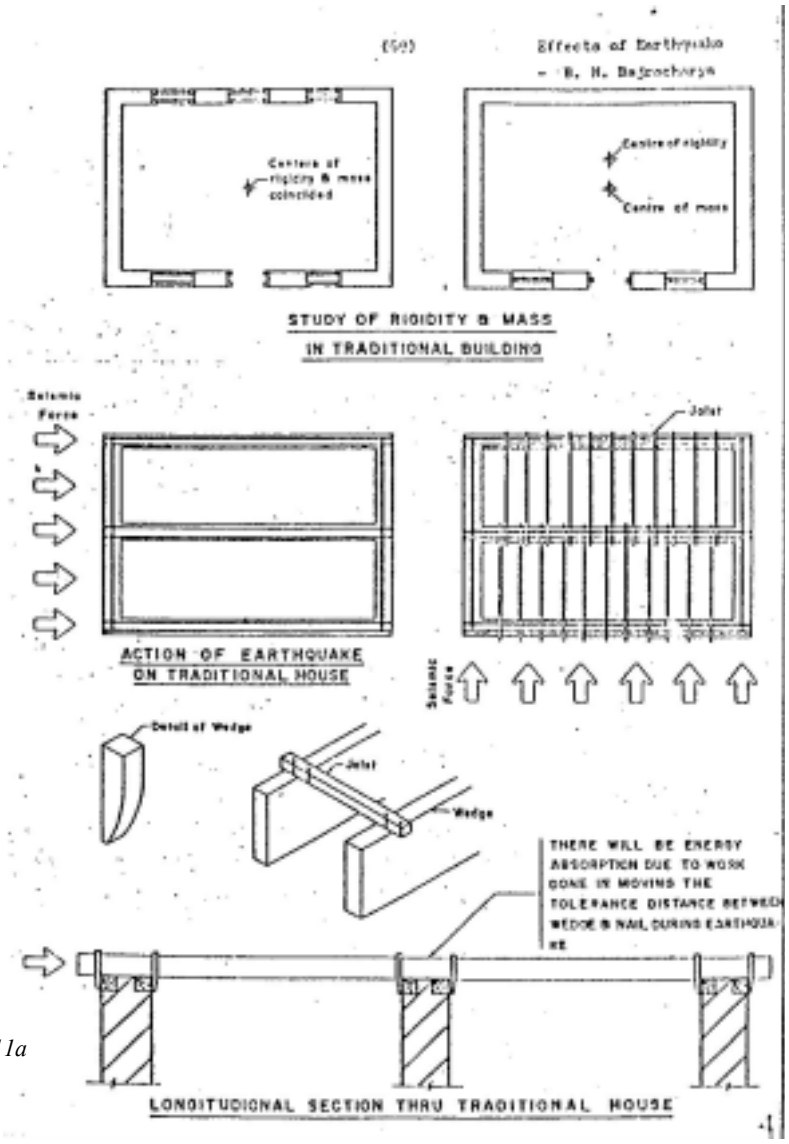

Fig. 9.11a

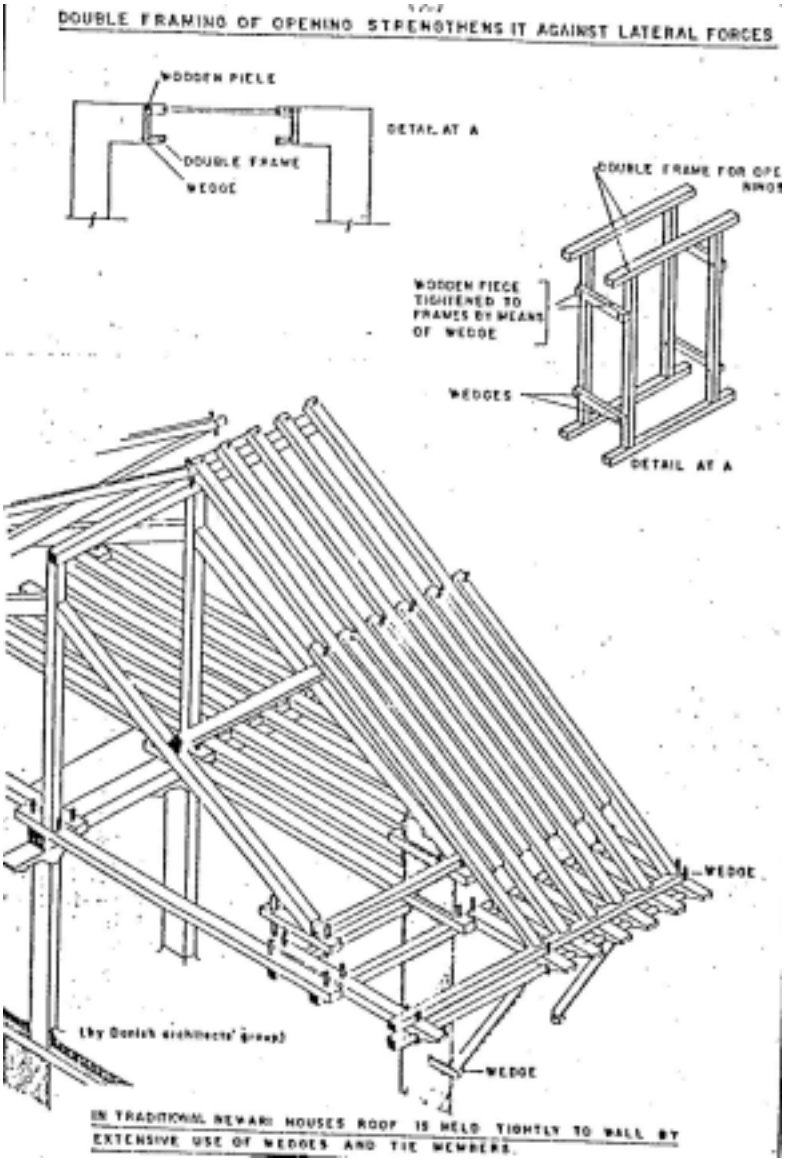

Fig. 9.11b Rigidity and mass, veg details, double framing of openings and roof ties in traditional housing in Kathmandu valley.
Source: Tiwari, 1998

Double columns: In some houses, one can also find double columns in wood, resting on stone bases. These are joined by tie beams at various levels.

Temple core wall: the general ground plan of temples is a square sanctum room with a concentric outer wall enclosing a circumambulatory around the sanctum. In later temples, a double post, odd bayed colonnade opening the

circumambulatory, replaces the outer wall. In both the cases, the central core goes up to support the upper structure. If the temple is more than two tiers high, then a partial beam floor is made to spring the third wall. Inner core walls are tied (ring ties) at short intervals, virtually making it a composite brick and timber wall, to highly augment its shear strength as it is this core which takes most of the shear during earthquakes.

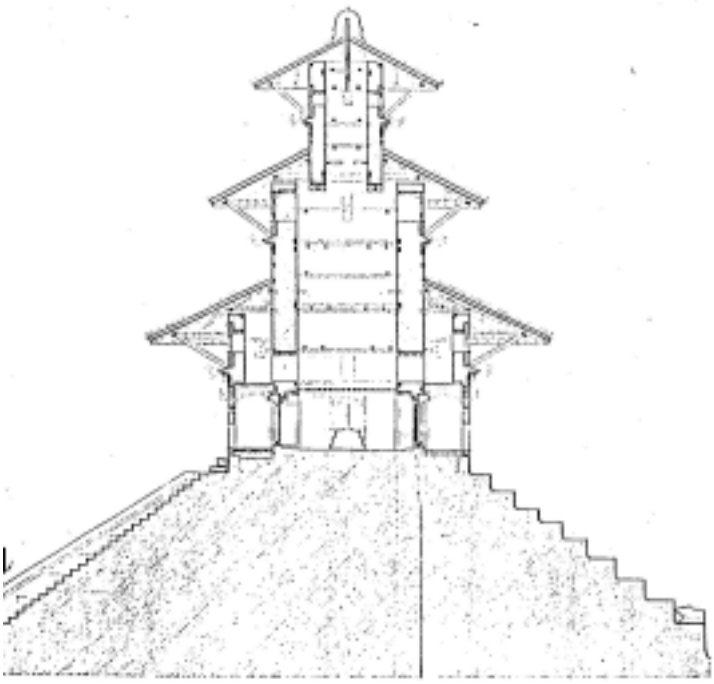

Fig. 9.12 Section through a typical Nepalese Pagoda Source Tiwari 1998

Mutual support systems

Mutual support systems among various sections of the rural community like that of Bungamati, which are defined through traditional caste system, have helped them to collectively cope with the impact of earthquakes and recover afterwards. This is exemplified from accounts of 1934 earthquake which are elaborated later in this chapter.

The above discussion clearly demonstrates that there is a tremendous wealth of local knowledge, skills and capacities, that are embedded both in physical form (spatial planning as well as architecture) as well as social, cultural and economic systems of rural societies in Kathmandu valley, that have potential for mitigation against earthquakes and also contribute towards sustainable

recovery from disaster. However, an important thing to note is that these features are present in only select buildings and even those buildings, which have one or more of these features, may not be fully earthquake proof. Nevertheless, they demonstrate local ingenuity in developing indigenous solutions to face the earthquakes.

In Bungamati village, most of these features, especially triple wall structure, double window openings and columns, timber ring plates and wedges to hold the sloping roof are seen in most of Newari houses and temples. However, as mentioned before, these features do not necessarily make them safe from earthquakes. On the contrary, these structures are at present highly vulnerable to earthquakes. This is discussed in the next section.

In the later sections, we will assess transformation processes taking place in Bungamati in the light of current urbanisation process in Kathmandu valley and analyse their impact on increasing vulnerabilities of rural communities.

9.3 URBANISATION PROCESS IN KATHMANDU VALLEY AND ITS IMPACT

At present, Kathmandu valley is urbanising at a very fast rate, due to several factors, which are leading to very rapid transformation processes resulting in increasing vulnerability of Kathmandu valley to natural hazards such as earthquakes.

The definitive break in the cultural continuity of Kathmandu valley came with the overthrow of the isolationist Ranas. When their policy of restricting entry to the hinterland population was lifted, every citizen from the length and breadth of Nepal gained the right to migrate to the valley. Simultaneously, Kathmandu was flung open to commercialisation and external influence. An insulated civilization was thrust into the limelight as the capital of a modernizing nation-state. The transformation began immediately, if slowly, in the early 1960s. The jolt of what was happening would not come until deep in the years of the *Panchayat* system[12], in the mid 1980s.

Numerous factors contributed to the breakdown of the religious and cultural framework and the spatial structure that had prospered for more than 1,500 years. Exposure to the outside world made single-unit houses and the suburban life-style attractive for those who could afford it. Many Newar families abandoned their ancestral dwellings and life of the *gallis* (lanes) and *bahals*

[12] Panchayat system was quite similar to single party system, where King had the absolute powers. The Panchayat was a body (kind of party) with one ideology. People had the choice to select among personalities with single ideology rather than among various ideologies.

(courtyards*)* of Patan and Kathmandu, and moved outside the perimeter of the old towns into detached bungalows of brick and cement.

The government takeover of properties of the traditional religious trusts (known as guthis) in the 1960s struck deep into the core of the ancient traditional settlement management system, sapping the will of communities to maintain and preserve temples, *patis* (rest houses), *hitis* (sunken water spouts), and other public spaces and monuments. (Dixit, 1994).

Social and economic development, part of the stated ideology of the Panchayat system, resulted in the centralization of power and money in Kathmandu. However, large-scale migration would not begin for a couple of decades. Meanwhile, the values of urban-land more than quadrupled between mid 1960s and mid 1970s).

The growth in the tourism sector began after king Mahendra's coronation in 1956. This accelerated the pace of transformation in Kathmandu valley. The central highway *(Rajpath)* linking Kathmandu with the plains was completed in 1956, which made the valley suddenly more accessible to people, goods and services from all over. Kathmandu came within reach of the plains' market as well.

As the areas immediatelly around the old rural towns were colonized, there was a need to push farther out into the *kaanth*, the periphery. The construction of the Ring road around Kathmandu and Patan, which was completed in 1975, helped make this possible, and the urban octopus steadily appropriated the fields and paddies. Agricultural lands were acquired to establish various administrative and educational institutes. Similarly large tracts of pastural lands of Pashupatinath Temple (*gauchar* area), was appropriated for an airport. Also slowly, those who had money and power privatised many ponds and fields that were part of public domain. Traditional garbage collection collapsed under the weight of 150 tons of solid waste that Patan and Kathmandu were generating daily by the middle of 1970s (Ibid).

This process of urbanisation was accelerated in 1980s, since this period saw Kathmandu acting as a magnet for migrants. These migrants were no longer well to do, rather the poor people who were drawn to the valley in search of low paid jobs mostly in the form of labour or to fulfil growing demands of tourism and carpet industries, which had flourished by then. Moreover, the residential building spree continued over the years, gradually consuming agricultural lands. Also the fertile river basins of holy rivers, Vishnumati and Bagmati were gradually eaten up by urban development.

The traditional building practises employing use of bricks in mud mortar was gradually abandoned to give way for cement and concrete. As a result, many historic buildings, mainly residential ones started disappearing. Interestingly

however, the medieval historic spatial fabric has been very resistant to change, thanks to the cultural significance of public open spaces.

However, what needs to be noted is that most of such developments have been haphazard, without any proper urban and infrastructure planning. Although Kathmandu valley saw five master plans for planned development – in 1963, 1969, 1976, 1984 and 1991 – there was no implementation. His Majesty's government of Nepal with support from UNESCO prepared 'The Master Plan for conservation of cultural properties in Nepal' in 1978. However, it is yet to be implemented by the Government. Lot of money has been spent so far in planning ways and means to develop Kathmandu.

Even now, a couple of plans and strategies are being formulated with the assistance of the World Bank and Asian Development Bank for this very purpose. However, one sees no implementation. An IUCN funded study on "Regulating Growth: Kathmandu Valley" submitted to the Government in 1995, never got endorsed or implemented by the Government.

In the meanwhile the urban area of Kathmandu has expanded from 24 percent of the total area of the valley in 1971 to 67 percent in 1991. There has been a phenomenal rate of growth in the Kathmandu valley's population with in-migration playing a significant role. Besides, Kathmandu has an estimated mobile population of 50,000. The population of Kathmandu municipality was recorded at more than 421,000 during the 1991 census registering a growth rate of 6 percent between 1981-91. The population is expected to reach about 730,000 in 2001 and more than one million in 2011. The total population of the five municipalities, which constituted about 61 percent of the total valley population in 1991, is expected to reach about 71 percent in 2011. If the present trends of population growth and urbanization are allowed to continue unchecked, almost 60 percent of the valley would be urbanized by 2020, say studies. The Kathmandu Metropolitan City (KMC) currently has no legal mandate to control developments beyond its borders or restrict developments in the flood plains and rich agriculture lands.[13] (Yogi, 2000)

One of the significant impacts is that many of the smaller rural settlements like Bungamati, that had their own built form, limited spatial extent and self-sustainable qualities are slowly getting engulfed by haphazardly planned urban fabric[14], posing a threat to their very existence.

[13] Bhagirath Yogi, "Greater Kathmandu. Will it Work?" Spotlight, September 22 , 2000

[14] The impact of this rapid and haphazard urbanisation is very visible, with increasing air and water pollution, destruction of ecological balance and sustainability, loss of cultural heritage and poor infrastructure.

9.4 THE INCREASING VULNERABILITY TO EARTHQUAKES

One of the major consequences of the increasing urbanisation is that many developments are taking place in seismically unsafe locations. Also inner city core is getting densified at a much faster rate. All this is increasing vulnerability to natural hazards such as earthquakes. Today, the entire Kathmandu and Patan cities have only a limited length of winding narrow roads and lanes. Most parts of these cities are inaccessible to ambulance, fire fighting equipment, heavy vehicles, excavators and dumpers. There is a severe shortage of water supply in Kathmandu valley (Upreti, 2001).

The majority of the buildings in urban as well as rural areas (new as well as old) are structurally unsafe to lateral forces of earthquakes. There is no quality control from any agency for new building construction. Many of the old buildings have become weak due to years of neglect and non-maintenance. A national building code was only very recently enacted but is yet to be implemented. The buildings constructed so far are at the owner's own risk. Even the quality of most public and government buildings is highly questionable. Therefore, most private and public buildings, hospitals, hotels and schools are highly vulnerable to earthquakes.

Such a poor fabric, coupled with dangerous geological condition (explained before) has made Kathmandu valley one of the areas that are most vulnerable to earthquakes. If an earthquake similar to 1934 (Nepal-Bihar earthquake with magnitude 8.3) occurs, there will be widespread loss of life and property in the valley. Based on various sources, Kathmandu valley Earthquake Risk Management Project (Dixit et.al. 1999) has estimated that during such an earthquake there may be approximately 40,000 deaths, 95,000 injuries and 600,000 or more rendered homeless in the valley. A conservative estimate shows that 60-70% of buildings in the valley will be damaged heavily. Residences are the most vulnerable structures.

Thus the next major earthquake to affect Kathmandu valley will be an unprecedented disaster especially its aftermath. The rescue operations will be greatly hampered, as there is no adequate equipment in the valley such as excavators, cranes or dumpers. Road access to the valley will be cut off for weeks to months due to landslide blockage and bridge collapses. The airport in the valley may not be operative. All rescue equipment and relief materials will have to be transported by air, probably only by helicopters. There will be severe water supply and sanitary problems. Also there will be great scarcity of firewood to burn the dead and to make fuel for cooking. Transportation within the valley will be most difficult, as many bridges will collapse and roads will be damaged. If the earthquake hits the valley during a monsoon or winter, the

situation will be even worse. All this points to a very gloomy scenario in the event of an earthquake that may hit Kathmandu valley[15].

The above discussion shows that a potential earthquake in the valley will have disastrous consequences both for urban as well as rural areas. In the next section, I will take a detailed look at the current transformation processes and resulting disaster vulnerability of traditional rural communities. These will be exemplified through the case of Bungamati village.

9.5 RURAL TRANSFORMATION PROCESSES IN BUNGAMATI AND THEIR IMPLICATIONS FOR DISASTER VULNERABILITY

Let us now look at the current transformation processes in village Bungamati that are characteristic of such rural settlements in the region. These are based on my observations during the field visit periods in years 1998, 2000 and 2001. Thereafter, I will examine the impact of these transformations on the vulnerability and capacity of such settlements against natural hazards in general and earthquakes in particular.

9.5.1 Changes in built form

The built form and morphological characteristics of Bungamati have remained intact for generations. The last major change was seen after the earthquake in 1934, which caused extensive damage to the village. However, village dwellers recreated the village fabric by retaining traditional architectural and morphological characteristics.

However, at present, the built form of the settlement is changing at a much faster rate than ever before. I observed the following changes: -

Changes in village morphology

In this respect, the relationship of structures and the adjoining or enclosing open spaces has changed considerably. However the most striking observation is that though height of buildings is changing fast, changes in the size of public open spaces is considerably less. Nevertheless, private vegetable gardens are increasingly being encroached. Interestingly the village boundary has remained unchanged, with widespread implications on changes in land use and ownership, which will be discussed later in the section.

[15] Dixit, A.M., L.Dwelley, M.Nakarmi, S.Basnet, S.B. Pradhanang, and B.Tucker, 1999. Earthquake scenario – An effective tool for development planning (a case study- Kathmandu valley Earthquake Risk Management Project)

Changes in traditional structures

Vertical division of houses – As a first step in division among the family, the house is divided vertically along the main central wall between two brothers. However with these kinds of changes, the general spatial arrangement remains the same except for minor changes.

Addition of floors – Most the houses have added one floor to their houses to incorporate increasing family size. This is mostly done when the family size reaches a stagnation point even after vertical division. However, vertical division is essentially the first step in introducing structural changes in the traditional housing. In the case of additions of floors, the sloping tiled roofs are reintroduced but in many cases, flat terraces built in reinforced cement concrete are increasingly replacing these.

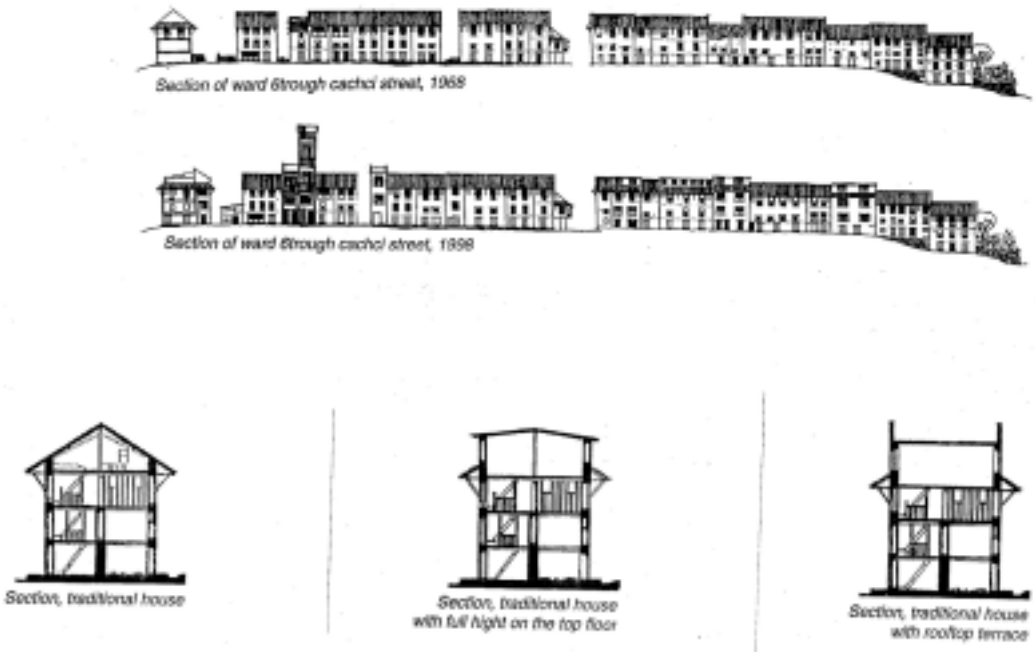

Fig. 9.13 Physical transformation in traditional housing in Bungamati village
Source- Jigyasu et.al. 1998

Change in space usage – As a consequence of structural changes due to internal division among families, changes in space usage also take place. The topmost floor is no longer used as kitchen. Toilets are added to the ground floor level mostly in the backyard.

Change in materials- there is gradual change from sun dried to baked bricks and from mud to lime or cement mortar. There is also a change in external finishes and the exposed brick facades are being increasingly plastered in cement and white washed. The tiled roofs are being increasingly replaced by tinned roofs or reinforced cement or brick concrete flat slabs. In many houses, iron railings are added on the terraces.

Change in openings – People are increasingly changing the shape and sizes of their openings. Wooden carved balconied windows are being replaced with square or rectangular windows. Moreover, their sizes are increased to permit more light in the interior. This is greatly changing the external facades of traditional structures.

Replacement of traditional structures with "modern" constructions

This is mainly taking place in those traditional structures, which are in very bad condition. The inhabitants gather financial resources and pull down their traditional structures, which are perceived to be weaker. In many cases, due to vertical subdivision of traditional properties, the house is replaced in fragments, thereby destroying the scale and continuity of traditional fabric. This aspect will be touched in the following section on 'false perceptions'.

Fig. 9.14 Modern constructions in Bungamati in 2001
Source- Jigyasu et.al. 1998

Construction of new structures in "modern" style

Such constructions are mainly taking place in the vegetable gardens. When the family size increases beyond control, the owners build houses for one of their sons in these garden areas, which are owned by them. Most of these houses are modern since they are faster to build and the material is easily available and probably the labour is cheap. However the quality of these constructions is poor, with improper reinforcements and concrete mix.

Unchanged traditional structures in dilapidated condition

Many traditional houses are found in the state of utter neglect. In such cases, the owners have left these and migrated from the village or they are too poor to maintain their houses.

Implications on physical vulnerability to earthquakes

All these changes are increasing the physical vulnerability of rural communities like that of Bungamati. The structural changes through vertical subdivisions, addition of floors and change in location and size of openings have destroyed their structural integrity and symmetry, thereby greatly weakening their capacity to withstand lateral forces of earthquake. In particularly, vertical subdivision and horizontal addition of floors makes these structures highly vulnerable to earthquakes. Moreover, material changes, which are taking place in a piecemeal manner, are posing structural problems due to loss of original building configuration. Ironically the modern structures are of extremely poor quality, thereby exposing these communities to impending disasters.

However, the most common reason for increase in disaster vulnerability is general lack of maintenance, which is a crucial aspect for traditional buildings. As a result, the mortar has weakened, the wood has deteriorated and the joinery has loosened, making traditional structures weak and vulnerable to earthquakes.

9.5.2 False Perceptions

People consider 'modern' reinforced cement concrete constructions with brick infill to be stronger and symbolising 'higher status'. As such, the physical fabric of the village is changing at a very rapid pace.

Most of those who make good money change over to these constructions. Also due to increasing population and cultural reasons, they undertake vertical subdivision among brothers rather than a horizontal one. While the floor area is reduced, height is substantially increased, to incorporate family members. As a

result, such structures become very vulnerable to lateral forces from earthquakes.

Oct. 2001

Fig. 9.15 & 9.16 Replacement of traditional fabric with modern constructions

Also the quality of construction is very poor. Proper quality control is not maintained over RCC constructions. The bricks and the mortar are also very weak, increasing their physical vulnerability to earthquakes. However the perceptions in favour of modern structures continue to grow as is evident from the following case histories:

Manik Lal Shakya is a 23-year-old carpenter, who owns 10 rupanees of land. He obtained a contract to work for a project in Germany in Expo 2000. After this, he has been getting other projects to make viharas and other traditional structures for hotels etc. Ironically, while he is making money on traditional crafts, he is using the same money to make a new house by demolishing his own traditional house. According to him, his old house was beginning to fall down and was not strong, so he thought it is better to make new buildings than repair the old one.

A Maharjan family also earned good money from carpentry and started to build a new house by encroaching on their vegetable garden. They found it very difficult to repair the old house. So they have started making a huge modern structure on their own (they do not hire any labour) adjacent to the old one. According to the housewife, Kauth Maya Maharjan, the old house is unsuitable for sifting the crops (taking out seeds by beating). Moreover, she would not like to keep her agricultural produce for drying on public land because of insecurity. This is just another example of increasing individuality in Newari Community. Ironically, the quality of new construction is very poor with improper mix and reinforcement.

However, most of the people are aware of the fact that traditional houses are good climatically i.e. they keep warm in winters and cool in summers, while this is not the case in modern structures.

9.5.3 Changes in Land use and ownership

The processes of transformation in Bungamati over the last 30 years can be assessed in terms of changes within and around the settlement in terms of land ownership and usage pattern[16]. Interestingly, while internal densification is taking place within the village, externally forced transition is happening around it. Let us understand these diametrically opposite processes in detail.

[16] The comparison over 30 years is based on the studies done on the settlement in 1968 and 1998. In 1968, a team of Danish architect students and teachers did analysis of the settlement structure of that time. In 1998, students in Urban Ecological Planning from Norwegian University of Science and Technology assessed the transformations over 30 years under the supervision of Prof. Hans Christie Bjønness. The author was part of this team.

Internal changes within village

A close analysis of the current changes in the land ownership status within the village reveals that social segregation (based on the caste system which determined their spatial location in the village) is breaking up and people of different castes are moving together. In fact now, economic forces determine land transactions[17]. As a result, the rich can afford to buy the plots / houses from the economically poor, who are left more marginalized.

When changes to existing structures reach a point of saturation, the private vegetable gardens are being built over. Interestingly, the public and semi-public land within the village is still intact and put to common activities. This is leading to densification of the built form while maintaining the overall spatial extent and morphological form, which has been determined, traditionally by a ritual path and landform.

Fig. 9.17 Bungamati in 1968

Fig. 9.18 Bungamati in 2001

Source – Jigyasu et. al. 1998

Forced transition around Bungamati

It is found that striking changes in land ownership have occurred over the last 30 years. More and more agricultural land is bought by outside people from Kathmandu and Patan who are putting it to residential and public use. This is

[17] Consequences of policies followed over last few decades influenced by forces of market capitalism.

seen particularly in areas along main access roads and in *Guthi* lands. While the land along access roads is bought mainly for commercial purposes, the *Guthi* lands are very vulnerable to residential use by outside people.

Many of these purchased lands are rented out to farmers for practising agriculture, until the new owners have enough money to put up a house or a factory there, which is economically more beneficial. At present there is not much pressure from outside due to economic recession. Thus many people, who have bought the land, have not developed it. Once this recession is over, one may start to see a lot of developments around the village and in no time, the agricultural land around the village will be eaten up. According to the chairman of village development committee (VDC), already approximately 140 rupanees of land have been sold, in the area, most of which belongs to a nearby village, Khokhana, for a boarding school catering to the rich from the city.

Another important aspect seen is that those villagers with large chunks of land rent their land to brick factories, which pay them a meagre rent (Rs. 1400/- per rupanee). On the other hand, they take out large portions of soil from the land (for which the proprietor does not pay) thereby making it infertile and thus unfit for future agricultural use.

According to Krishna Narayan Nikarma (a local farmer), earlier most of the farmers had land but it did not belong to them. It was primarily owned by Ranas (the erstwhile rulers) but used by the local people for farming. In return, they had to give more than half crops to the Ranas. Traditionally, most people who work on these Guthi lands have to pay tax to *Guthi sansthan*[18]. This money is used by the *Sansthan* (organisation) to hold festivals and rituals.

However, the current dynamics are quite different. At present, most of the people in the village own the land but they do not have land registered in their name (source- VDC chairman). Some work as tenant farmers on lands belonging to other farmers or Guthi lands. After a multi-party system was introduced, the government gave full rights to these people working on Guthi lands to sell their land in the free market. This was prohibited earlier. Now, the people cultivating on them can buy these lands from *Guthis* at a very cheap price of Rs. 10,000/- per rupanee[19]. The *Guthis* (the traditional religious trusts) are supposed to put this money in a bank and can only draw interest from it to support their activities. However, the local people, who are desperately in need of money (thanks to extreme poverty, the reasons for which are beyond the

[18] Guthi lands are collective lands owned by traditional religious cooperative organisations. For details refer section on traditional systems.
[19] This is equivalent to approximately 133.6 dollars per 600 sq. metres, which equals to 0.2227 dollars per sq. meter.

scope of this thesis), sell these lands to outside people, who are willing to pay a much higher price.

According to Surya Muni Bajracharya, earlier government provided 4000 rupanees for Machendra Guthi (in Kathmandu valley as well as in West Nepal) and nowadays it is reduced to merely 1000 rupanees. Also the government earlier provided 1200 rupanees to Bhairav Guthi and nowadays it is reduced to just 600 rupanees. According to Sukha Ratna Brahmcharya, who runs Amrapur Environmental development Committee in Bungamati, large chunks of land is sold by some Guthis. For example, Vishnu Bhagwan Guthi has sold 21 rupanees of land out of a total of 45 rupanees. Bhairav nathu Guthi has sold 40 rupanees of land to make a *Patti* (rest house) in Machhendra Bahal. Incidentally it is made in modern brick and cement construction, which is totally incompatible to the traditional ambience of Machendra Bahal. Aaju Guthi also sold around 5 rupanees of land. According to one resident, 600 rupanees of Guthi land belonging to Bungamati has been sold over the last five years. The land is mostly being sold to people from Kathmandu and Patan[20].

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. Local people do not have sufficient financial resources to put this land to an alternative use. As a result, they find it much more economically beneficial to sell off the land rather than continuing to put it under agricultural produce[21].

Interestingly, this land transaction is taking place through lot of Dalals (middlemen) from the villages themselves. These people are always on a lookout for the most vulnerable who are desperate to get money. The middlemen *(dalals*) and property dealers are so strong that they want to control any kind of land use planning to suit their commerical interests. As an example, one of them has bought 50-60 rupanees of land in ward number 7.

[20] Surya Muni Bajracharya, the head priest is not happy with the role of Guthi Sansthan. According to him, they are not sincere in serving the activities of Guthi and indulge in corrupt practises. He complained that when they demand Rs. 200/- for holding the activities, the Guthi Sansathan gives only Rs. 100/- and shows Rs. 1000/- on receipt

[21] The impact of all this is now gradually being felt on the unique natural setting of Bungamati. Very recently, a Boarding school from Patan has managed to purchase 70 rupanees of fertile land between Bungamati and Khokana (a neighbouring traditional village) and embarked on an ugly modern construction at a very big scale. This is now complete and the context of Bungamati has been changed forever.

This was part of the land, which VDC wanted to develop as a residential colony for the villagers. By buying a part of this land, they have blocked the access. Also, I heard from an old single woman from the nearby village,

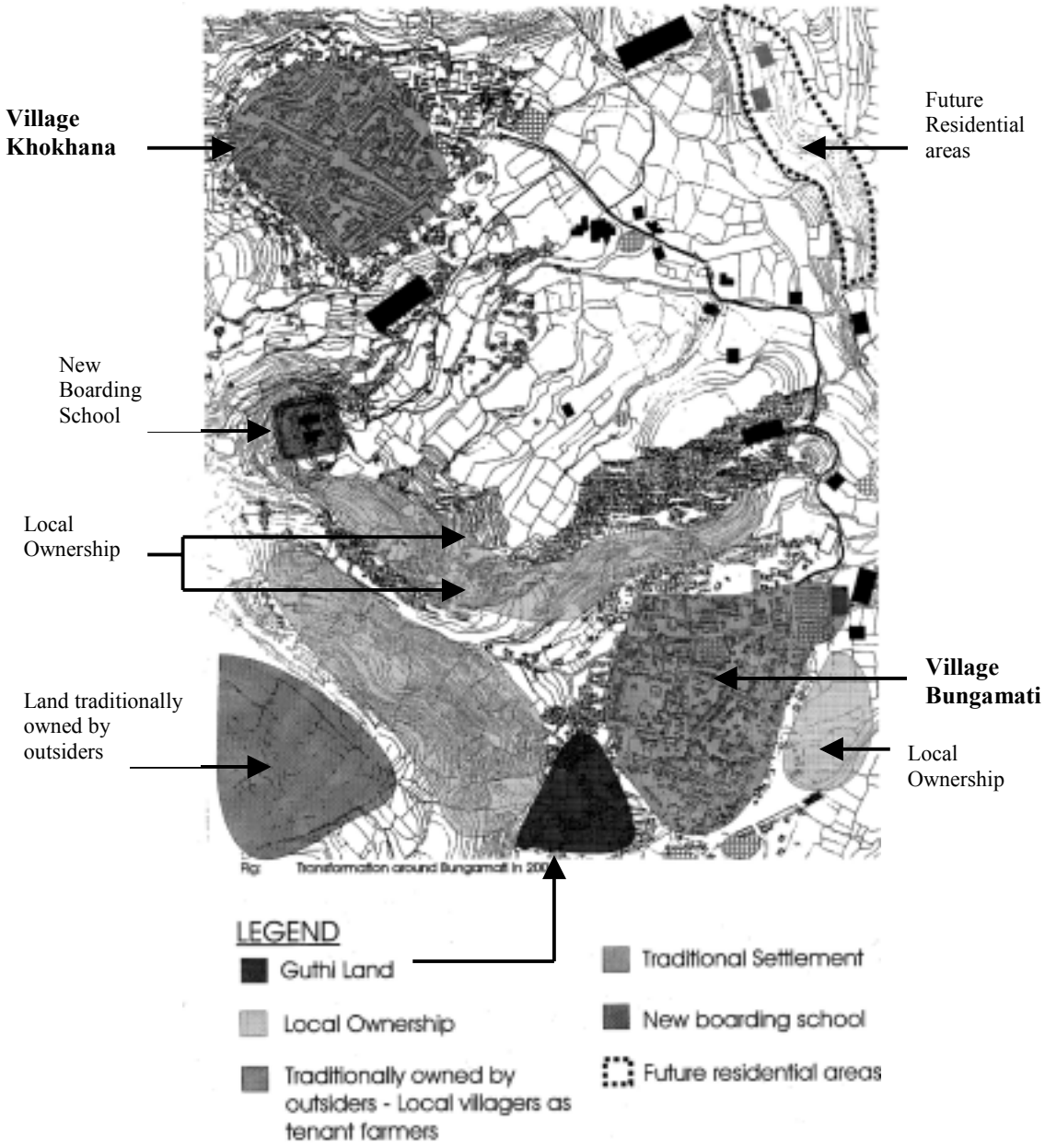

Fig. 9.19 Landuse around Bungamati in 2001
Source – Jigyasu et. al 1998. Updated in Oct. 2001

'Khokhana, how a middleman offered Rs. 500,000/- per rupanee and managed to convince her. When the woman opened the suitcase, she found it full of 1-rupee notes instead of 100 rupee ones. The old woman fainted but could not do enough, since this middleman threatened to kill her. This just shows how strong is the builders lobby and the 'ways and means' they adopt to grab the land by hook or by crook. Such vulnerable groups are forced to sell their land due to various factors.

Underlying reasons for selling land

Lack of economic resources is the main cause of these forced transformations in land use and ownership due to which the people of the village have lost the control over their future. Let us now investigate the underlying causes of this extreme poverty situation.

One of the main reasons for local people selling the land is because agriculture is no longer able to give them enough returns for their produce. Over last few decades, agriculture has lost its economic potential, generated through its raw produce, thanks to the continuous thrust on industrial development at the cost of the agricultural sector. Moreover, agriculture is still practised in a traditional way. Modern technology is neither affordable nor accessible.

Many villagers are not able to grow vegetables and other crops, which can give them good return for their money. In fact many of them have shown interest in growing vegetables. Even many villagers have shown interest in getting training in new agricultural practises. However, they are unable to do that because the land is so far off that they cannot take proper care of their produce. Moreover, they are worried that someone will steal their produce. This is more so because people are no longer taking care of each other's fields.

Moreover, these farmers are not educated, and thus cannot think about long-term consequences of selling their land. Neither can they demand their rights effectively. Also, with increasing family size, agriculture is no longer able to sustain the whole family.

The religious and cultural association of people to the land has changed considerably. Earlier the villagers were willing to offer more services in cash and kind for running the Guthis and maintaining their lands, which unfortunately is not the case now. Land was considered not just an economic resource for exploitation but had cultural meaning and significance for people. The earlier associations with the Guthi land is substantiated by the following statement made by the old head priest, 'Earlier Government took loan from the God and Government had no money to return back, and thus Government may provide land to the God as Guthi land'. Of course, increasing poverty has made the matters worse.

Implications for Disaster Vulnerability

The long-term implications of present land transactions are only now beginning to emerge.

The Guthi land has now been reduced so much that there is hardly any money with Guthi Sansthan to conduct various religious and cultural functions. There is a great threat that these will slowly disappear. Already some functions have disappeared, for example a drama that used to be played during Dessain festival has not been held in the last 10-15 years. The indirect consequence of this is that the close-knit community structure and identity, which were reinforced through these rituals and festivals, is gradually breaking up. As a consequence, people are no longer as co-operative as before. This is crucial for physical as well as psychological recovery in the aftermath of a disaster. We have learnt that after the 1934 earthquake, various social groups in the village helped each other to rebuild the village on their own without much external help.

Also fertile agricultural lands that have traditionally formed their livelihood source are increasingly being sold off and changes in land use are being initiated and this process is being accelerated at a very high rate with each passing year. While the local people may get hard cash in return for these, they are losing out heavily on a livelihood source, which would have helped them in a disaster situation. In many cases, they cannot even produce enough food for their own families and thus have to import food from outside. The absence of a public planning policy to check land-use changes and thereby conserve the agricultural land has served to speed up the process. If this was not enough, government in fact has plans to buy collectively a huge piece of agricultural land and establish a residential colony for outside people[22].

Another consequence of loss of agricultural land to outside people is that people are becoming more and more dependent on external resources for their own sustenance. According to Sukha Ratna, five years ago, people did not have to buy rice, while now, nearly every household has to buy rice. Interestingly, the rice is imported at a cheaper price from outside the country. On the other hand, farmers sell their own produce at a cheaper price to the broker, who then sells it in the open market at a much higher price (sometimes even more than the price of imported rice). According to Surya Muni, earlier villagers did not sell their agricultural produce; rather they paid to the landowners not in cash but in a part of their produce, who (landowners) then paid revenue to the government. Thus, there was no need to sell the land, since they had a mutually supporting system for sustenance. According to him, at that time, one paise[23] was enough to eat and live for one day. People had barely enough food to eat;

[22] Based on the interview with the chairman of Village Development Committee of Bungamati
[23] A coin whose value is one hundredth of a Nepali Rupee

still they were afraid to transact in money. Instead, they were always ready to give free food to the needy, which is crucial in a disaster situation.

Increasing densification within the village is leading to loss of open spaces in the village, which is crucial for immediate rescue and escape in the event of an earthquake. Also, vertically densified houses though sub-division are much more physically vulnerable to lateral forces of earthquake owing to weak foundations and incompatible additions. Loss of vegetable gardens also adds to the loss of some source of livelihood.

All the above factors lead to an interesting scenario, where on one hand, the people of the village are densifying themselves and on the other hand, more and more people from outside are controlling the land resources around the settlement, thereby putting pressure on this compact settlement, destroying its ecology and making it more vulnerable to disasters.

However one must admit that in spite of tremendous pressure for selling the land, still there is enough agricultural land left thanks to the restraint exercised by most of the people. Many of them are not ready to sell their land and some of them do not even want to divide it. According to Jeet Govind Maharjan, a traditional farmer, he would not like to sell his land because that is the only security for his sons. He would like that his sons get good jobs but he is not sure if they get them due to stiff competition. He is also not ready to divide his land.

9.5.4 Changes in Occupational Structure

Besides agriculture, the traditional occupations ascribed to various castes have gradually become obsolete[24]. Certain low caste occupations such as those of butchers have found higher economic viability compared to those of traditional high caste function like that of the priest. This has a positive impact on decreasing traditional social segregation. However, this comes at the cost of increasing economic segregation since some of the people no longer find any economically viable role. On the other hand, certain lower caste groups have been further marginalized economically, for example sweepers. In spite of all these weaknesses, the traditional occupational base was designed to meet the demand and supply within the village and everyone in the community could find a role for himself or herself.

With this kind of transition, the community structure is breaking up fast. The rich are powerful and thus can access all the services, while the poor get more and more powerless. Such a bifurcated community is no longer able to take

[24] The traditional occupations of Newars that have become obsolete are oil pressing, spinning and weaving and leather works

collective initiatives and decisions and implement collective actions, which are crucial both for preparing as well as responding to the disaster.

The impact of crumbling traditional occupational base is that more and more people are changing their occupations. Agriculture is gradually ceasing to be the primary occupation and more and more people are shifting to wood carving and tertiary jobs required in cities.

Woodcarving is becoming the primary occupation of the people at such a fast pace that now almost half of the village youth below 30 years, are engaged in this occupation. Even young girls and women are taking up this profession. In some families, all the children are working as wood carvers. On one hand, this appears to be a positive development that local people have found a source of livelihood based on their own culture. On the other hand, there are some issues, when the situation is analysed with a long-term perspective.

According to Punni Raj Tuladhar, master craftsmen (who has undertaken some prestigious projects in Germany as well as in Nepal), with more and more people taking to this profession, the quality of their products has become very poor, as they want to make more things in a shorter time and tourists are looking for cheaper products. Moreover, these only cater to the needs of the tourists and the 'rich living in the cities for making their homes' or for big hotel owners or for rebuilding historic buildings.

Also, with increase in competition, and presence of middlemen, the local people sell their products at a very cheap price. They are then sold at much higher prices when they reach big retail shops. Ironically, they no longer serve the needs of local people, as they were traditionally supposed to do. According to Punni Raj, the cooperative society that was started 7 years ago has also closed down for last 3 years due to corruption and lack of cooperation and coordination. Some of the members were selling their products at a much higher price to the cooperative society, than they would get by selling directly to the middlemen or tourists. The middlemen lobby is so strong that they are trying every hook and crook to stop tourism from developing the village, so that their business is not affected. However, these craftsmen have started to open their workshops facing the main village streets, to attract the tourists. According to him, he was the first person to open a showroom in the village by putting up signboard, 30 years ago.

Another grave implication of this change in the occupation structure is that children leave their education at a very early age and start to learn this craft. This is very serious as they are no longer able to speak, write and develop themselves intellectually. Also, due to this reason, they cannot demand their rights and participate in decision-making processes. This interestingly is also affecting their own capability to interact with the tourists and demand the right price for their products.

Implications for disaster vulnerability

Traditionally, only two or three families in the village were catering to one kind of craft and it primarily served to satisfy the basic needs of the villagers. For example, the craftsmen were especially skilled to make wooden beams and columns of highest quality, not only in terms of detailed carvings, but also in terms of the sound knowledge of employing certain safety features, which could make these constructions stronger e.g. employing double columns and beams. Also they had knowledge of selecting good quality of wood, treating it and maintaining these constructions. Moreover, people traditionally used mud bricks laid in fresh mud plaster. Interestingly, as mentioned earlier, the structures built with the traditional crafts and skills have sound capacity to withstand earthquake forces[25]. Also, since these use wood and masonry, their reconstruction (in the event of an earthquake) was economically viable (as materials were locally available and many of the materials could be salvaged and reused). In this context, Sukha Ratna told me that due to good quality of construction, many houses during 1934 earthquake were only partially damaged.

However, at present they use poor quality of brick and cement, making their houses more vulnerable to earthquakes. Moreover, with loss of local knowledge and skills of traditional construction, complemented by changing life-styles and growing perception among local people that traditional buildings are weak against earthquakes compared to 'modern houses', the vernacular fabric of the village is increasingly getting lost. This is the result of the modern information technology and the media, which creates images of 'western' way of life. The content of basic education has also a role to play in this.

9.5.5 Changing cultural practices – decreasing level of cooperation

Bungamati is essentially a Newari community. However, in the past few decades, Newari culture is getting lost due to several factors. There is considerable loss of civic pride. As mentioned earlier, this community used to be very close knit and there was strong cooperation between members on various issues that were of common interest to the village e.g. maintenance of common open spaces, helping each other in the time of distress, sharing resources for the welfare of the community. These castes were mutually dependent on each other based on their occupations[26] .

Though social stratification has been greatly reduced in the village, economic segregation has increased many-fold. People have become more self-centred.

[25] By withstanding we mean absorbing lateral forces of earthquake and not resisting these as the modern structures do.
[26] Based on interviews with elderly people in the village and Slusser (1982)

According to Kanth Maya Maharjan, who is a volunteer for giving training and information to pregnant women, the main problem is lack of cooperation from the community. She says that they do not want to change and gives the main reason for this to be lack of education. They do not consider common problems for the community as a whole.

Moreover, the local cultural practices (songs, dance and drama) are forgotten and people are more influenced by foreign movie songs. Traditional mask dance is replaced by dance competition on foreign songs. This is also owing to loss of income from guthis, thanks to the sale of guthi lands, which has been explained earlier.

Surya Muni, the head priest also mentioned a lot of changes in the village since 1934. Earlier, people were very religious minded and were ever ready to help each other. Human values, ethics and responsibility could be seen. However, now rituals and religious practices have changed a lot. Moreover, people do not cooperate and have become more selfish. The village has also increased in its size. 30 years ago there were only nearly 75 houses in each ward, now there are 200 to 300. Further, regarding social situation, he said that earlier people were themselves aware of the roles and responsibilities according to their caste and thus did not try to dominate each other; rather they used to help each other within their castes. Such mutual help was observed in recovery after 1934 earthquake. At that time, only one family was doing carpentry and the master craftsman helped people with sound building technology in wood based on his skills and experience. Here one must acknowledge that the statements of head priest could not be corroborated. These may be nostalgic and partly false.

9.5.6 Weak Local Governance

Until 30 years ago, the chiefs *(Dware)* conducted everything in the village. During that time, under Panchayat system, people were afraid of law.

After democracy was established in 1991, Village Development Committee (VDC) has been set up to initiate grass root governance. However, in spite of good intentions and democratic set-up, the VDC is effectively devoid of money and power that is required for real actions on the ground. Then there is an issue of current administrative boundaries that do not always take into account the traditional boundaries. This makes it difficult to link management decisions to existing social relationships[27]. Moreover, the current top-down system of planning and management is bound to overlook the needs of the people at the village level[28]. Last but not the least, blame can be placed on the present

[27] The lowest administrative boundary is called ward. It is demarcated along the existing road structure while traditional boundaries are demarcated on the basis of open space structure.
[28] A District Development Committee (DDC) controls the finances. Though the actual decisions are in the hands of VDC, they cannot really implement their decisions since the finances are

planning policies, which completely overlook such important aspects as that of land-management. As mentioned earlier, there is no role and responsibility of VDC in disaster preparedness and mitigation. Moreover, they do not exercise enough power to take effective decisions in this regard.

9.5.7 Conclusion

The result of all these processes has been an increase in general vulnerability of such rural communities as Bungamati. Therefore, if an earthquake strikes the region now, its impact will be of untold proportions, not only in terms of loss of life and property but also in terms of the capacity of the local community to recover from it. This scenario is very different from what used to be the case earlier. The historical records from the earthquake in 1934 suggest that almost the entire village suffered heavy damage, however people could redevelop this village with their own skills and resources and reinforce cultural identity by recreating traditional fabric. Of course, one has to realise that this was a painfully slow process.

9.6 INITIATIVES TOWARDS DISASTER PREPAREDNESS AND MITIGATION AND RECOVERY

In the previous section, I have taken a detailed look at the current transformation processes in rural communities, which are contributing to their increasing vulnerability to earthquakes. In this section, the institutional and community measures for dealing with earthquakes will be discussed, both in the historical as well as present context. In the historical context, the recovery and reconstruction initatives of the government and the local community after 1934 earthquake will be analysed through secondary sources as well as from primary interviews. In the present context, the existing institutional efforts towards mitigating and preparing for natural hazards in general and earthquakes in particular will be discussed.

This section looks back at the recovery initiatives taken in the aftermath of destructive 1934 earthquake. These help us to have an overview of the strengths and weaknesses of the recovery initiatives of the government as well as local communities. It will be interesting to analyse these in comparison to the current situation and the likelihood of possible scenarios, which are based on the current management systems in place and determine recovery initiatives being practised elsewhere in the region (notably in my other case study areas of Latur and Gujarat).

controlled by DDC, who release money for VDC in standard instalments, irrespective of the actual need at a particular time.

These are primarily based on various literary sources, namely Gopal Raja Vansawali, a long poem titled '*Nabbe saal ko Bhaunchala ko sawai'* by Khadganand Sharma and the chronicles of Maharaja Juddha Shumsher Jung Bahadur Rana (Prasad)[29], who was the ruler of Nepal at that time. Here one must acknowledge that since these are literary sources written by loyal subjects of the erstwhile rulers, they may tend to glorify the work done. However, there are some interesting facets especially relating to official and people's initiative in reconstruction, mainly demonstrating the importance of self-reliance. Older people from the village, who had experienced the earthquake and the recovery operations initiated afterwards, give the primary inputs in interviews.

9.6.1 Recovery and reconstruction initiatives after the 1934 Earthquake

Policy level initiatives by the Government

As mentioned earlier, the earthquake that occurred around 2:15 PM on 15th of January in 1934 was one of the most destructive earthquakes that hit the region causing tremendous loss of life and property in Kathmandu valley.

Maharaja Juddha Shumsher Jung Bahadur Rana ruled Nepal at that time. There had been earthquakes in Nepal before but this was the severest of its kind in the near past. It surpassed all others in intensity and magnitude. Moreover, there was no record of organised relief operations by the Nepal Government in the past.

From the secondary sources, I gather that lot of emphasis was placed on self-reliance in the recovery initiatives by the government. The community, irrespective of their social segregation, showed themselves equal to the occasion and began a vigorous search for their lost property with the help of the police and the army. People themselves moved the debris in the neighbourhood of their dwellings and began to construct thatched shelters for themselves. Many of them began to reside on the ground floor of their dilapidated houses.

Self help housing was promoted in the reconstruction efforts that followed. One of the important policy decisions of the Government was to remove the existing restrictions on the use of the forests so that the people might make good use of the timber for house-building purposes. On the other hand, shattered doors, windows and beams dug out of the ruins provided material for fuel (Prasad, 1972).

[29] Dr. Ishwari Prasad, 'The life and times of Maharaj Juddha Shamsher Jung Bahadur Rana of Nepal', Ashish Publishing house.

Huge quantities of Khar (species of timber) and bamboos was transported to the interior for the rapid reconstruction of thatched dwellings. Besides these, some of the other measures that were undertaken for reconstruction were: -

1. Arrangements for the supply of timber from government go downs at very cheap rates.
2. Laying of brick-kilns and limekilns for supplying bricks and lime dust at concessional rates.
3. Builders, masons and carpenters sent for to facilitate building operations.
4. Import of 250,000 of corrugated sheets, their sale and the remission of ropeway charges and custom.
5. Sanction of Rs.150,000 for the removal of debris.

The Government recommended the building of low-roofed earthquake proof houses and asked the people to wait till the next monsoon was over for building double storied and large houses. The report by Geological Survey of India was adopted. Accordingly, it was advised that heavy buildings should not be constructed until six months after the earthquake. Buildings should be given adequate foundations and proper bracing. They should be of sound materials, one storied and as light as possible. In the belt of maximum intensity, the use of steel or timber framed structures was recommended.

Bhukampa Pidita Sahaya Krina (Earthquake relief fund) was also set up by the government for advancing money to those sufferers from the earthquake who for want of ready money in hand, required loans for the repairs and reconstruction of their houses. Applicants, desirous of help, were to be granted loans of some amounts with interest for four years on the security of their respective houses. The loan was repayable either in instalments or in one lump sum within the prescribed period of four years, according to the convenience of the payers.

While responsibility for rebuilding houses was left to the owners, various government buildings, palaces, temples, rest houses, bridges were all repaired entirely at the cost of the state. Within a year and a half, with cooperation of officials and non-officials, recovery efforts were completed with some changes in the urban fabric like widening of roads and introducing ‘New Road’ in Kathmandu city core.

The emphasis on using existing local knowledge and capacity for reconstruction after the earthquake is demonstrated by the following speech made by the King to describe the procedures of administering relief,

> “Our countrymen are known to be laborious and industrious in their every day life; they are seen to help themselves as best as they could in meeting their own wants. In fact the hill men and so many others in the valley too often make stone or brick walls for their houses, prepare the

> needful timber for themselves and the members of their family, and act as labourers to help in the construction of their modest structures. Further, some ordinary labourers are seen here working with the masons, supplementing to some extent the work of the latter. Should all these be offering help to one another by the assiduous application of the knowledge and experience gained by them in any particular line, the construction of the houses will be very much expedited and more economically done. A particular kind of work is not, as a rule, confined to a particular class of people with us here: According to a tribal saying of the Gorkhalis a body of men containing 12,000 men in all is described as one consisting of 12,000 oil men, 12,000 washer men and 12,000 barbers. This does not certainly signify the different castes or classes of men to which they belong, but men, each and every one of who is conversant with the work of an oilman, a washer man and a barber. Why not add 12,000 masons too to that saying if it could be managed? (Ibid, p. 76)"
>
> "Again our men are known to work as amateur bricklayers too and get separate brick-kilns made for themselves when they require bricks for constructing their buildings. Let them vigorously work in this line as well and help themselves as much as they can let supplies of timber direct their attention towards bringing in large quantities of timber from forests, and let traders and shop-keepers see that their go-downs and shops have a plentiful supply of the building materials and make them available to the public at cheap rates, following the motto that quick returns with small profits pay much more than a slow return with a large profit. (Ibid, p. 76)"

It is not clear though how the whole management system actually functioned and to what extent it was successful. There are many questions which arise; How many people could actually afford to make use of the financial support, what kind of constructions they undertook and in what time and how? But one thing is clear that a considerable amount of emphasis was placed on self-reliance and the bottom line is that the entire architectural fabric was recreated along with the cultural ambience and spirit of the place.

Community initiatives to rebuild Bungamati after 1934 earthquake

According to Surya Muni Bajracharya, the 78-year-old main priest of Rato Macchendranath, in 1932, there were only 300 people in the village. Most of the houses were heavily damaged. However, many of them were partially standing, especially at the ground floor level. This was due to some special features, which have been described earlier.

To rebuild houses, people collected funds from different sectors. Juddha Shamsher Singh Rana, the ruler at that time came to see the damage and

declared a compensation of Rs. 6000/- per family. However, the local chief at that time thought that if everyone gets this much amount, then his or her status will rise. Therefore, eventually some families only got Rs. 60/-, while others didn't get any amount.

The families salvaged broken bricks and wood from the rubble for rebuilding their houses. People collected mud and made fresh bricks and mortar. They also cut their trees for making windows. Initially, people only built ground floors and covered with thatched roofs. The tiled roofs were replaced only after a few years. The village rebuilding was entirely people's own initiative. People mainly cooperated within their own castes. The whole village was eventually rebuilt in 3-4 years.

Interestingly, traditional morphology and architectural character was recreated by introducing some changes to improve seismic performance. One such example was introduction of double columns, which can still be seen in few surviving houses. One such house, where I observed this is the one belonging to the master craftsman of the village.

At present, it is very difficult to trace pre-1934 houses and also those houses where structural modifications were carried out. This is because, the nature of recreated built fabric and open space character more or less remained unaltered after the quake. Moreover, such an analysis will need a very detailed architectural investigation, which was outside the scope of my work.

However, a crucial question, which remains to be answered is what will be the physical impact in case such a devastating earthquake strikes the people of the village again? How will the government respond and the local community cope with the disaster? How will eventually recovery and rehabilitation of Bungamati take place and what kind of fabric will be recreated?

9.6.2 The current institutional measures and status of preparedness and mitigation of rural communities against earthquakes

Earthquakes are a recurring natural phenomenon. In recent history, Kathmandu has almost completely been destroyed in two great earthquakes (1833 and 1934). It is therefore not a question whether a major earthquake will strike Kathmandu (or other parts of Nepal) or nor, the question is when will it strike? Scientists are not yet able to predict the time of occurrence of a future earthquake. As such, mitigation and preparedness are the only ways left to minimize the impact of an earthquake disaster. In the previous chapter (South Asian context), we have already looked at the current status of disaster management in Nepal and also various agencies that are involved in it. In this sub-section, we will briefly review the institutional measures for reducing

vulnerability of rural communities to earthquakes. This indeed is a great challenge in the light of current urbanization processes in the valley.

While the vulnerability of such settlements as Bungamati continues to increase, various international and local NGOs are carrying out sustained efforts towards disaster preparedness and mitigation. Worth mentioning here is the name of one NGO called 'Nepal Society for Earthquake Technology' (NSET), which is running a vigorous programme of educating the villagers about the earthquake threat and preparing them to meet the disaster. Efforts towards mitigation are also being carried out through construction of model houses and schools that demonstrate earthquake- resistant technology.

However, there is little or no involvement of the grass root organisations, institutions at village level (like Village Development Committee) in planning and mitigation measures against earthquakes or for any disasters for that sake. Therefore, the Village Development Committee for Bungamati has no roles and responsibility and power to take decisions on matters relating to disaster mitigation and preparedness. Moreover, earthquake preparedness fall much below their priority list considering more urgent issues confronting the villagers relating to their day-to-day survival[30].

Therefore, one can conclude that the existing measures have been more or less ineffective in reducing vulnerability of rural communities.

9.7 CONCLUSIONS

This case study has brought forward the current dynamics of transformation that are affecting rural communities in the region and contributing to their increasing vulnerability to earthquakes. It has further explored the underlying causes for these processes.

Since time immemorial, these communities have been developing within their own terms of reference. They had developed their own mutually defined relationships and means of self-sustenance. They may not have had enough resources, but had certainly developed some skills and capacities for their optimum use. Earthquakes and the ways and means to deal with those were not identifiable fields in themselves. Rather the means to cope, deal and recover from them were internalised in their cultural systems. Interestingly, these communities have never been static. Rather, they have always changed, though mostly on their own terms and have absorbed outside influences.

[30] These views are based on the interviews with the chairman of village development committee of Bungamati and also other officials in the Ministry of Rural Development in Nepal.

However, things have changed drastically due to the impact of current development processes, as a result of which, the external pressures of urbanisation and growth have become so strong, that local systems are no longer able to deal effectively with them. This is coupled with growing loss in civic pride and increasing perceptions favouring use of 'modern' technology as panacea for their development. Ironically, these communities neither have the resources, nor the knowledge to adapt to these external influences. Ultimately, they end up becoming more vulnerable to natural hazards.

The current dynamics also have a telling effect on local skills and resources, which are slowly getting lost, out of choice or compulsion, thanks to the over riding factors.

This case also brings out the challenge confronting the rural communities that are changing from close knit communities with definite socio-cultural and economic set up to highly complex and dynamic multi cultural societies. In such a situation we are confronted with a challenge as to how can we mobilise community resources that are crucial to preparedness and recovery from a disaster situation and how can we get the emerging societies to secure these resources for their common benefit.

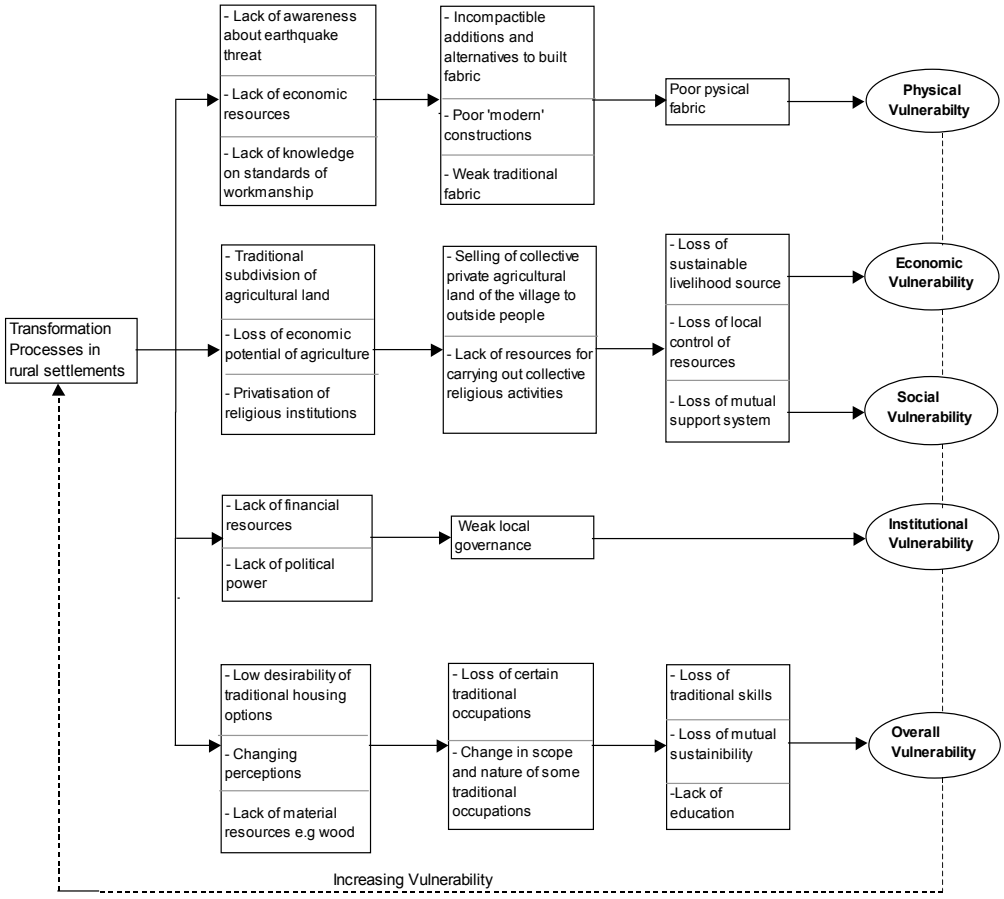

Fig. 9.20 Progression of pre-disaster vulnerability of rural settlements in Kathmandu valley

PART VI
CONCLUSIONS

10. COMPARATIVE AND COMBINED ANALYSIS

10. 1 INTRODUCTION

In this chapter, I will discuss the key findings of my research based on the comparative and combined analysis from the three case study areas. First, I will elaborate on the nature and content of local knowledge and capacity of rural communities that have potential to mitigate the impact of earthquakes. Next, various transformation processes that are taking place in these communities, will be discussed to highlight pre-disaster vulnerability of rural communities, for their impact on local knowledge and capacity. This will be followed by a discussion of various approaches towards post-earthquake rehabilitation, through comparative study of the two case studies of Marathwada and Gujarat. The impact of these rehabilitation processes will then be discussed over a period of time, which is 9 years in the former case and 9 months in the latter one. Last but not the least, underlying causes of disaster vulnerability will be discussed for their consequences on pre and post disaster situations. The Chapter will end by highlighting key issues which emerge from my research findings. These issues will be further discussed in depth in the next chapter titled 'Theory and Method Revisited'.

10.2 LOCAL KNOWLEDGE AND CAPACITY FOR EARTHQUAKE MITIGATION – EXISTING STRENGTHS *(Refer Table 10.1 in the appendix)*

10.2.1 Physical Planning and Building Aspects

The scope and extent of local knowledge and capacities of rural communities for earthquake mitigation, preparedness and recovery is complex and dynamic, since these have evolved over centuries. At the physical level, these are embedded in the construction systems, use of materials, building design and organisation. At the spatial level, it can be identified in locational aspects as well as in the morphology and well-sized public-escape places in the fabric.

The applied part of the knowledge embedded in physical aspects is related to traditional crafts and skills, that are still practised by rural artisans who work with locally available materials, notably stone, mud and wood in rural communities of the region.

Spatial and locational characteristics

Traditional knowledge for earthquake mitigation and preparedness is not only manifested in buildings and structures, but also in morphological form of village as well as house design. These qualities are briefly explained below: -

- The extent of village boundary is delimited through traditional constraint for example ritual paths. While on one hand this leads to densification of built fabric, it serves to preserve rural ecology and land as a sustainable resource.
- The most important aspect of traditional morphology is public and semi-public open spaces, which are maintained by the village community and are crucial for emergency escape in the event of an earthquake.
- Many traditional houses with private courtyards also help in emergency escape.
- The locational aspects of many rural settlements take into consideration their relationship to fault lines or local geology, for example, many traditional settlements in Kathmandu valley and Marathwada are located on rocky base, which helps in making firm foundations.

Technical knowledge for seismic safety embodied in traditional buildings

Traditional building knowledge can be rediscovered by closely studying surviving buildings and structures that embody this knowledge. It is important to note here that only in rare instances, one can find a single building with all earthquake safe features. This is because traditional buildings, especially vernacular housing is rarely a single end-product. It is a continuous process of incorporating additions and alterations, which may include some earthquake safe features added in response to a particular earthquake. These features may eventually get rooted in the building culture of the region, in part or in the whole.

A very significant feature of many traditional buildings is their capacity to absorb and dissipate energy rather than resist it through their strength. In contrast to modern reinforced concrete buildings, which are more or less bonded monolithic systems, traditional buildings are designed like combination of various materials that exist in a particular pattern, which distributes lateral forces of earthquakes. This organisation or disorganization is crucial for a building to stand or fall in the event of an earthquake. Here the threshold limits are not important as in modern buildings. This is the very reason that many traditional buildings stay up, when today's conventional wisdom may expect them to fall down. Earthquake safety is a relative term and there cannot be uniform standards to judge seismic performance of these buildings, especially since these buildings use different materials and technology. Therefore the

level of earthquake safety can never be assured by incorporating these features.

Another significant aspect, which contributes to good seismic performance of most of the traditional buildings in the case areas, is the extensive use of wood, which is an excellent material as far as earthquake safe building construction is concerned. This is because it can absorb and dissipate forces very effectively. Moreover natural qualities of timber to expand and contract improve seismic behaviour substantially.

An investigation of traditional buildings for their seismic behaviour suggests that the behavioral strength of these buildings lie in their sophistical timber joinery, which permits flexibility of movement when lateral forces of earthquake strike these buildings.

Repair and Reconstruction

Another important quality of traditional buildings is that many building materials especially stone and wood can be retrieved easily from the rubble and reused for reconstruction. This proves to be economical for rural communities. Also minor repairs can be easily done compared to the modern structures due to easy availability of local skills.

10.2.2 Skills for using Local Resources

The rural communities have traditionally been able to get an access to locally available material resources, and have developed skills to put these to optimum use. Many of these skills have great potential in mitigating the impact of earthquakes and also achieving sustainable recovery after natural disasters.

The traditional skills for building demonstrate use of local materials, which are available locally such as wood, mud and stone. This makes them both, sustainable as well as affordable (in cases, where local community gets an access to these resources) for the local community. For example, traditional techniques of ‘adobe’ construction in Marathwada demonstrate skillful use of locally available mud, rammed and mixed with hay. These constructions if properly maintained, can significantly help in reducing the loss of life, in the event of an earthquake.

The case studies have shown that land is a valuable resource with the rural communities, which is considered more than just an economic resource for exploitation. Land has significant cultural and social meaning for the local villagers, as is exemplified in the case of Guthi lands of Kathmandu valley. Here, land is collectively owned and guarded by the whole or a section of the rural community, thereby becoming a significant community asset, to be

utilised collectively in the disaster situation. Besides, local ownership of agricultural land is a crucial livelihood sources, which can assure basic survival in critical situations after the disaster.

10.2.3 Mutual Support Systems

The scope of local knowledge and capacity also extends to social and cultural mechanisms by which rural communities not only mitigate the effects of natural disaster but also cope and aid in physical, social and psychological recovery. These mechanisms are embodied in mutual support systems that are determined by traditional relationships. These prove crucial in recovery and reconstruction after earthquake through collective help and shared labour. As stated earlier, traditional cultural practices also help in forging community solidarity, which is crucial for recovery afterwards. Take the example of traditional wood craftsmen, in the case areas of Kathmandu and Marathwada. Their traditional role and responsibility was to cater to the building needs of local community through their skills and they got returns for their service in kind (like food grains). Besides, social networks (at joint familly and neighbourhood level) also helped communities to provide material and psychological support to cope with the trauma. This is well exemplified in the case of Gujarat, where traditional community networks of Gujaratis were very helpful before outside relief could pour in.
These mutual support mechanisms have enabled local community to cope with extreme natural hazards such as earthquakes and recover through collective initiatives.

10.2.4 Informal livelihood mechanisms

The coping capacity of local communities is also evident in the informal ways of using the existing opportunities to generate alternate sources of livelihood. These demonstrate the capacity of rural communities to innovatively use the available resources, considering the available opportunities and constraints. For example, after earthquake, construction of concrete blocks for reconstruction has become small-scale industry in Kutch region of Gujarat. This case also provides us with other examples of informal activities being undertaken by the local communities amidst rubble like those of Barbers, whose immediate demand after the earthquake was not shelter, but mere provision of razor blades, so that they can restart their livelihood.

10.3 TRANSFORMATION PROCESSES AND RESULTING VULNERABILITIES OF RURAL COMMUNITIES IN PRE- EARTHQUAKE SITUATION

(Refer Tables 10.2 and 10.3 in the appendix)

In the three case studies, the transformation processes taking place in rural communities in India and Nepal are studied for various aspects, namely, changes in built form, landuse and ownership, occupational structure, social structure, cultural practices, general perceptions and grass root governance. These transformation processes have affected local knowledge and capacity of these communities and thus increased their vulnerability to natural hazards such as earthquakes. First of all, let us briefly discuss these transformation processes:-

10.3.1 Changes in Built Form

In spite of the fact that sizable knowledge for mitigating impact of earthquakes is embodied in traditional buildings, the present reality is that these are very weak and vulnerable to earthquakes. This is very evident from my observations in all the three case study areas.

The main reason for these is: -

Poor masonry

One of the main problems with vernacular buildings is poor quality of masonry. This is clearly seen in poorly bonded stone masonry in Marathwada and Kutch. Significantly, the problem is not with the material itself (as widely perceived), rather the problem is with quality, size and shape of stones, the type of bonding and the quality and condition of mud mortar used. The same can be said for brick masonry in Kathmandu valley, the quality of which has deteriorated to a considerable extent.

In all the three cases, general ignorance of good masonry contruction practices is seen. In Marathwada, behind the façade of nicely shaped ashlar stone masonry, the core is made of random rubble in loose mud mortar without through stones and interlocked corners. The same is the case with Kutch.

Lack of maintenance

Another important reason, which contributes to increasing vulnerability of these structures is that these are not maintained properly. Many traditional maintenance practices have been abandoned due to lack of resources and discontinuity in knowledge of traditional skills.. For example, linseed oil, which was normally applied for protecting wood, has been abandoned in

Marathwada. As a result, the wooden structural members have rottened to a considerable extent, making them weak and brittle to lateral forces of earthquakes. Also traditional repair techniques have been more or less abandoned. For example, replacing damaged portion of stone masonry with properly cut stones laid in mud mortar is now being replaced with random rubble masonry, which is sometimes strangely laid in cement mortar.

Incompatible Changes

Another major factor is incompatible changes in building form and technology, done to these structures especially over the last few years. Many of them are vertically subdivided or an additional floor is added without undertaking required structural changes. For example, vertical subdivision and addition of floors of houses in Kathmandu valley have made these structures highly prone to lateral forces. These changes are mainly done to accommodate increasing members of the joint family. Changes or new additions of openings also affect seismic performance of buildings.

Drastic changes are also seen in many cases, where local people replace their standing traditional fabric with modern constructions, which in many cases is of very poor quality, due to lack of technical knowhow. This is mainly because of over-riding perceptions of local people, preferring modern constructions as stronger and symbolising high status.

However, many changes are subtle and thus take place over long time. For example, addition of mud layers over roofs in Marathwada have resulted in substantial increase in vertical loads of these roofs, without corresponding changes in walls.

Another main change is replacement of traditional building materials in part with modern materials, thereby damaging the original configuration and structural integrity of these structures. For example, many stone constructions in Kutch and Marathwada have become weak because stones laid in mud mortar are replaced at many places with bricks or concrete. Also in many structures, traditional joinery details are replaced with simple nailing of joints.

10.3.2 Changes in Landuse and Ownership

One of the main changes affecting rural communities relate to changes in traditional land use and ownership pattern. Before, I comment on the changes, I must accept that in rural communities in India and Nepal, land tenure has traditionally been concentrated in the hands of socially and economically priveliged sections, while the majority have worked as landless tenant farmers. However, agricultural land around the settlement has been a (more or less)

steady source of their livelihood and has belonged to the villagers in that sense. Moreover, these communities derive their cultural identity from it.

However, the current global dynamics of market economics and local power structures are significantly changing the local relationship to land. Increasingly, the rural communities are forced to sell their private or collective land to these socially and economically priveleged people from urban areas, more out of compulsion than choice, thanks to the increasing rural poverty. The consequences of this are multi-fold. The land use is changing from agricultural to residential, public or commercial. While on one hand, it is destroying the traditional rural ecology, on the other hand, it is depriving rural people of their sustainable source of livelihood. This process is well exemplified by the case of Bungamati village in Kathmandu valley.

The result of this process is grave on the landless tenant farmers, who are increasingly migrating to urban areas in search of livelihood opportunities.

10.3.3 Changes in Occupational Structure

The building skills of rural communities are embodied in their traditional occupational structure, which is determined through castes. However, their scope and nature is increasingly changing. For example carpenters in Marathwada are no longer making timber understructure for houses. Similar is the case in Kathmandu valley, where wood carvers are only catering to the needs of tourists. Also some of the traditional skills are getting lost because the craftsmen are changing to other occupations, due to lack of demand. For example, traditional stone carvers and extractors are difficult to trace now in Marathwada region. Interestingly these skills contributed to a great extent in improving the earthquake safety of traditional stone houses in the region.

10.3.4 Changes in Social and Economic Structure through caste mobility

Social vulnerability of rural communities in India and Nepal is primarily due to increasing social segregation among various sections of the community. Ironically, on one hand, the mutual roles and responsibilities, that were dictated by caste system are breaking down; the horizontal solidarity within the castes is increasing. Also as a result of the new economic system, some socially deprived castes (like Khadgi; the newari caste of butchers) are able to become economically strong, while others (like Shakya; the Newari caste of priests) are becoming economically weak. This is resulting in caste mobility and slowly but gradually the caste system is being replaced by ‘class segregation’. The result of increasing social and economic segregation within rural communities is that it is increasingly becoming difficult for the community to reach collective decisions on matters of common values and interests. This is clearly

seen in the case of Bungamati village, where traditional religious institutions that served the matters of common interest for the whole village are getting weaker. This can also be said for local governance systems, which are increasingly controlled by socially and politically powerful groups.
All this has negative implications on collective coping capacities of rural communities to recover from natural disasters.

10.4 POST EARTHQUAKE REHABILITATION AND ITS IMPLICATIONS ON DISASTER VULNERABILITY

(Refer Tables 10.4, 10.5 and 10.6 in the appendix)

My research findings from the two case studies of Marathwada and Gujarat have shown how pre-disaster vulnerabilities, are reinforced and even increased in some instances, as a result of the policy decisions and social, cultural, economic, political and institutional context for relief and rehabilitation in post disaster situation. Assessing their implications over time, eight years in the former case and nine months in the latter case does this.

The approaches for rehabilitation followed in Marathwada and Gujarat, essentially differ in terms of the process for reconstruction. While contractors drive the main approach towards reconstruction, the one in Gujarat is owner driven. In the former case, government and donor agencies were the main stakeholders, while in the latter case, the main actors are non-government organisations and the local community. There are some major differences in the policy approaches in the two cases. In Marathwada, relocation is the main strategy for reconstruction. In the second case, financial compensation is the preferred strategy. There are also differences in the type of technology transferred in the two areas; modern technology in Marathwada and alternative technology in Gujarat.

Also in Gujarat, for the first time, the concept of semi-permanent shelters was conceived as an intermediate shelter between temporary and permanent shelters. The implications of this policy is also interesting to observe and take lessons.

The Gujarat case is also unique since here for the first time an effort is made to use rehabilitation as an opportunity for rural development at grass roots level, through setting up of village resource centres by Abhiyan; the consortium of NGOs, for collection of data at village level. The data pertains to various aspects of rehabilitation needs of various sections of village community and is passed to the government to take adequate actions. All the major differences in the rehabilitation approaches in the two cases are articulated in the table 10.4 in the Appendix.

The dynamics of post earthquake rehabilitation and its long-term impact on local knowledge & capacity and disaster vulnerability are studied by analysing various decisions and their consequences. The transformation processes that follow in the physical fabric (in terms of the status relocation, self-help and contractor driven reconstruction and repair and retrofitting programme) are analysed for both the cases (Refer table 10.5 in the appendix). In the following discussion, I will discuss in detail, how pre-disaster vulnerabilities are reinforced or increased.

Reinforcing Pre-disaster Vulnerabilities

First, let us discuss how existing vulnerabilities are reinforced through the policy decision of relocation, as exemplified by Marathwada case. Here relocation of villages destroyed the ecological relationship of local people with their agricultural land and moved them away from their source of livelihood. Many of them became landless, as their land was taken away for relocation. This has reinforced the process of increasing loss of local land resources from the villagers and has further marginalised certain sections of the community by making them landless. Interestingly, the financial compensation does not substitute for their agricultural land, which is their sustainable asset.

As a consequence of negative effect of relocation, people are even going back to their original sites. Also taking a lesson from Marathwada, majority of the people rejected the official plan of relocation for the most affected villages in Gujarat.

Besides, the criteria for allocating reconstructed houses on the basis of the existing size of land-holding has reinforced the existing social and economic inequity. This further marginalises traditional artisans, since in many cases, they do not possess any agricultural land.

As discussed before, the traditional built fabric is already vulnerable in pre-disaster situation due to discontinuity of knowledge, incompatible additions and alterations and lack of maintenance. Due to the same factors, the reconstructed self-help housing in post disaster situation is also of poor quality. This is exemplified both in the case of Marathwada and Gujarat. In the earlier case, in spite of so much money being spent on contractor driven reconstruction using heavy reinforcement, people have reverted back to ‘contemporary traditional’ unsafe practices. This shows that newly introduced earthquake safe technological options have not been internalised into the building culture of the region.

Another significant factor, which reinforces the existing vulnerability, is lack of power and resources with local government institutions. Even in rehabilitation process, these institutions are not delegated with significant roles and responsibilities, because of which sustainability of the interventions is put

to question. Lack of accountability and resulting mistrust between the government and local communities is another issue, which comes forward in the Gujarat case.

Creating new vulnerabilities

The decisions taken as part of post disaster rehabilitation can not only reinforce existing vulnerabilities, it can also create new vulnerabilities. In both the cases, 'modern' and 'urban' layouts and house designs in reconstructed villages built through contractors raise the issue of cultural compatibility. The long-term negative consequences are seen in Marathwada, where local people have made changes in the tailor made fabric to suit their way of life. In some instances, people have even vacated these villages and moved back to their old village sites.

A related issue is concerning over-riding perceptions on behalf of engineers as well as local people favouring the use of 'modern' village layouts and housing designs, without actually looking into their feasibility considering the resource constraints and without proper technical knowhow. As a result, the 'modern' constructions are of poor quality and in some cases, more vulnerable than the existing fabric.

The allottment of houses on the criteria of the size of land-holdings has not only reinforced the existing disparity but has also created new ones. The existing social network determined by joint family and neighbourhood units is broken since the individual household are separated. Interestingly, in many cases, the social network has got reinforced in these villages after some time and some households have even moved with their relatives and old neighbours by vacating these reconstructed houses.

Another important reason for increasing vulnerability is unsustainability of 'earthquake safe building technologies', which are introduced by the government, donor agencies and the NGOs in the reconstructed houses. The 'modern' technology using reinforced concrete and heavy reinforcement has proved to be totally alien, unaffordable (by local people) and also climatically unsuitable in these regions. This is seen in contractor driven reconstructions in both the case study areas. In the case of Gujarat, 'alternative' technological options have also been introduced by some NGOs by using local materials. This has certainly reduced the cost of construction. However, these technologies are seen as 'products' without focussing on the 'processes' by which these can get internalised with the local communities. Moreover, they do not build on existing local building skills. The sustainability of these technologies is in doubt once these NGOs withdraw from the scence. The result is that either people revert back to unsafe 'contemporary traditional' practices or make poor quality constructions using these technologies, in the absence of proper resources and technical knowhow. This certainly contributes

to increasing disaster vulnerability in the long run, in spite of such money being poured into the rehabilitation process.

A negative consequence of tailor made reconstruction by various agencies is increasing dependency of the local people on outside skills and resources and loss of self-initiatives and mutual support systems.

Last but not the least, is a shocking implication of increasing social segregation and local power structures, because of which the community is unable to take collective decisions on matters of mutual interest. Moreover, the interests of the marginalised are often overlooked, when rich and powerful sections take decisions on behalf of the whole community. This may have far-reaching negative implications in the post earthquake rehabilitation process, as is exemplified in Gujarat, where the official decision to leave the decision about relocation on the village community. This led to their physical break up since the powerful sections of the community decided to relocate, while the less priveleged were left behind, sometimes even devoid of basic infrastructure.

10.5 EMERGING KEY ISSUES & CHALLENGES FOR REDUCING DISASTER VULNERABILITY

The underlying causes for increasing disaster vulnerability, both in pre and post disaster situation are essentially linked to the existing social, economic and political context and existing policy approaches for managing disasters. This in many instances, is a result of existing development processes, whose implications on rural communities are in the form of social and economic poverty and inequity, market economy and lack of proper education. In the context of my research findings, five main issues and challenges are brought forward in the context of rural communities of India and Nepal for reducing their disaster vulnerability through building local knowledge and capacities. These are :-

1. Loss of material and land resources (from rural communities).
2. Loss of Traditional Skills
3. Cultural Incompatibility of external interventions
4. Increasing Social and Economic inequity
5. Weakening of Local Governance.

With respect to the above-mentioned issues and challenges, various delimmas of dialectical nature emerge in the case of these communities. These issues and associated delimmas will be discussed in depth while revisiting the existing theories on disaster and vulnerability, the role of local knowledge and capacity and the paradigmatic base for disaster management, particularly through post-disaster rehabilitation, in the following chapter.

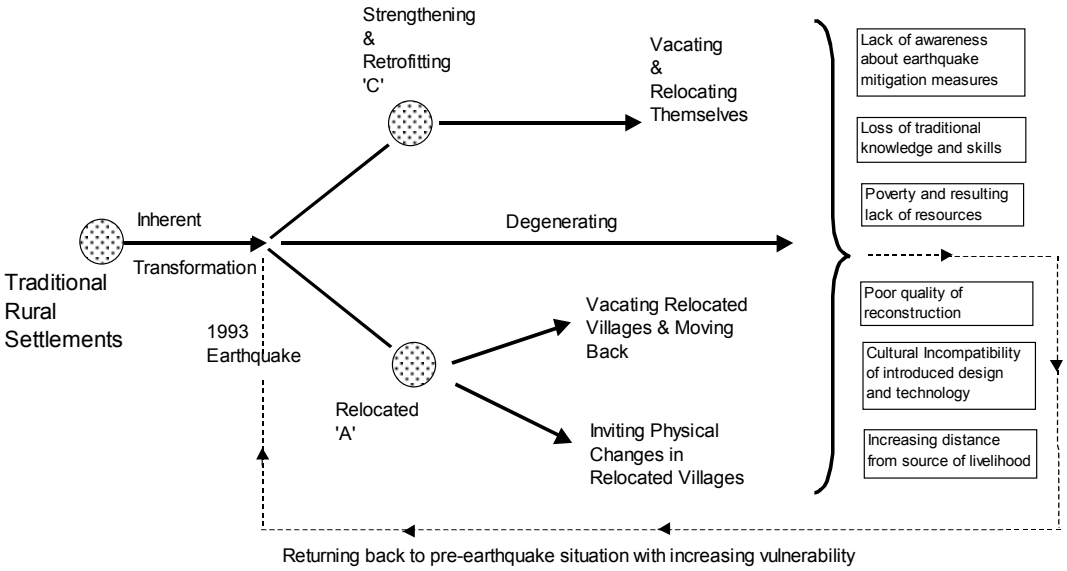

Fig. 10.1 Conceptual diagram showing impact of post-earthquake rehabilitation in Marathwada after 7 years

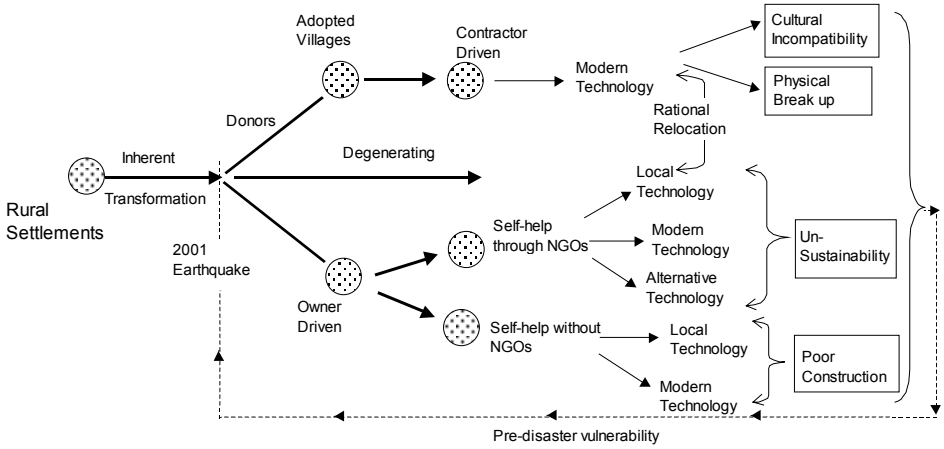

Fig. 10.2 Conceptual diagram showing impact of post-earthquake rehabilitation in Gujarat after one year

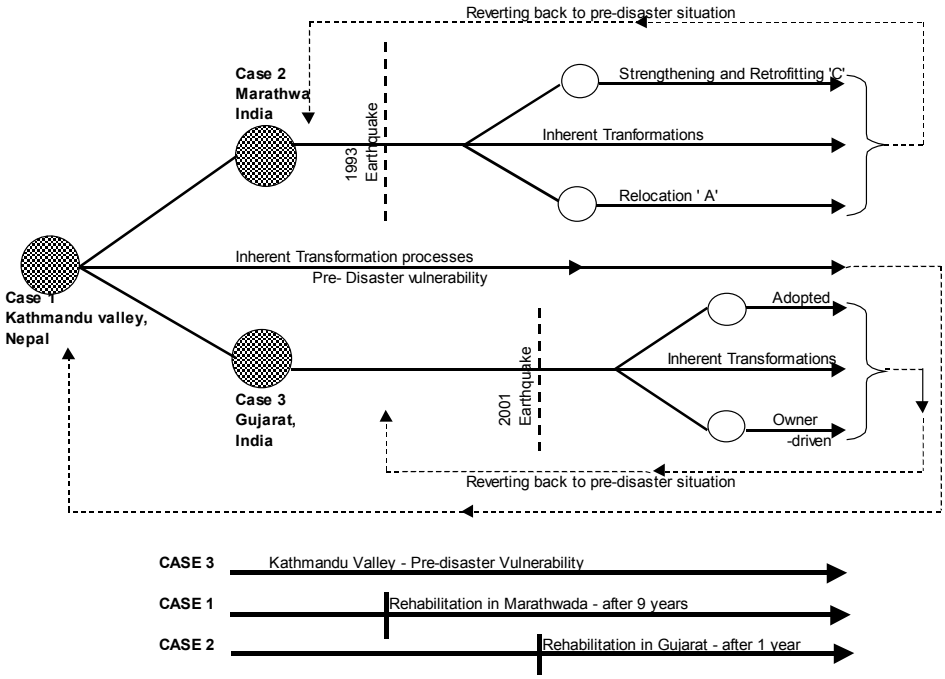

Fig. 10.3 Conceptual diagram showing combined analysis of the three case study areas

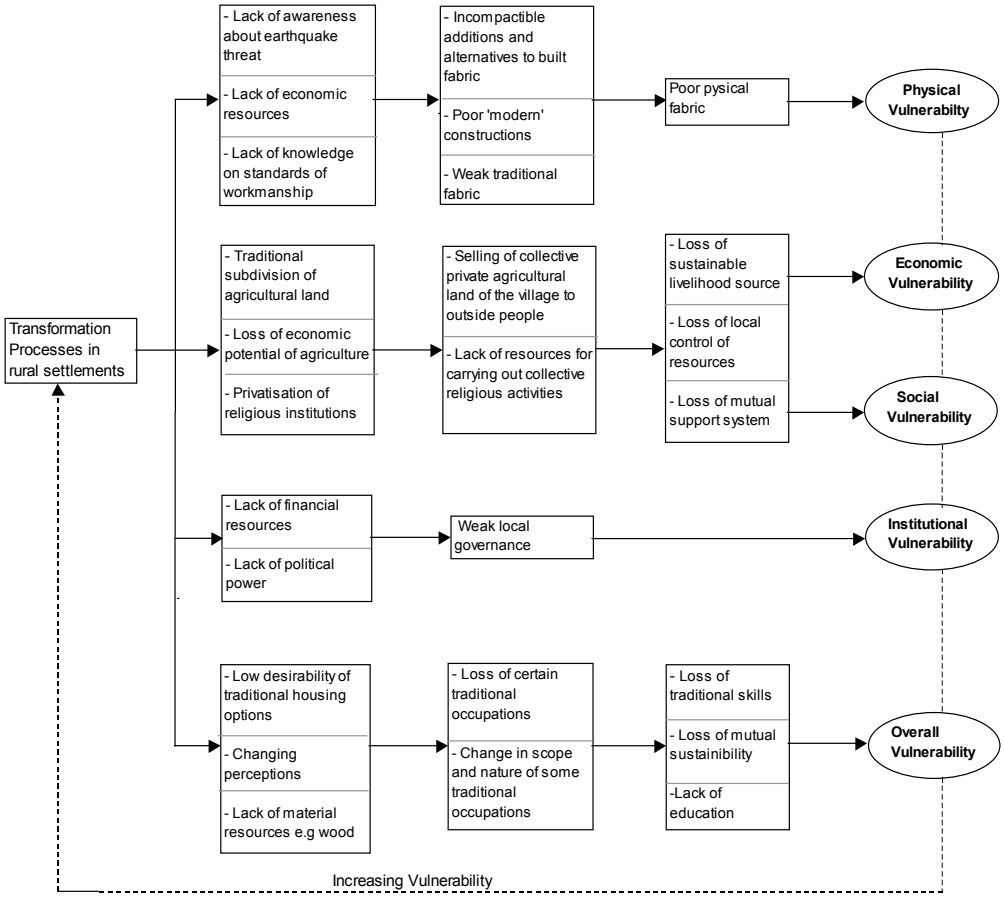

Fig. 10.4 Progression of pre-disaster vulnerability of rural settlements in Kathmandu valley

11. THEORY AND METHOD REVISITED

11.1 DISASTER VULNERABILITIES AND CAPACITIES – THEORETICAL LINKAGES

11.1.1 The Complexity of Relationships

In my research, I have followed an integrated temporal framework for analysis as suggested by Cuny, 1983 and Lewis, 1999. Accordingly, disaster, reconstruction and development are seen together for their impact on disaser vulnerability of rural communities in India and Nepal. The empirical findings have thrown a significant light on its theoretical understanding and link to local knowledge and capacities; how they influence each other.

Vulnerability is essentially a set of negative conditions within a community, which may be a consequence of several factors. This may be due to inherent weaknesses of these communities or a consequence of external threats. In contrast, local knowledge and capacity are a result of positive conditions in a community. These are the internal strengths of these communities and their external opportunities.

However these negative and positive conditions do not make vulnerability and capacity as mutually exclusive. My findings have shown that disaster vulnerability is both the cause and effect of degenerating local knowledge and capacities and of conditions of deprivational poverty. This brings us to a critique of the capacitities and vulnerabilities analysis Matrix by Anderson (1989)[1] which does not explore the relationships between vulnerabilities and capacities as mutually influencing conditions, rather looks at them independently.

Disaster vulnerability is complex in the following respects :-
- It can encompass various aspects such as physical, social, attitudinal, economic etc.).
- It may hold true with respect to one hazard or multiple hazards.
- It may hold true for the whole community or certain sections of it.

The complex relationships between vulnerability, poverty and local knowledge & capacity in the context of rural communities in India and Nepal will be explored in depth, in this chapter.

[1] Mary Anderson in her matrix defines vulnerabilities and capacities as two mutually exclusive terms, which are described in terms of three main aspects, namely physical / material, social /organizational and motivational / attitudinal. She further makes strict division between vulnerabilities and capacities on the basis of gender and economic status.

11.1.2 Dynamic nature – as 'products' and 'processes'

While exploring the interlinkages between vulnerabilities and capacities, a significant aspect is their dynamic nature. This implies that vulnerability does not remain the same over a given time period, especially after a natural hazard such as earthquake. On one hand, certain aspects of vulnerability before the hazard form the context or setting for the disaster. On the other hand, reactive actions (as relief and rehabilitation process) may help in eradicating or reducing certain kinds of vulnerabilities, changing certain vulnerabilities to different kinds and reinforcing or compounding or strengthening or even increasing others. The vulnerability conditions can also change with time on their own through certain inherent community coping mechanisms or other practices.

Vulnerability to natural disasters can therefore be understood as 'products'[2] and 'processes', existing before as well as after a disaster. Certain aspects of disaster vulnerability preceed a disaster, and thus create a setting for the disaster, thereby contributing to its nature and severity. These can get reinforced and changed after a disaster as a result of various response decisions, as well as the overall social, economic, political and institutional context. In spite of good intentions, certain aspects of vulnerability are carried forward since the underlying causes remain.

Also local knowledge and capacity that have potential for disaster mitigation, are accumulative, continously updating or changing (in positive or negative direction) in response to various situations, which are taken as part of learning processes through local initiatives. The internal world views or perceptions dictate these learning processes and communication mechanisms, which develop over time, leading to creation, reception and accumulation of new knowledge.

Considering the dynamic nature of vulnerability and local knowledge and capacities, I will again reflect on Mary Anderson's Matrix, which takes a static view on these terms. Communities are always in transition and as such, their vulnerabilities and capacities increase or decrease accordingly. Besides, there may be some hidden capacities and vulnerabilities, which may not be linked to one hazard or another but nevertheless characterise the strength and weakness of these communities in general. Moreover, in many situations, vulnerabilities and capacities pertaining to various hazards may compliment each other.

When seen in a time continuum, disaster vulnerabilities and capacities in the context of rural communities in India and Nepal can be described as the processes, which are the 'products'of -

[2] The term 'product' is used here in a non-physical sense.

1. Inherent social, cultural and economic transformation processes within communities.
2. Normal (under) development process.
3. Immediate and long-term disaster response, includiing those of emergency relief models by various NGOs.

These three factors affect the vulnerability and capacity of rural communities, and also affect each other.

In the following discussion, I will elaborate each of the above aspects of disaster vulnerability and capacity in detail, highlighting the nature, delimmas and challenges in the context of rural communities in India and Nepal.

11.1.3 As 'Product' of Social, Cultural and Economic Transformation Processes within Communities

The rural communities in India and Nepal have traditionally been coherent (to quite an extent!) entities with distinct social hierarchy but well-defined roles and relationships. In this respect, they have essentially embodied main characteristics of Geminschaft societies, which have been discussed earlier in the theory chapter.

However these communities are transforming in many respects, one of which relates to inherent structural changes in traditional patterns and relationships within communities, which determine their mutual support systems. These contribute to lessening their vulnerability, although one must admit that some of these patterns and relationships are exploitative in some respects and lead to increasing vulnerabilities of certain groups. Moreover, the inherent transformation processes of these communities also extend to changing perceptions and thinking processes, which strive for anything which is 'modern', whether it is the way of life or the built form.

These structural changes are mainly due to the predominant forces of globalisation and changing political and economic context, because of which the traditional systems and social and resource relationships, that have defined these communities for generations are breaking up. The nature of communities, which are emerging in its place, present a complex picture, which is very different from the industrial societies, termed by Tönnies as Gesselschaft societies.

Social vulnerability in the context of south Asian rural communities is very much linked to widening social and economic segregation, which gets further reinforced with local political power structure. This has weakened the collective coping and response mechanisms of the communities. As a result, social and economic inequity has further increased, resulting in increasing vulnerability of certain marginalized sections.

While we lay aside the pros and cons of caste system as described by the likes of historians, sociologists and anthropologists, the present reality as seen by me in the case study areas is very different from the 'ideally' conceptualised caste system. The reasons for these changes are very much rooted in history. The most significant effect of British rule on the caste system was the increase in the horizontal solidarity of individual castes and the facilitation of their release from the local multi-caste matrix (Srinivas, 1998). What has happened afterwards is that the solidarity within caste groups have further got strengthened in post independence era in India, due to several factors[3]. This certainly has long term repercussions especially in the way communities respond in the aftermath of disaster. This is well exemplified in the case of Gujarat, where social polarisation has lead to physical break up of villages during post earthquake rehabilitation process.

Looking from an inter-generational perspective, the present generations of these communities can rightly be described as one of the "Lost" generations, since they are neither able to use their traditional systems, nor able to adjust and take the benefits of 'modernisation'.

11.1.4 As 'Product' of normal (under)development Process

Vulnerability of rural communities is certainly a direct or indirect result of the dominant paradigm of development. Such a paradigm is by and large made up of the some assumptions and resulting practices. In some form or other development has implied modernisation – the transformation of "traditional" society (characterised by dependence on particular social forms and cultures, as well as on the whims and dictates of nature) towards "modern" society (characterised by control over nature, by individual free choice, and by independence as freedom from given social and natural reality. Also such a paradigm assumes that 'Development can be created and engineered'. It is something, which is brought, to and for some, by others who presumably are more developed. Moreover, it is assumed that development is linear and predictable. Put another way, there is a direct line between cause and effect, between input and output (Kaplan, 1999).

Such predominant notions of externally driven 'modern' development are having negative implications on rural communities. Firstly, the agencies in charge of development perceive 'modernisation' as panacea for development of 'backward' rural communities, without actually comprehension of the local frames of reference – their worldviews, needs and priorities. The result of this is cultural incompatibility and unsustainability of interventions. As a result,

[3] One of the factors influencing this is the increasing politicisation of castes. Politicians from various caste groups have strengthened their vote banks by appeasing their own caste members through various incentives given through reservations in jobs and other means.

rural development approaches in India and Nepal have failed to some extent to meet the their basic needs and enhance their capabilities.

The consequence of such a development process on rural communities is that they are increasingly loosing access to local resources, especially land. The question of choice and access to resources is fundamental in any discussion on rural poverty, which will be discussed later. Increasing rural poverty in the region is also driving rural people to urban areas, leaving behind their skills and knowledge, to search for opportunities. However, most of them end up getting marginalised in urban areas also.

11.1.5 As Product of immediate and long-term disaster response

The case studies have shown that disaster vulnerability is not only a pre-disaster condition. It is also a product of external human interventions and myths or perceptions of decision makers, undertaken as post-disaster decisions or actions, both immediate relief and long term rehabilitation, that in fact are originally intended to reduce vulnerability against such natural events. This is either because of wrong official policies for undertaking relief and rehabilitation or in many instances, a result of emergency, relief and rehabilitation models by NGOs. Many of these policies and models are dictated by the dominant paradigm of development, which is explained in the previous section. Take the case of Marathwada and Gujarat, where during post disaster rehabilitation, the decision-makers perceived provision of 'modern' and 'city like' layout and housing for the villages, as benchmark for their development. The negative consequences of these in the long run are evident in the Marathwada case. Also in these areas, provision of reconstructed houses is thought of as an end product for development of villagers.

Besides wrong policies, the ineffeciveness may be due to the overall social, economic and political context, within which disaster management takes place. In fact, existing context shapes disaster management, which in turn also shapes the context. The case studies of Gujarat and Marathwada have shown that wrong policy approaches can reinforce and in some cases, even increase existing resource dependencies, social inequity and at the same time, overlook local knowledge and capacities. There are several core issues, which emerge as a result of my empirical findings. For example, community participation in disaster management depends largely on the local power structure, which ironically, is reinforced by existing social segregation. Theoretical discussion on this issue will be done later.

Another significant issue pertaining to disaster management practised in India and Nepal is that it has become a highly specialised discipline and various professionals and decision makers perceive various approaches for mitigation

and rehabilitation within their own disciplinary field. For example, policy makers perceive relocation as a safe option based on the technical criteria of seismic safety, without considering the relationships to land, culture and livelihoods. Similarly, housing reconstruction is seen as a physical end-products, without paying heed to the process of rural housing and its link to social structure, way of life and local economy. Similar issues emerge on the questions of transferring technology, which can make the structures highly resistant to earthquakes, but throw open questions on their affordability, cultural compatibility and sustainability in the context of rural communities in the region. Theoretical debate on these issues will be carried later in the section on 'Vulnerability and Cultural Compatibility'

11.1.6 Conclusion – Redefining Disasters

The above discussion throws light on the perspectives to the fundamental question; What is a disaster (Quarantelli, 1998). The complexity and dynamism of vulnerabilities and capacities, makes 'disaster' a very loose and vague denomination, which does not have a starting or an ending point. It can only be measured for the phenomenological discussion of the nature and the increase and decrease in vulnerabilities and capacities before and in response to specific natural hazards.

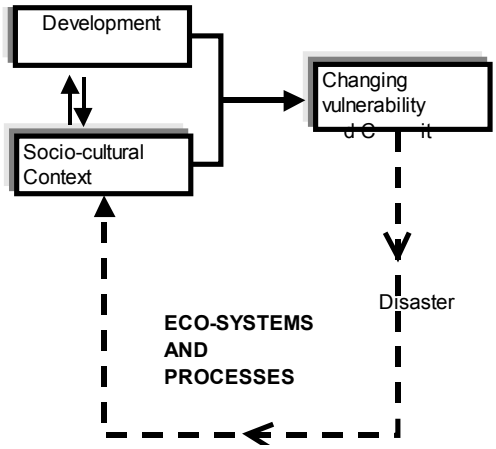

Fig.11.1 Relationship of disaster, vulnerability and development

Therefore, discussion of phases as pre-disaster or post disaster will not be appropriate. Rather, the shifts in magnitude, scale and severity of vulnerabilities and capacities need to be looked at various stages with reference to the particular hazard event, that catalyses these processes into disaster situation. These stages are :-

1. In the normal situation (without impact of natural hazard).
2. In the emergency situation (when the natural hazard has struck, extending to a few days or months after the event)
3. In the transition phase from relief to recovery (extending to a few months to a year after the event)
4. In the rehabilitation phase (over the years, when the rehabilitation process takes place).

5. After the rehabilitation phase in the long run (to assess the impact of post natural hazard interventions)

The above discussion also prompts me to reflect on PAR and Access Model by Blaike (1994)[4]. This model essentially describes how vulnerability situations develop by elaborating on the causal relationships. However, the model is linear in its conception and conceives disaster as an end-product.

In the above discussion, development is a fundamental context within which all the above situations are intervened and take shape on the ground. Such a development is either externally driven or driven by the local communities. Therefore, in the disaster management cycle, development is not a phase in itself, rather it interacts and affects separately, each of the above situations and in turn, each of them are affected among themselves, ultimately shaping the developmental context itself.

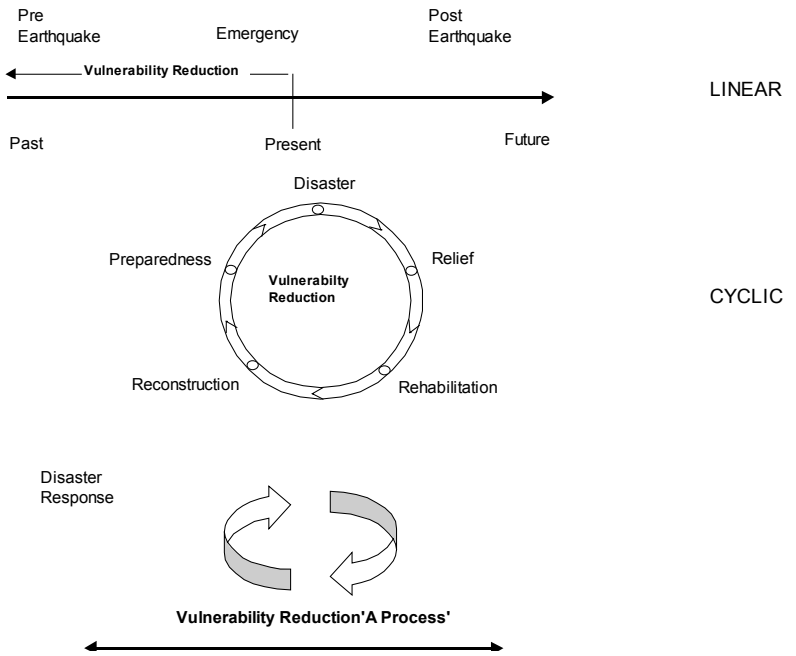

Fig. 11.2 Vulnerability Reduction – Linear or Cyclic ?

[4] PAR is a simple model of the way in which 'underlying factors' and 'root causes' embedded in everyday life give rise to 'dynamic pressures' effecting particular groups, leading to specifically 'unsafe conditions'. The access model is a more magnified analysis of how vulnerability is generated by economic and political processes. (Refer section 3.2.3 for details in the theory chapter)

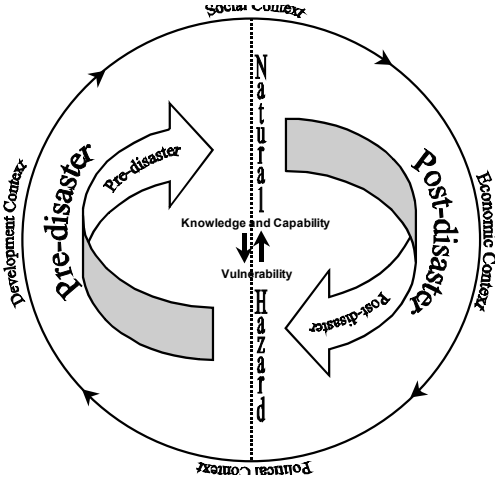

Fig. 11.3 Vulnerability and capacity as a dynamic process

11.2 CROSS-CUTTING ISSUES

As explained before, my research findings have demonstrated that the impact of development on vulnerabilities and capacities of rural communities (pre as well as post disaster) raises broad issues related to the control of resources, cultural compatibility and sustainability of liveilihoods, equity, empowerment and governance. These point to several key issues and deilemmas of dialectical nature for reducing vulnerability of these communities to natural hazards such as earthquakes.

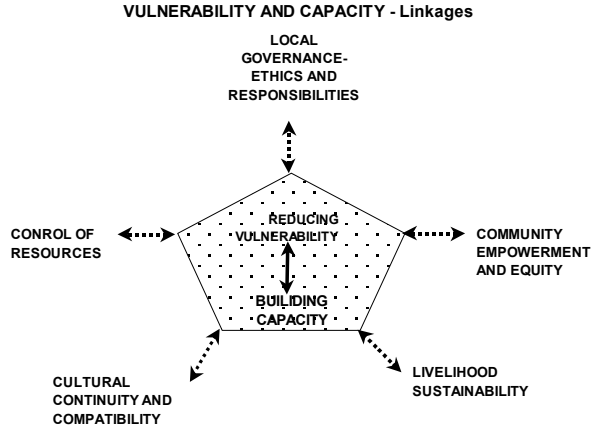

Fig. 11. 4Critical factors linking vulnerability and capacity

11.2.1 Poverty and Local Control of Land and Material Resources

One of the main sources for evolution of local knowledge and capacity of rural communities are the development of skills for using the locally available material resources. These include building materials such as stones, wood etc. Land is certainly one of the most valuable resource, which has defined ecological relationships of these communities for generations.

Various cultural practices have determined how human beings in a particular geographical context have related to their environment and the resources available at their disposal. Such territorial relationships are not only governed by the physical needs but also 'sub-consciously' governed through deeply embedded world-views.

In the context of rural communities in the region, disaster vulnerability and land is very much linked to such changing relationship of land. Take the case of relationship to land in Bungamati village in Kathmandu. The way land resources have traditionally been used as collective and symbolic entities have preserved the rural ecology for generations and helped in mitigating the effects of natural hazards.

However, when the same cultural processes interact with externally driven development (which are mainly driven by new market forces of capitalism and neo-liberalisation), the land resources get exploited as mere commodities for sale. This has happened more out of force than out of choice, thanks to the consequences of 'modern and progressive' and 'centralised' notions of the current development. As a result land is increasingly being fragmented or sold and lost, thereby posing a big challenge to sustainable rural future.

In fact, such a development, that was supposed to reduce the vulnerabilities, created the vulnerabilities of certain sections, while helping a handful of groups with power and control over resources. Ironicallly, while land as a collective resource is depleting, it is increasingly used as a criteria of segregating community members in post disaster rehabilitation. Both in Latur and in Gujarat, reconstructed house and plot size has been decided on the basis of the size of land holding. As a result, land as a symbol and pillar of community solidarity is increasingly being replaced by a status symbol with widespread repercussion on already weakened community structure.

The link of disaster vulnerability to access of resources has also been articulated by Winchester (1992), who states that vulnerability is affected by availability of and accessibility to resources, and on the personal and domestic level, by defencelessness and the inability to cope with risk, shocks and stress. Two characteristics of the daily lives of vulnerable individuals and groups are

immediately responsible for increased exposure and decreased capacity to cope and to recover. These are: -

- Lack of access to a variety of services and information (e.g. health care, credit, technical assistance, education, etc.)
- Lack of resources in the form of income, assets, reserves, social support etc. Often it is particular groups of people who suffer these lacks of access and resources

However it is important to note here that the conditions of vulnerability are not synonymous to a state of poverty. Poverty is determined by historical processes that deprive people of access to resources, while vulnerability is signified by historical processes that deprive people of the means of coping with hazard without incurring damaging losses that leave them physically weak, economically impoverished, socially dependent, humiliated and psychologically harmed (Chambers, 1989:1). Of course there is often a strong correlation between access to resources and the ability of people to prepare or recover from hazard. But the simple identification of the poor as vulnerable fails to explain how people at the same income level do not suffer equally from disaster (Hewitt, 1997:147;Wisner, 1993:127). However, one finds the answer, when one considers aspects, which are beyond mere economic aspects of poverty. For example, in south Asian communities, poverty is very much linked to inherent socio-cultural weaknesses and local power dynamics.

This definitely has its effects on local knowledge and capacities, in many ways as is evident from the case studies. The physical vulnerability increases, as people are no longer able to maintain their existing structures and the motivational vulnerability is affected as people's ability to engage in creative processes is seriously affected by concerns for everyday lives that result from poverty. Moreover, lack of availability or access to resources lead to general disappearance of some basic skills for the want of said resources.

The link of vulnerabilty to deprivation and poverty is also well articulated in the 'Capability approach' as advocated by Amartya Sen[5]. In his original conception (1980), this approach was proposed as a broad ethical theory with greater thrust that the existing moral theories of justice, with regard to achieving equality or impartial treatment of individuals. Sen argues for the space of 'capabilities'- rather than that of income, utility, liberty, or primary goods- as being the appropriate space in which equality should be assessed. The inequity thus produced leaves certain sections of the community more marginalized and further vulnerable to disasters.

This further affects coping capacity of the people, after the disaster. Blaikie et. al (1998) define coping as a manner in which people contest, struggle, combat

[5] This approach was first advocated by Sen in an essay titled 'Equality of What? Delivered as the Tanner Lecture on Human Values in 1979.

within existing resources and range of expectations of a situation to achieve various ends. With reference to the above definition, it can be said that traditional communities have many times coped successfully if their 'contest, struggle, combat' actually led to the achievement of their ends. However, as Chakrabarty (2001) puts it 'coping needs entitlements'. These play a strong role in determining the existing resources, with which to cope. This is especially true for traditional societies, which are forced to give up their entitlements (determined by local practices) under pressure from the market economy as well explained in Kathmandu case.

The general conditions of poverty, not only create vulnerability, but also inhibit a sustainable road to recovery after disaster, as general dependency on outside resources is greatly increased. As we have seen from the impact of rehabilitation process in Marathwada, slowly people revert to unsafe practices, not just by choice but also by sheer ignorance or inaccessibility to resources. In fact at each level, susceptibility and therefore vulnerability is increased by dependency, that is, reliance upon external assistance or upon systems not of indigenous origin. Dependency is in fact a very real cause of vulnerability, whether it is by choice, chance or inevitability.

According to Lewis (1999), the removal, disappearance or failure of the dependency 'prop' results in a worsening of a vulnerable condition; the converse of dependency being self-reliance and indigenous systems or cultural norms for the sharing of losses and of efforts for survival and recovery. Not only the deliberate attempts at rehabilitation but also gradual changes in resource management through time have led to growing dependency on external resources, both for food supplies and for a growing range of non-food products. This has also extended to housing built of imported materials. These is clearly evident in changes in building techniques, before the disaster and also post disaster reconstruction, which have demonstrated increasing dependency on outside resources, out of choice as well as compulsion.

Increasing dependency by choice is linked to loss of civic pride, which is clearly a result of growing misperceptions. This is result of both lack of education and also because of its content. The consequence of this is that 'development' as perceived by these communities is dictated by lucrative options, which cannot be comprehended in reality.

11.2.2 Cultural Continuity & Compatibility

As discussed before, the existing notions of development of decision makers as well as local people consider 'modernity' and 'urbanisation' as panacea for development. However, these 'images of development' are seldom comprehended in reality because of the four main reasons :-

1. Ignorance of the local people on what 'modernity' implies in reality.
2. While the images are created, culturally deep-rooted thinking processes may remain unchanged, thereby creating a mutally contradictory dichotomy.
3. Lack of education, because of which local people may not be conscious and confident to be aware of their assets (resources), rights and duties.
4. Inability of the local people to afford and sustain whatever is perceived as 'modern'.

Essentially 'development' has no fixed frame of reference and is very much dependent on local cultural context. The definition of culture is well articulated by Rapoport (1984; 50-51), who highlights three important aspects of culture

1. "Culture as a way of life typical of a group, a particular way of doing things…".
2. …as container of symbols, meanings and cognitive schemata transmitted through symbolic order…".
3. "…as a set of adaptive strategies for suvival related to the ecological setting and its resources.

The above definition demonstrates the all encompassing nature of culture, in terms of what it implies for the rural communities. One of the main challenges is to reinforcing cultural continuity through development opportunities that are afforded through post disaster rehabilitation, so that one does not end up with cultural incompatible solutions, which prove unsustainable in the long run.

Bjønness (2002) states that cultural continuity is addressing a dynamic perspective. According to him, continuation here refers to continuation of knowledge not only in relation to building of a cultural sensitive and responsible civil society, but also to people and place. He further states that cultural continuity is not hostile to change, but change has to be positive and linked to general agreed values related to prime areas of settlement development; equity, sustainability and the building of civil society (UNCHS, 1995, 2001), (UN, 1997).

In the context of post disaster rehabilitation strategies, cultural continuity and compatibility is not just the factor in perceiving overall development, but also needs consideration in vital aspects of 'earthquake safe' technology transfer. There are interesting references on the relationships between technological knowledge, and the qualitative aspects related to community relevance, social acceptance etc. besides economic viability and long term sustainability.

It continues a line of argument advanced by Dickson (1995) to the effect that conceptions of technology are in one case misleading, when technology is invested with a transparent instrumentality and neutrality, and in a second case incomplete when technologies are assessed extrinsically in terms of, say, economic, political, or legal institutions. A model of technology that treats it as a symbolic, intentional embodiment, as, in fact, a language of social action, will augment this second approach. Such a line of argument inextricably links technology and culture, but more importantly, shows how modes of technological action reflexively condition the culture itself. So it is that technology creates a way of being in the world, or a world in which to be. While technology is but one symbolic embodiment of culture, its pervasiveness – what Ellul and Heidegger both profoundly lament – provides an inescapable backdrop for the most serious of contemporary conversations. It is "well-formed" solutions, expressed in the syntax of Western technologies, by which aspirations of the less developed countries are so frequently formulated.

What technologies transfer, includes both ideology and practical knowledge? Since technology constitutes a major intentional embodiment of culture, its transfer cannot occur solely in instrumental ways but instead carries along donor country ideology. However, given the dialectical nature of technology, with both ideology and practical knowledge historically situated, what is transferred is itself transformed and reflected in the process, thanks to outstanding capacity of human beings to adpat to new situations. This is seen in the relocated villages in Marathwada, where the local people have initated changes in the reconstructed fabric that was tailor made for them to suit their way of life and needs.

11.2.3 Sustainability of Livelihoods

Another important factor, which effects vulnerability and capacity of rural communties before as well after disasters is sustainability of their livelihoods. Importantly in the context of rural communities in south Asia, traditional livelihoods are very much linked to local skills, which contribute to reducing disaster vulnerability. This is especially true for some groups of farmers and other building artisans, who are carriers of the 'surviving' knowledge. Ironically, they may possess the knowledge but their capacity depends significantly on their occupational pattern, which can contribute to their vulnerability in other aspects. Take the case of tenant farmers, who are affected by a disaster much more than those who possess large land holdings.

This analysis of the linkages between people's access to resources and livelihood diversification has been taken up in the literature on people's coping strategies in response to seasonality and famine (e.g. Corbett, 1989; Davies, 1989) and on the role of entitlements and assets in these coping strategies (Sen,

1981; Swift, 1989)[6]. Sen (1990), has supported this argument on the basis of his well know case study of Bengal famine of 1943;

> "In explaining famines, we have to look not primarily at the total food supply (though it is one influence among many) but at the "entitlements" of the vulnerable groups, i.e., the ownership rights over food that these groups can establish (Sen, 1981). We have to concentrate therefore, on the economic and political changes that rob particular occupation groups of their ability to command food. For example, the development extensive unemployment leading to widespread inability to earn an income, or a sever rise in food price vis a vis wages, or a sharp fall in the price of the products that the craftsmen make, can lead to widespread starvation" (Sen, 1990; 3).

The above discussion explains one of the underlying reasons for the loss of traditional occupational base.

Another impact of livelihood is again related to the overall development pattern. This expains why agriculture, which is the primary occupational base and cultural determinant of rural identity, has lost out to industrial development and policies of market capitalism and neo-liberalism. The adverse consequences of this are to be seen, in breaking down of mutually supporting economic structure and increasing migration from villages. This is linked to the urban-bias that is very much visible in the postcolonial policies which over-emphasised industrial development and led to the growing marginalisation of rural communities.

The result of all the above factors is that traditional livelihoods, which have been the source of local knowledge and capacity for disaster mitigation are increasinglly getting lost, thereby contributing to increasing vulnerability of rural communities in India and Nepal.

The discussion leads us to discuss the concept of 'sustainable livelihood approach' (Carney, 1998). In the previous section, we have discussed link between livelihood situation and vulnerability. Drawing on the work of Chambers and Conway (1992), a livelihood is defined as comprising 'the capabilities, assets (including both social and material resources) and activities required for a means of living (Carney, 1998). Sustainability is achieved when a livelihood 'can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base' (Carney, 1998, p4). As an approach to understanding and facilitating development the 'sustainable livelihoods approach' contains echoes of the basic needs approach and its evolution into concerns with food security and then poverty alleviation and reduction (Maxwell, 1998). It also draws on insights from 'integrated rural development',

[6] From Dorward et.al., 2001.

from farming systems research and from participatory approaches in development. These various strands are linked with appreciation first of the diversity of livelihoods of rural people, second of the roles of different types of assets in rural peoples' livelihoods, and third of the importance of the wider social and political and economic environment in mediating access to assets. It is necessary to devise ways and means of strengthening or updating their access to local assets, in order for these traditional livelihood systems to survive. Significantly, these are not only physical, financial and natural assets but also social and educational assets.

11.2.4 Equitable Participation through Empowerment

An important factor, which influences vulnerability and capacity of rural communities is their nature in terms of various internal structural relationships among various members. These relationships extend to social, economic and political aspects and determine the internal context in which vulnerability is generated and addressed by the community itself.

Here we take a relook at the very definition of community. Alley (1993) has defined it as a group of people sharing or bringing together of common ideas, ideals (values), resources, environment, aspirations (interests). However, considering the current dynamics in these villages, both preceeding and in the aftermath of a disaster, one wonders to what extent, rural 'communities' exist in reality. As mentioned before, the ethnic solidarity within caste, ethnic or religious groups has further got strengthened, while among various groups has considerably weakened. Also, shared values and interests of the community as a whole are put into question, when we look at the presently disintegrating rural structure. This has adversely affected mutual support systems within rural communities, which were crucial for their collective coping capacities against disasters.

Significantly, the horizontal consolidation within various sections also gets reinforced in local power structure (politics) and in this process, some are left powerless, while others enjoy social and political power. The nature of power relations are also determined by increasing class segregation, within communities. As Lewis (1999) remarks, disaster vulnerability comes not only from being poor, but also from being powerless to do anything about vulnerability, which results from actions and activities of richer, and therefore more powerful, groups.

Lewis (1999) has indentified three kinds of stakeholders who help in reducing or increasing vulnerability, which were also observed by me in the case areas: -

- Those with power who create vulnerability, sometimes without being fully aware of their actions. These are primarily those who command control

over resources and in that process make others vulnerable prior to a disaster, for example, people from Kathmandu who purchase land from villagers of Bungamati, depriving them of their sustainable livelihood resource. These also include those who advance their interests through hidden agendas behind several decisions taken for post disaster rehabilitation. For example, the criteria for recontructed houses is done on the basis of size of land-holdings with a particular household, thereby advancing of the interests of a few.

- Those with power who are attempting to do something about hazards, but may be unable to make it effective enough because of the failure to incorporate vulnerability analysis. These include decision-makers in a rehabilitation process, who fail to look into underlying causes that create vulnerability in the first place.

- And thirdly, those who are operating at the grass roots level who suffer the consequences of disasters or are working with people to reduce their vulnerability and increase their power. This includes countless community based organisations who are trying to work with the communities but are unable to make much impact, owing to lack of power.

Looking through a wider perspective, distribution of power is also connected to access to knowledge since knowledge itself is power. Lack of education has in fact made local people powerless as they are not conscious of their strengths and also lose their ability to voice their concerns and demand their rights. Experts hold the power to make decisions for them. Such power structure within rural communities inhibits all good intentions of community participation for reducing disaster vulnerability.

However, my case studies show that community participation approaches for disaster management are many times blind to the local power stucture. This depends on how community participation is widely perceived by the decision-makers. The top-down approach among politicians and experts generally views local community as potential barrier to the implementation of techno-scientific solutions. It is assumed that what is needed is merely sufficient information to make the community accept those solutions and therefore community participation is essentially a case of enlightenment and not power and manipulation. In this way, community participation is made into a matter of disseminating scientific facts, intended to ensure acceptance and facilitate the implementation of any techno-scientific solutions. Such a perspective not only ignores the uncertainities of scientific knowledge, but also sidelines the community's experience based knowledge, which is branded as 'unscientific'. In contrast to this view of the decision makers, the local community, based on its intimate knowledge of conditions in their own environment, may have major objections, apathy or ignorance to purely technical solutions.

Equity and Empowerment are two essential pre-conditons for community participation in disaster management.

Let us understand what 'empowerment' means. An examination of the components (i.e. prefix and suffix) contained in the word empowerment point to an interesting interpretation of the complete word. The prefix "em" represents the concept: "cause to be, or to provide with" it also reflects the "process of going into". The word "power" refers to a "a possession of control, authority, or influence over others or self". Finally the suffix "ment" represents the concept: " a concrete result, object, or agent of a (specified action)" (Webster, 1986). Empowerment thereofore represents a process reflecting a person's ability to pull from within themselves control, authority and influence that leads to concrete action in their life. Empowerment is embedded in the language, consciousness and actions of the present.

Zimmerman (2000) has stated that asserting a single defintion of empowerment may make attempts to achieve it formulaic or prescription-like, contradicting the very concept of empowerment (Page and Czube, 1999). Empowerment is crucial in the context of rural communities in India and Nepal, who need to voice their opinions and raise their concerns.

Empowerment implies that local communities are no just involved in reconstruction efforts, but have a greater say and role in decision making through dialogue and not just one way communication. This requires strengthening of internal communication systems within communities and also communication between community and the decision makers or 'experts' and the politicians.

However, giving 'power to people' implies that equity issues need to be resolved among the communities. And equity is not to be seen from a western perspective. Rather equity issues are very much dependent on locally defined roles and responsibilities and their acceptance as through human dignity and support mechanisms. Equity of values defined from 'outside' can not be forced upon these communities. Since knowledge is power, "power to people" also implies widening and deepening the knowledge base, and all, in "breaking the monopoly of knowledge" and ownership of knowledge as knowledge is power. This in turn means change in the concept of scientific knowledge and what it consists of. New paradigm in research means questioning the sovereign claim of science to validity of knowledge of scientific specialists (EADI, 1996).

11.2.5 Ethics, Roles and Responsibilities of Local Governance

One of the essential factors, which determine the local capacity of rural communities to manage disasters, is the scope and nature of governance at the grass roots level.

The current system of governance is top-down, bureaucratic and primarily based on 'command and control model' of governance. As a result, it is difficult to relate to rural communities, who have their own organisational structure and mechanisms for local governance. Moreover, Marathwada and Gujarat cases have shown that local governance has hardly played any constructive role in undertaking post earthquake rehabilitation. . Also it is structurally and financially so weak that in spite of good intentions, it is not able to do much. Kathmandu case clearly shows this. Another significant issue concerns ethics and accountability of government towards community to gain their trust.

Governance is the complex of mechanisms, processes, relationships, and institutions through which citizens and groups articulate their interests, exercise their rights and obligations, and mediate their differences. Governance encompasses all the methods – good and bad – that societies use to distribute power and manage public resources and problems. Bad governance in the form of gross corruption, or in its subtler form of extreme urban bias and skewed distribution of services, will have the effect of limiting the range and effectiveness of local coping practices and undermining livelihood security (Wisner, 2001a).

Sound governance is a must for effective reduction in disaster vulnerability. It implies that public resources and problems are managed effectively, efficiently, and in response to the critical needs of society. Effective democratic forms of governance rely on public participation, accountability, and transparency (UNDP, 1997). The four essential elements of humane governance are

- Ownership (or genuine participation by all group members),
- Equity (or the sharing of benefits of development among all members, especially the most deprived)
- Transparency (ensured through consensus based decision making and transparent accounting systems,
- Accountability (whereby every member takes responsibility for decisions made by the group)
- And efficiency – provide an enabling environment for human development and eradication of human deprivation (HDC, 1999)

It is important to note that all these elements are not universally defined, rather they should be collectively agreed for their scope and nature in each cultural context. Besides inculcating these qualities, it is important that empowering them with well-defined roles and responsibilities and decision-making power strengthens grass root governance. Strengthening local governance is necessary to ensure long term sustainability of interventions, which are taken as part of post disaster rehabilitation.

However decentralisation and institutional development does not guarantee good governance. People are at the centre and are the subject of governance, not merely its object or instrument, people themselves must be aware of their rights as citizens and as members of civil society and exercise their rights vigorously, rigorously and regularly.

11.3 EMERGING PARADIGM FOR DISASTER MANAGEMENT

Lastly, I suggest a further shift to a new paradigm which has 'territorial', 'cultural' and 'ecodevelopmental' perspectives embedded into it. Such a dynamic view looks at how specific cultures respond to change (an anthropological rather than ethnological perspective). Therefore, it focuses on how we can reduce vulnerability by building on existing skills and capacity. In this paradigm, various inter-relationships and processes are considered in a time continuum (preceding, during and after the disaster). Moreover it is based on alternative development theory, which deals with these communities in transition and advocates local 'participatory' solutions both at the action as well as strategic level.

Territorial perspecitve

According to Hettne (1995), a territorial strategy consists of specific elements rooted in space; a geographically bounded community, controlling a certain set of natural resources, and united through a certain set of cultural values. Therefore, a territorial force essentially derives from common bonds of social order forged by history within a given place. Such a strategy is in contrast to functional strategy, which is sectorial and is based on mutual self-interest.

Based on the above definition, a territorial strategy for disaster mitigation of rural communities, stresses on the following important aspects :-

1. Relating local resources to people so that they can exercise a degree of control to a greater extent (if not in absolute terms !). This implies that the following resource aspects be taken into consideration:-

- preserving complex but integrated relationship of the farmers to agricultural land as production systems.
- Preserving relationship of local artisans or craftsmen to material resources through local skills.

2. Strengthening social relationships within communities and identifying common values and interests through dialogue.

Cultural perspective:

A culture is the fundamental condition for collective existence, it is the unconscious universal frame of reference, which becomes specific only in confrontation with other cultures (Hettne, 1995). The new paradigm is embedded in local cultural context and is characterised by various spatial, temporal and experiential dimensions. Here 'inter-linkages' governing social, economic and cultural eco-systems are more important than 'sectarian' knowledge. ‘Dynamic process’ is emphasised rather than the 'product' and in this way due consideration is given to 'cultural continuity' rather than mere 'cultural artefacts'. Further, the cultural perspective of disaster highlights the relevance and potential of local knowledge and capacity for mitigating the impact of disasters. The paradigmatic shift for reducing disater vulnerability of rural communities in India and Nepal will be further articulated.

Besides continuity, another aspect is cultural compatibility. While the former is perceived as an evolutionary process, the latter demands sensitivity on part of the decision-makers while dealing with a particular cultural context. This implies taking into account not only their physical fabric but also their internal world views and thinking processes, while deciding on strategies for disaster management, especially post disaster rehabilitation.

The reduction of vulnerability, as a crucial path to disaster reduction, has to be focused not only upon ‘protection’ by technology in building construction, nor in warnings and communications (UNCED, 1993), but in measures more to do with accessibility of social and material resources, and social participation linked to cultural expression and traditional knowledge and norms. Therefore local knowledge and capacity of a society needs to be studied in detail before any intervention is made from outside[7]. Here it needs to be emphasised that this is bound to be a very long process with no set end points (targets). Any externally directed attempt (conscious or unconscious!) to temper this process through various initiatives with set standards, targets and short-term quick solutions (based on 'expert-defined' criteria), which though well intentioned may have serious implications on the long term development. The externally

[7]The kind of traditional knowledge! With whom it resides? How it is used? Who controls it? Who executes it? What is the process of execution? How is it managed? What are the traditional management processes'?

directed 'provider' approach may in fact destroy beyond repair the internal coping mechanisms and local innovative capacity to experiment and thus engage in a process of evolution of cultural heritage.

This will also serve to bring the 'traditional' knowledge and the 'expert' knowledge to interact with each other, more in terms of the needs and priorities of local community. Disaster planning and management cannot be explicitly tailored for rural communities in a sectarian manner, rather this need to be internalised in a holistic manner into their frames of reference and not those of experts from outside. On close monitoring we have discovered that some aspects of disaster preparedness and management are already embodied consciously or sub-consciously into various cultural practices that are carried for generations. Unfortunately, both the cases aptly demonstrate that the main victims of the present development process are landless tenant farmers and craftsmen, who in fact are the bearers of cultural heritage. Therefore, the goals of disaster management can be truly realised if they are empowered.

Ecodevelopmental perspective

The Ecodevelopment perspective is articulated for pre-disaster mitigation, preparedness as well as post disaster actions of relief and rehabilitation to address possible links between long-term development effect, pre-disaster mitigation and post-earthquake relief and rehabilitation, which are sensitive to particular needs and problems of a region.

According to Sachs (1974; 9),

> "….ecodevelopment is a style of development, that in each ecoregion, calls for specific solutions to the particular problems of the region in the light of cultural as well as ecological data and long-term as well as immediate needs. Accordingly, it operates with criteria of progress that are related to each particular case, and adaption to the environment plays an important role."

One needs to ask oneself, what does development and disaster management mean for the local community? It cannot just imitate the macro-economic growth models, as there is no real benchmarks to measure 'development' per say. Economic models of sectarian development have to be replaced by 'Holistic perspective towards Eco-development' that stresses cultural evolution (and not just continuity) and territorial relationships(Sachs, 1974, Hettne, 1996). Such an ecological framework for development and disaster management is based on three underlying principles which has been articulated by Bjønness and Corneil (1998). These are :-

1. Ecology is fundamentally value-laden; it is an ideological framework in search of balance equity and improvement. However, the author feels that such an 'ideological framework' has to be formulated and agreed upon by the civil society itself and not imposed from outside.

2. The study of ecology is both process-oriented and systems-based; it is about the process of transformation and the complexity of relationships; and
3. It is not driven by a desire for "development" but rather by a need for positive change. The author has called this as 'alternative' development or 'alternatives' to development. The benchmarks for such a development have to be set up by the civil society itself, based on their own ideological considerations.

The failure of the predominant development notions leads us to search for an alternate development paradigm. It considers development to be non-linear, therefore unpredictable and even anarchic. It is not something, which is brought. Being driven from within, it is not the prerogative of an outsider. Respect for the integrity of others' processes must be paramount, not simply from a moral point of view but because of the reality of the development process. This is very valid for rural communities, whose benchmarks for development are unfortunately set up by outsiders.

Developmental interventions are not "expert products or packages of resources" delivered as input to organisations, as in case of Marathwada and Gujarat. Rather they are processes, which are created and applied in response to particular situations.Ultimately, the development paradigm which we are articulating here has little to do with the transfer of resources, which we saw earlier as the notion which informed the traditional approach to development. On the contrary, development is about facilitating resourcefulness.

As said earlier, culture is not static entity, it is a dynamic ever-evolving phenomenon. No culture can survive if it refuses to adapt to new knowledge and situations. Disaster management has to be built into such development processes driven by local initiatives. Disasters will be managed once development is managed.

Dr. Uma Medury (1996) very eloquently relates the relevance of ecodevelopmental perspective to Indian villages. According to her, these are highly integrated ecological systems. What happens in one component leaves its impacts on others. However, this finely turned system can easily be split apart. What the country desperately needs is an approach in which attempts are made to increase the productivity of all the components of the village ecosystem, and in a sustainable manner. According to her, the only way to end the present fragmented approaches to rural development is to promote integrated village ecosystem planning and management. This can be attempted only at the village level, village by village because there is an enormous diversity in Indian village ecosystems. Even within one overall ecosystem, village ecosystems can vary greatly. Besides, the task of planning for every Indian village can be achieved rapidly and judiciously, only if it is participatory.

Conclusion

To summarise the above discussion, holistic eco-developmental framework for reducing vulnerability in the context of rural communities of India and Nepal will require three essential shifts, namely,

- Moving from external resources to development of local resources in skills, landuse and construction materials.
- Moving from only stressing social consequences of disaster towards ethical and overall eco-developmental principles.
- Moving from command and control and relief model towards community determined development model facilitated by NGOs and local governance.

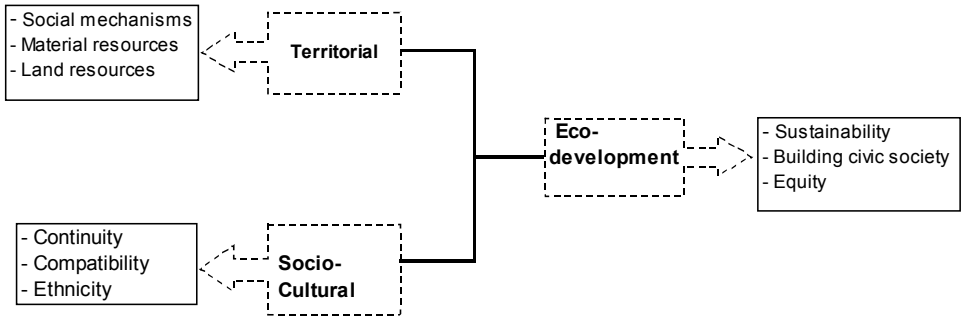

Fig. 11.5 Suggested theoretical model for new paradigm of disaster management

11.4 REVISITING RESEARCH METHODOLOGY – THEORETICAL INSIGHTS TO PARTICIPATORY METHODS

In this section, I wish to discuss the 'ideal' role of a researcher like me in this kind of research[8]. Does he only rediscover the knowledge, its current status and its link to disaster vulnerability as a passive elite, or he can also be a generator of practical actions? Here I wish to refer to the concept of 'Participatory action research'. One of the basic assumptions of this kind of research has been that

[8] The author recognises that the role of researcher is significantly different from that of a practioner, who is planner in this case.

knowledge is a dialogue. Common people can consciously contribute to scientific knowledge in a process of mutual inquiry and learning, and scientists (researchers) can consciously expand common people's knowledge base with new information and new ways of analysing their life situation.

A natural consequence of such a process in a developmental situation is that common people (i.e. non-specialists) participate in the analysis and planning and in the subsequent or simultaneous action. Action is part of knowledge formation while it contributes to the solution of the commonly identified problem.

Knowledge formation is seen as an interactive process between practical knowledge and theoretical knowledge, where action regenerates knowledge. This is at the base of Participatory action research (EADI, 1996). In Participatory Action Research (PAR), we move on the border between theoretical knowledge, practical knowledge and practical action. The assumption is that in dealing with people's existential problems different knowledge systems have to interact. On what level and how they interact is a crucial question. One problem is that of communication: How do the different knowledge systems interact? This discussion has already been taken up in the previous section. However here I view it in the light of my own role, in this work.

While I have a lot of faith in the potential of participatory research, I am aware of the essential pre-conditions in order for this to happen, which are linked to education, empowerment and poverty alleviation. These are further linked to larger issues of development. These issues have already been discussed in the previous sections.

Also on the part of the researcher, there is a need to build not only a basic knowledge of local dynamics, but also a feeling of mutual trust and rapport with the local community, with whom he is entering into a seemingly 'unbounded' dialogue and this requires time and commitment. I discovered a number of grass root community organisations in my case areas, which are undertaking this kind of work.

However, I must acknowledge that due to limitations in time and considering the scope of the work and other practicalities, this has not been possible in my own work. So I cannot claim my research to be participatory in that way. However, I have made an extra effort to establish a rapport with these communities as close as possible. For this, I have taken the help of those civil society organisations, who have been working in these areas for a long time. Rather than directly participating with the local communities, I participated in the actions of these Civil Society Organisations and used them as a bridge to gain insight of the communities. However, I have not solely relied on their

information, but rather made an attempt to cross check it with real stakeholders.

At an overall level, I have attempted to be faithful to the case-study method (Yin, 1981). Qualitative research has been used through various interviews, primary observations and secondary sources. At many points, I have been very inductive in the way various situations have been investigated, without a narrow focus and in these way established inter-linkages to the main research question.

However, the problem with inductive research is that one is never too sure. For example, I first decided to work on village level but when I investigated Latur case, I found out that one or two villages did not tell the whole story. The whole set of information get enriched by taking a macro level viewpoint. Even the third case study was included as part of this inductive way of research.

In Gujarat too, initially I wanted to zoom down to one or two villages later. However, I found later that the dynamics of developments over nine months are so interesting that I decided instead to focus at the macro level on the dynamics of the transition from immediate aftermath to post disaster rehabilitation phase. In this way, the criteria for selection of the levels was based on the way I managed to collect the data and also depending on the range of interrelated issues that were considered relevant to the main research question.

In this way, while the Kathmandu case has helped to undertake microscopic examination of transformation processes at the village level, in the other two cases, macroscopic examination of the dynamics was done at the regional level.

Another important aspect of the research is use of Hermeneutics for interpreting meanings behind various sets of information. This is primarily due to the fact that in most cases, local knowledge and capacities for disaster mitigation and preparedness are not consciously designed for the purpose; rather they are part of 'holistic' multi-purpose actions. The dialectical nature of meanings requires a reform of both sorts of analyses and descriptions of meanings. However, the understanding of some sorts of meanings, particularly spiritual and social ones, by the researcher could be oversimplified or distorted if one does not have a thoroughly local knowledge, which can control the perceptual reactions. On the other hand, the research should not only explain what is already known but also the hidden meanings in the present settings and the old meanings which have disappeared or have been changed in the present and have not been known by the users. With this frame of mind, I have rediscovered various potential aspects of local knowledge and capacity.

I wish my findings to be communicated through unbounded dialogue to the stakeholders, which include decision-makers, civil society organisations and above all, the local communities. This can be done through publishing my findings in local language as well as in English and also arranging community level meetings.

12. POLICY IMPLICATIONS AND SUGGESTIONS

12.1 INTRODUCTION

The link between theory and action is very crucial to make a research worthwhile. Hamdi 1996 and Edwards 1994, who stress on an essential link between understanding and action, also support this view. They believe since expert knowledge and understanding are seen to be prerogative of universities and studied in abstract from the processes, understanding becomes progressively divorced from action, as does research from practice, and researcher from the researched (Edwards, 1994). Research then proceeds largely along reductionist lines. Observation is strictly objective and its methods largely normative and hegemonic. That is conclusions, models, laws, are drawn up which assume universal value; the observer assumes that he or she becomes the prime repository of knowledge, which is then passed, sometimes, selectively, from those who have it to those who don't. Dependency and intellectual colonization are inevitable outcomes.

Hamdi further stresses on the need to move on from 'reductionist' or 'critical research' toward methods which promote a variety of connected learning and teaching settings in which to explore ideas and devise new practices. He states,

> "We will need to shift away from making instant projects, away from sectoral programmes. The new approachs[1] converge in their characterisation of development (research and practice) as non-linear, unpredictable, complex, open systems. They emphasize diversity and choice (while not abandoning the search for patterns and connections), set great store by participation of the subjects of enquiry in the process of research and practice, and between different academic disciplines, theories and approaches to research."

Therefore, in this last chapter, I am proposing broad strategies for improving disaster management policies and practices in India and Nepal. These point to the essential shifts in the existing policy approaches so that vulnerability of rural communities can be effectively reduced in the context of India and Nepal. The underlying basis is that there is enormous wealth of local knowledge, skills, resources and capacity of rural communities to reduce disaster vulnerability. These need to be rediscovered, built upon, explored and

[1] These approaches are described as 'naturalistic enquiry' (Lincoln and Guba 1985); 'post-Newtonian' (Uphoff 1992), 'non-Euclidean' (Friedmann 1993), or 'post impasse' (Booth 1994) development studies; and 'new professionalism' (Chambers 1993).

regenerated by the decision makers, both at the strategic level as well as practical level for reducing disaster vulnerabilities.

12.2 IMPROVING INSTITUTIONAL STRUCTURE FOR DISASTER MANAGEMENT

12.2.1 Delegating Roles and Responsibilities to local governance

At present, disaster planning and management in India and Nepal are controlled mostly at the state and the national level respectively and the whole management process is top-down with strongly centralised style of allocative (command and control) planning. Moreover, it is reactive in its conception, basically designed to face disaster situations through emergency relief.

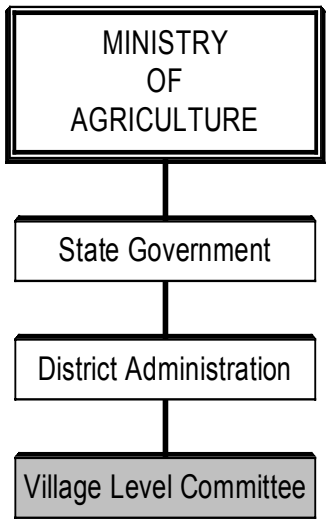

Fig. 12.1 Proposed institutional structure for disaster management in India with village level committee as the nodal level for activities

I propose that such a management structure has to be replaced with the one, where grass root governance i.e. local governing bodies at village level. For example, Panchayat in India and Village Development Committee (VDC) in Nepal are given active roles and responsibilites for disaster management, which is truly a participant one through creation of a grass root planning mechanism. Infact, these elected bodies at the village level can act as the bridge between the community and external agencies. However this implies that these organisations are strengthened politically as well as economically. Some degree of autonomy needs to be given to these local level institutions, so that they take decisions and execute them.

Also, their link with the institutional structure at district and village level also needs to be effectively improved, as current disaster management system is operationalised mainly at the district level. This essentially has to be a two way process and not top-down. It is important to note here that the governance at the village level must ensure equitable representation of all the section of the community based on their social and economic status and gender. Moreover, it should evoke representation of traditional community organisations such as Guthis in Nepal.

The basic question is whether NGOs can substitute for the role of government. There needs to be a balance in division of roles and responsibilities of the Government and the NGOs so the role of latter does not undermine the responsibility of the former and vice versa. Even donors need to ensure that their support to NGOs does not undercut the centrality of the local government in planning and service delivery. Overlaps, duplication, and competition between local governments and NGOs must be discouraged and local governments must be informed about donor-supported NGO programmes. Also transparency and accountability of the Government and resulting trust of the community are crucial issues to be addressed. However, most importantly, grass root community organisations and governance need to be strengthened so that the local capacity of rural communities can be utilised and further developed in a long run for mitigating, preparing and recovering from disasters. Otherwise, all the existing efforts will only remain short-term, ultimately dependent on external aid to NGOs for running these programmes. .

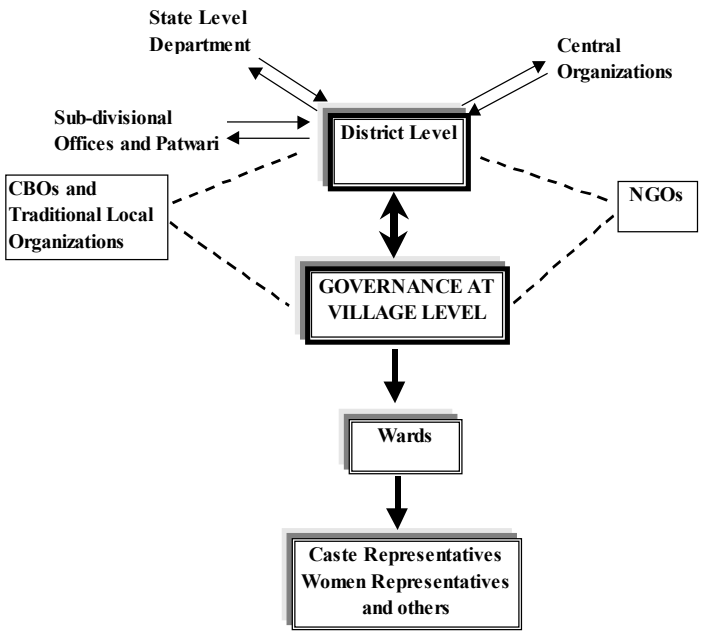

Fig. 12.2 Proposed institutional structure for disaster management at grass root level

12.2.2 Reinforcing institutional link between Disaster management and Rural Development sectors

Disaster management has to be built in as part of the day to day management of development by rural communities. Therefore, it cannot and should not be institutionalised to the extent that it ends up as one isolated department. It needs to be realised that disasters are so closely linked to social and economic and human dimensions of rural development, that they cannot be managed in isolation.

Therefore, an inter-disciplinary coordinating mechanism is suggested to take decisions pertaining to disaster management. The underlying aim is to link mitigation, preparedness and recovery aspects of disaster management to various sectors of rural development, namely livelihood, land management, physical planning and building and last but not the least, education. The corresponding links of each of these to disaster management are discussed in next section. Such a mechanism can be institutionalised at the district level

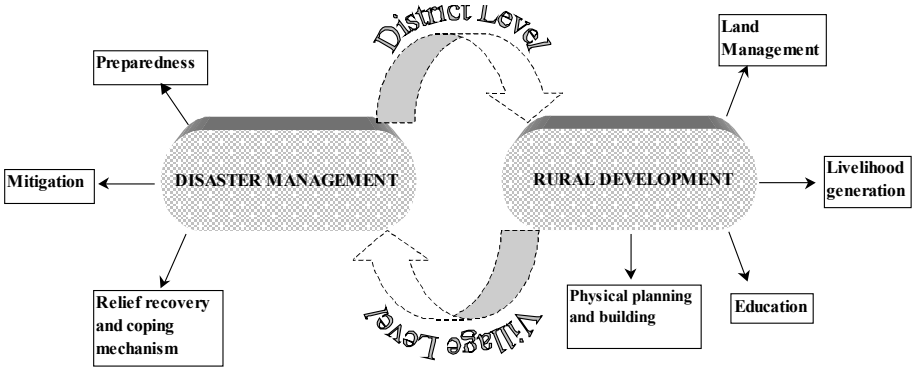

Fig. 12.3 Integrated framework for disaster management and rural development

12.3 INTRODUCING DISASTER MANAGEMENT INTO STRATEGIES FOR RURAL DEVELOPMENT

12.3.1 Regenerating Rural Livelihoods

Reorienting the focus of rural development and strengthening the traditional occupational base can reduce considerable vulnerability to disasters. Following broad development strategies are suggested here :-

Since rural occupational and cultural base is sustained primarily on agriculture, there is a strong need to formulate policies for development in this sector, through introducing new technology and development of agro-based industries. However, at the same time, one has to be careful that these technologies have to be affordable and sustainable. Equally important is to ensure that benefits of the returns go to these rural communities. This requires that certain amount of state incentive and protection needs to be given to the local village artisans, so that traditional occupations are not lost to outside pressure and thus existing capabilities of rural communities are strengthened. This may seem controversial, yet appropriate options may be explored.

Policies need to be formulated for regeneration (and not mere preservation) of local skills and resources, many of which have potential to mitigate the impact of natural hazards such as earthquakes. They are important, not only for their role in keeping cultural links with these communities and preserving local ecology, they are also important as a source of livelihood. Again the benefits have to go to the real stakeholders and not eaten up my middlemen. Cooperative organisations at village level need to be encouraged to manage this However it has to be kept in mind that generating livelihood opportunities for rural communities needs improved access to resources.

12.3.2 Formulating Strategies for Rural Land Management

Land is an important social, cultural and livelihood resource for the rural communities, which is crucial at times of disaster. However, this resource is increasingly being lost to outside people, thanks to predominant forces. Therefore, it is absolutely crucial to develop land management policies, to secure land for rural communities, irrespective of their social and economic status. The following strategies are suggested :-

- the traditional and existing land tenure system of these communities should be carefully recorded. This includes recording private as well as collective ownerships. It is important to note current land transactions to record the transformations that are taking place on ground. This is essential as a first step towards formulating a land management policy.

- The land belonging to the village, should be clearly demarcated and policies need to be formulated regarding future landuse. In this context, I strongly advocate preservation of agricultural land-use to preserve the main source of rural livelihood. Such a policy needs to be complimented with economic and other strategic measures to improve income and productivity from agriculture.

12.3.3 Improving strategies for spatial planning and building

A clear policy document and legislation for physical planning and building in earthquake prone areas is crucial for a countries like India and Nepal, which witness atleast one major earthquake in every two years.

The spatial planning of villages need to be improved, not by replacing the whole fabric with city-like urban structure with grid-iron pattern of wide roads, but by securing traditional public and semi-public open spaces and making physical improvements to improve their emergency access. These changes have to be done according to the specific morphology of each settlement.

The legislation for improving earthquake safety in buildings should take into consideration :-

- using of locally available material resources
- using local skills
- learning from historic buildings (to build on knowledge of the past).

These rural communities have their own dynamics and compulsions. Therefore these guidelines need to be formulated specific to each geographical or cultural region both in their content and also in their nature of implementation. While deciding on their content, these should take into account the existing building tradition, cultural practices and the way of life. The guidelines sould permit some flexibility in execution in terms of :-

- the design
- the construction techniques
- the choice of materials.
- The additions and alterations to the fabric

The guidelines should also be closely monitored by the local governance system.

12.3.4 Improving Quality of Education and Incorporating Disaster Mitigation and Preparedness Lessons in the school curriculum

Another critical factor that links disaster management and development is in education sector. The research findings have brought out that lack of education is one of the critical factors, which indirectly makes rural communities vulnerable to disasters. Here it needs to be realised that literacy programmes initiated by the Government may not actually help beyond enabling people to read and write (sign). A well-formulated education is needed for conscious development of thinking processes rooted in local cultural context. They should help making rural communities conscious of their values and thinking

processes vis a vis external ones. This is crucial in people takinig control of their own lives and also developing consciousness for their own and other's actions. Following strategies are suggested in order to achieve this:-

- There is need to formulate strategies for regenerating the local knowledge, which is embodied in the surviving documents of built heritage. In that sense, mere preservation is not enough, rather a knowledge base needs to be developed for documenting and recording these knowledge systems and making extra effort for adapting them to changing ground situations. I strongly suggest that educational programmes of surveying the traditional building techniques of own community, should be launched in secondary schools. Such a programme will certainly prove helpful in generating interest in local heritage.
- Basic principles in mitigation and preparedness, general or specific to particular disaster such as earthquakes, should be taught in the educational curriculum at the secondary school level.
- Training and awareness programmes should be launched to remove misperceptions of the communities, local artisans, engineers as wells as disaster managers about effectiveness of traditional constructions. However, one must be careful not to romantisise traditional knowledge and overlooking its weaknesses. Also, certain outdated aspects of knowledge need to be removed. Here the professionals especially the planners can take a lead by performing the role of `training the trainers ' among the community, thereby providing the settlement with local and skilled human resources. NGOs and local CBOs can also play an important role in this. It is important that these efforts are sustained over time. The external facilitators should make sure that the responsibilities are eventually passed on to the local governance.

12.3.5 Intervening in local power structure

Critical factors that have proved significant in the way disasters are responded by communities are their inherent social and cultural weaknesses. This critical link between underlying social segregation and their implications need to be understood at the strategic level so that equity and social justice is guaranteed in the decisions taken while planning for disasters.

Given the existing social and political dynamics, it is important to find out ways of intervening with the local power structure, so that no one, irrespective of social status, economic class and gender are left out

Local governance should take on an active role as an institution for monitoring social equity and justice. However the values and norms should be mutually agreed and accepted. It is very much an issue of advancing positive social

change, self driven by rural communities and not imposed from outside. Moreover, social upliftment needs strong political sanction and not just restricted to academic and job reservations.

12.4IMPROVING POST-EARTHQUAKE REHABILITATION POLICIES AND PRACTICES

12.4.1 Formulating policies by understanding the linkages

Rehabilitation is a complex proposition involving physical, social, economic and political aspects. There are no clear-cut answers to improving post disaster rehabilitation, which can be specific to each context. However, my research has brought out a fundamental aspect, which is crucial for effectiveness of post disaster rehabilitation policies. This relates to understanding various linkages, which are briefly mentioned below: -

- Linkage of location to cultural and livelihood patterns are essential considerations to be made while deciding on strategies for relocation after disaster. This has to be a careful decision taken after consultation with local communities by apprising them of both the positive and negative aspects of the decision.

  Moreover a blanket policy on relocation should not be formulated, based on the criteria of the extent of damage. It has to be specific to each rural settlement.

- While formulating strategies, it is very important to recognise the linkage of rehabilitation strategies to long term development and sustainability. Therefore, rehabilitation process should give careful consideration on formulating long term strategies for social and economic development rather than mere construction of houses to achieve fixed targets. It is important to ensure that these measures are socially, culturally and economically sustainable, once external facilitators withdraw after the rehabilitation phase is over.

- Merely duplicating traditional building techniques or using local materials or involving local people may not guarantee that disaster resistant technology can be inculcated within communities. It has to be seen within a wider social, cultural and economic perspective for their suitability.

- It is important to recognise that community participation in rehabilitation efforts depends to a great extent on the levels of education and awareness and local power structure. As already mentioned, education and social status makes people capable of voicing their views and concerns. This is absolutely critical in the context of rural communities in India and Nepal. Therefore, a sensitive and difficult but neverthess very crucial aspect is to work out ways and means to intervene in local power structure, so that interests of the marginalised sections can be secured. As a first step in this direction, basic needs based approach is suggested while deciding on the extent to which various sections of community are helped from outside through financial benefits, housing or livelihoods. . Infact, post disater rehabilitation should be seen as an opportunity to make structural social and economic changes in the community so that inherent weaknesses are removed. For example, the criteria for deciding the size of reconstructed houses can be used to allow redistribution of land, to ensure equity.

12.4.2 Redefining the Priorities from Relief to Recovery

It is important to define the priorities of various actions taken after the disaster, so that sustainable recovery is achieved. In this context the following priority areas are suggested in relief, rehabilitation and recovery phases after the disaster.

In the emergency relief phase, it is important to provide psychological and physical support to the victims and also ensure efficient management of relief material, according to the needs and priorities of the victims. NGOs, donor and public agencies can play important role in this. The local governance has to be nodal agency for management of relief material.

In the rehabilitation phase, it is suggested that livelihood regeneration should be the area of priority, contrary to reconstruction of permanent shelter (as has been the case in Marathwada and Gujarat). Training and education programmes for housing reconstruction should be launched to apprise the local villagers on various options for building that are available to them. However, key policy decisions on reconstruction such as site layout, house designs, materials and construction should be taken in this phase. There needs to be a dialgue between the communities and the external facilitators to arrive at these decisions.

Strategies for livelihood regeneration should take into consideration existing skills and resources with the communities. Reconstruction itself can also prove to a good source of livelihood. Many NGOs are already working on livelihood regeneration activities in Gujarat. This needs to be encouraged.

Here I suggest another phase, where actual shelter reconstruction should take place and institutions of local governance can take the key role of monitoring the process. Various community development projects related to health, education and livelihood sector should be launched or developed in this phase.

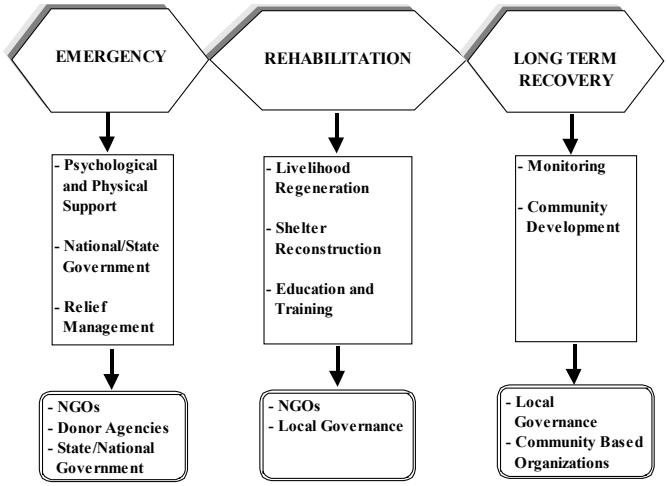

Fig. 12.4 Priority areas and key stakeholders at various stages of disaster management

12.4.3 Alternative strategy for Housing Reconstruction after disasters

We have seen the success and failures of housing which is contractor driven or self-help. Here I propose an alternative strategy, which is somewhat intermediate between the above mentioned approaches. It involves various stakeholders i.e. local community, NGOs, local governance and even contractors at different stages of the housing process and redefines their roles.

From site selection to village layout and house-designs, the local community, governance and NGOs should be involved in a dialogue, right at the initial phase. The needs and constraints of communities should be priority factors for deciding on the design, choice of materials and construction techniques.

However, in the phase of actual reconstruction, I suggest joint role of contractors or engineers and local craftsmen as educators on the safe building methods. The actual task of reconstruction should be taken up by the house owners, as is also the case in self help reconstruction in Gujarat. However, this process has to be carefully guided and monitored. Importantly, at this point the institution for local governance also needs to educated on good practises in construction.

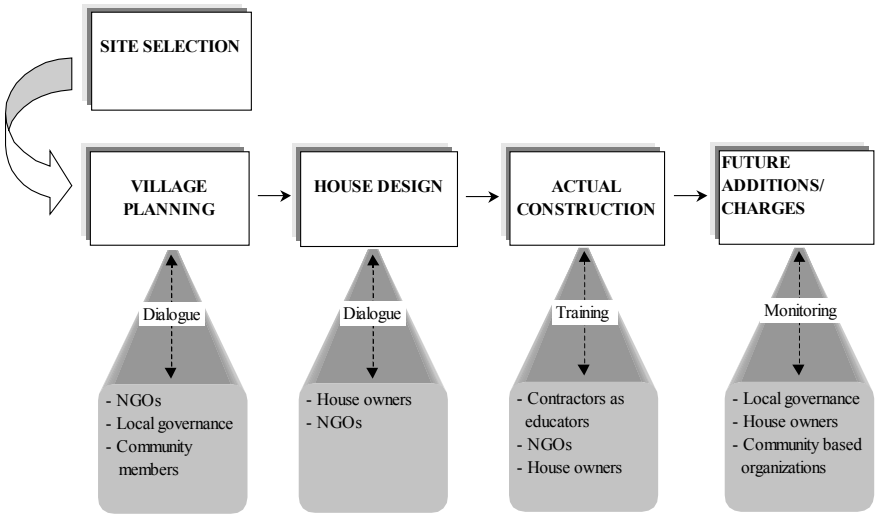

Fig. 12.5 Various Stages of housing reconstruction in post-disaster situation

Repair and Retrofitting decisions should be taken on the basis of the following criteria :-

- degree of damage
- the cost involved in undertaking these measures.
- availability of materials and technical knowhow

These measures should be faciliated by NGOs. Some of them like CPDP are already involved in this. However, most importantly, the techniques should be very simple and easily undertaken within the constraints of the house owners. Again, education and training will play an important role in selecting appropriate techniques.

12.5 SUGGESTIONS FOR FURTHER RESEARCH

No research work is complete in itself. In fact, each research question leads to other research questions and this process of adding / updating the wealth of knowledge is incremental. Based on my research, some future research directions are suggested below:-

1. There is also a need for independent researchers to undertake a detailed documentation of post disaster rehabilitation process and assess its implications over time. Such a research should try to assimilate views from various stakeholders and adopt a holistic perspective, exploring inter-relationships between various issues.

2. Current research work has pointed out that relationship between disasters and land is very significant. Therefore further research can be undertaken to explore relationship of disaster specifically to changing land situation (in what ways?) Finding public land resources and resulting vulnerability in south Asia.

3. The author suggests a detailed research into 'architectural knowledge systems' that contribute to disaster mitigation, specific to each cultural region in south Asia. This can be done through detailed documentation, recording and subsequent analysis. Such an ethnographic research work will contribute to the knowledge bank. This is crucial in the light of fast disappearing cultural heritage in the region. The author acknowledges that this is a long drawn process and will need contribution from many researchers and systematic use of architectural students and faculty.
   Besides architectural studies, ethnographic studies into other traditional systems that characterise rural communities should be undertaken.

4. A detailed research work is suggested to develop an index for measuring changing vulnerability and capacities over time (which includes the situation before as well as in the aftermath of disaster). For this several indicators can be specifically developed and tested in particular context. I have already done an initial work in this direction. The following indicators have emerged from my research and can be further developed :-
   Control over land and material resources, governance, livelihood sustainability, cultural continuity and compatibility.

Professionals from various disciplines can carry out the research areas mentioned above. However, I suggest that new areas of research should be explored, which facilitate multi-disciplinary studies in the field of disasters.

Another point that I wish to stress is that there is an urgent need to carry out more studies in specific cultural contexts, especially relating to developing countries, where disasters are severe and complex in their scope and impact.

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APPENDICES

APPENDIX I

TABLE 10.1 (1/2):

LOCAL BUILDING KNOWLEDGE AND CAPACITY FOR EARTHQUAKE MITIGATION AND RECOVERY

	Indicators	Case 1: Marathwada, India
Spatial Pattern	Location and extent	- Location on mounds of rubble
	Village Morphology	- Clustered layout with heirarchy of open spaces for escape
Traditional Buildings	House form and design	- Private courtyard surrounded by colonnaded verandah in traditional houses known as Wadas for easy escape
	Structure system	- Timber understructure known as 'Malwad' is effective in absorbing lateral foces of earthquake.
	Masonry	- Adobe constructions with binding material of hay has proven to quite effective in preventing total collapse - Very few good examples of stone masonry with through stones in Wadas and temples.
	Joinery and other structural details	- Few constructions have tongue and grooved joints
Recovery Process	Reconstruction	- Easy recycling of stones, mud and timber for reconstruction - Easy retrieval of timber
Skills and Local Resource Use	Building skills	- Stone masons - Stone excavators and cutters - Stone carvers - Carpenters
	Traditional livelihhods	- Agriculture
	Other strengths	- Inter-caste solidarity

TABLE 10.1 (2/2):

LOCAL BUILDING KNOWLEDGE AND CAPACITY FOR EARTHQUAKE MITIGATION AND RECOVERY

Case 2: Kutch, India	Case 3: Kathmandu Valley, Nepal
---------	- Compact and well-defined through ritual paths
- Clustered layout with open spaces for	- Traditional neighbourhood unites called Toles with public and semi-public open spaces
- Circular form of traditional Bannin dwellers called Bhungas	- Square or Rectangular plan configuration of many free-standing houses give perfect symmetry in terms of distribution of mass and rigidity - Symmetry in location of openings
- Wattle and daub construction especially where wood is used as reinforcement for the wall has proved to be very effective especially since they fall outwards. - Timber laced structures	- Central spine wall parellel to the two exterior long walls and layout of floor joists and their connection to the wall effectively distributes the stresses. - Double wooden columns with tie beams on floor and roof level.
- Adobe constructions with binding material	- Fine specimens of Brick masonry with neat joints found in many older constructions.
- Floor joists extending through rubble stone walls to support the balconies help in stabilizing the walls - Knee: braces ties to wooden columns on stone base - Wooden trusses with tie beams at various levels - Tongue and groove joints	- Double framing of openings and use of cross ties counter the earthquake forces. - Timber ring plates and wedges to hold the sloping roof tightly to wall to avoid sliding during quakes - Struts supporting the large roof overhands. - Use of wedges in openings and joints of floors
- Easy recycling of local materials for reconstruction - Easy retrieval from debris	- Easy recycling of timber and bricks for reconstruction
- Stone masons - Carpenters	- Masons - Wood carvers and carpenters
- Handicrafts - Block printing	- Agriculture - Wood-carving
- Enterprising of Gujarati community - High level of self-esteem - Inter-caste solidarity	- Guthi lands as collective community resource - Collective rituals and festivals for the community - Solidarity among and within Newari castes

TABLE 10.2 (1/2):

TRANSFORMATIONS - Pre-earthquake Situation

Transformations	Case 1: Marathwada, India
Built Form	- Weekening of traditional fabric - Contemporary 'traditional' constructions in poor quality - Poor quality of 'modern' constructions - Incompatible changes in materials and structural system of traditional building
Landuse and Ownership	- Land concentrated in the hands of high castes - Marginalization of landless small tenant farmers and building artisans
Occupational Structure	- Change in the scope and nature of traditional occupations e.g. carpenters are no longer making 'malwad' (timber understructure) - Loss of traditional occupations lime stone carvers (patharwat) and stone extractors (wadar)
Social Structure	- Landless and socially deprived ('lower' castes) further getting marginalized
Perception	- Changes in perception
Grassroot Governance	- Weak local governance because of poor economic resources and lack of power - Social and politically powerful control - Local institutions

TABLE 10.2 (2/2):

TRANSFORMATIONS - Pre-earthquake Situation

Case 2: Gujarat, India	Case 3: Kathmandu Valley, Nepal	Issues
- Weekening of traditional fabric - Contemporary 'traditional' constructions in poor quality - Poor quality of 'modern' constructions - Incompatible changes in materials and structural system of traditional building	- Weekening of traditional fabric - Contemporary 'traditional' constructions in poor quality - Poor quality of 'modern' constructions - Incompatible changes in materials and structural system of traditional building - Densification of village vegetable gardens and built upon	**Poor Built Fabric**
- Land concentrated in the hands of high castes leaving others marginalized - Landless tenant farmers migrating to cities	- Selling of private and collective agricultural land belonging to villages to outsiders - Change in landuse from agricultural to residential, public and commercial	**Control of resources**
- Loss or degeneration of some traditional skills for example Stone masons and carpenters	- Change in the scope and nature of traditional occupations. For example, wood carvers are only serving tourist industry and no longer making traditional buildings - Poor quality of skills because of mass production and middlemen	**Loss of Traditional Skills**
- Increasing horizontal social segregation - Break up of mutual support system within communities	- Social segregation getting replaced by economic segregation. Some socially deprived castes are able to become economically strong while some are becoming increasingly week - Disappearing common cultural practices and rituals	**Loss of Mutual Support System**
- Changes in perception	-General perceptions that traditional building are week. -Therefore, people are replacing traditional houses with modern constructions	**Loss of Civic Pride**
- Weak local governance because of poor economic resources and lack of power - Social and politically powerful control - Local institutions	- Weak local governance because of poor economic resources and lack of power - Social and politically powerful control	**Weak Local Governance**

TABLE 10.3 (1/2):

PRE-DISASTER VULNERABILITY OF RURAL COMMUNITIES TO EARTHQUAKES

Indicators	Case 1: Marathwada, India
Location and extent	- Traditional location along river banks may not be safe because of proximity to fault lines and poor soil quality
Village Morphology	- Densification of village fabric leading to loss of open spaces - Narrow roads with sharp bends
House form and design	- Loss of structural integrity due to sub-division of Wadas among families
Strucutre system	- Thick mud layers on 'Malwad' roof - Rotting of wooden understructure (Malwad) due to non-application of linseed oil for maintenance
Masonry	- Poor random rubble masonry in mud mortar beneath nice facades - Absence of through stones - Weak joints between walls - Replacing stone with poor brick masonry or reinforced concrete
Joinery and other structural details	
Traditional livelihoods	- Loss of building skills of carpenters and stone extractors due to changes in traditional occupation
Relationship to land	- Tenant farmers getting increasingly weak socially, economically and politically
Social structure	- Increasing social segregation among castes within communities

TABLE 10.3 (2/2):

PRE-DISASTER VULNERABILITY OF RURAL COMMUNITIES TO EARTHQUAKES

Case 2: Kutch, India	Case 3: Kathmandu Valley, Nepal	Issues
	- Traditional location of certain villages on ridges may not be earthquake safe.	
- Narrow roads with sharp bends	- Internal densification of village leading to loss of open spaces especially vegetable gardens - Increasing pressure of development around the village. No space for the village to expand	**Dense Fabric**
- Additions to Bhungas such as raising the height of walls and accommodating new fixtures such as fans, made them weak. - Change in the positions of openings	- Vertical subdivisions of Newari houses and addition of floors making them very vulnerable to lateral earthquake forces. - Replacing traditional fabric with reinforced concrete	**Incompatibility**
- No structural framing to tie the house structure - New constructions have poor quality concrete mix and reinforcement	- Rotting of wooden structural elements due to lack of maintenance - New constructions have poor quality concrete mix and reinforcement	**Lack of Maintenance**
- Poor random rubble masonry in mud mortar with little or no key stones at the corners and no through wall bond courses	- Weak brick masonry due to natural deterioration and age - Replacing with new bricks laid in poor quality cement mortar	**Non-availability of Local Resources**
- Replacing sophisticated timber joints with nailing - Additions and alterations to other housing fabric, especially replacing traditional fabric with new materials such as brick laid in cement mortar - Poor quality new constructions in brick and reinforced concrete with improper curing, poor reinforcement and workmanship		**Ignorance**
- Loss of building skills of carpenters and stone masons due to changes in occupation		
- Landless labourers further getting marginalized due to breaking up of traditional support system	- Local people are increasingly selling agricultural land to outside people by choice or compulsion - Loss of collective Guthi land belonging to the community	**Inequity in Land Tenure**
- Increasing social segregation among castes within communities	- Social segregation is getting replaced by economic segregation	**Social Inequity**

TABLE 10.4 (1/2):

MAIN POLICY APPROACHES FOR POST EARTHQUAKE REHABILITATION
(Comparative Analysis)

	Marathwada Rehabilitation 1993
Main Approach	Contractor driven
Main External Stakeholders	Government and donor agencies
Main strategy followed	Relocation' of villages
Impact of relocation	Whole village is relocated. Traditional social pattern reinforced. People adjusting by initiating changes. Lot of problems relating to land and livelihood.
Type of technology transferred	Modern' mainly dependent on external resources. Questions of sustainability
Status of 'self-help' constructions	Mostly poor. People reverting back to degenerated
Role of government	Quick decision. More responsibility with the government
Local Governance **Community participation**	Little role and responsibility in rehabilitation through consultants. Mostly participation of elected representatives of village committee for 'name-sake'
Relationship with normal development	Negligible. Too much focus on housing as end product
Repairs and retrofitting	Introduced for the first time. Difficulty in getting initial acceptance by government as well as local communities
Perception of local engineers	Strongly advocated 'modern' concrete constructions in place of traditional constructions. Not so much convinced to use local resources.
Economic rehabilitation	Distribution of Tool Kits to artisans
Immediate Shelter	Temporary shelter

TABLE 10.4 (2/2):

(Comparative Analysis)

Gujrat Rehabilitation 2001
Owner driven
NGOs and local community
Financial Compensation to owners for reconstruction
Only section of village is relocated leading to physical break up of the communities based on caste-lines.
Alternate' mainly dependent on local resources Questions of sustainability
Mostly poor. Unsafe practices still continue in new constructions
Comparatively slower decision. Lesser responsibility with the government
Little or no role and responsibility in rehabilitation. Mostly involvement of community in providing labour for reconstruction
Pioneering By institutionalizing link between community, NGOs, and government through setting up of Setus.
More acceptance with the government but still difficulties in getting acceptance from the communities
Considerably less preference for 'modern' concrete constructions. However, increased acceptance for use of local resources for building.
Distribution of Tool Kits Construction of worksheds
Temporary and semi-permanent shelters

TABLE 10.5 (1/2):

POST-EARTHQUAKE REHABILITATION - Transformation Process

Types of self-help reconstruction	Marathwada (After 8 years)
- Using local technology without facilitation	People moving back to original village sites and reverting back to unsafe construction practices using poor rubble masonry
- Using local technology facilitated by NGOs/Govt.	This was not observed
- Using 'modern' technology without facilitation	In all the villages where strengthening and retrofitting programme was to be implemented, people vacated their houses and made one room shelters at the periphery using poor quality construction in brick
- Using 'alternative' technology facilitated by NGOs	Such reconstruction is not observed
Types of contractor-driven reconstruction	
- Using 'modern' technology facilitated by NGOs/ Government	City-like' relocated villages constructed using state of the art earthquake resistant 'technology' using concrete with heavy reinforcement. People have initiated various changes to suit their life style.
- Using 'local/alternative' technology facilitated by donor agencies	Not observed
Changing status of relocation	
	People initiative physical and social changes in villages relocated by the Government
Repair and retrofitting	
	Government initiative was lacking, some NGOs made efforts to undertake these 'low cost' measures through model houses and awareness programmes. Lack of awareness on these measures among these measures among official engineers Repair and retrofitting programmes were not widely followed by the people afterwards.

TABLE 10.5 (2/2):

POST-EARTHQUAKE REHABILITATION - Transformation Process

Gujarat (after 8 months)	Issues
Unsafe construction practices continue using rubble from debris, mixed with new materials. Temporary and semi-permanent constructions made by NGOs getting permanent by using local techniques	**Ignorance, Poverty, Unsustainability of Technology**
Some NGOs like Vastu Shilpa foundation recreated the whole village and vernacular house forms (Bhungas) using traditional spatial pattern and local construction techniques	
In many villages like Nani Cherai, people have initiated modern constructions in brick and reinforced concrete in very poor quality using improper mix and reinforcement. Ignorance of basic earthquake resistant features such as concrete band.	
NGOs like Abhiyan are reconstructing houses using vernacular built form of bhungas but using alternative technology employing local as well as modern materials such as compressed soil blocks.	
Same approach as in Marathwada using state of art eartquake-resistant 'technology' using concrete with heavy reinforcement.	**Cultural Incompatibility and Unaffordability**
Not observed	
Self-relocation of certain sections of village community leading to physical break up.	**Social Inequity**
Government initiative is encouraging and efforts made by more NGOs through model houses and awareness programmes. However, still there is considerably less emphasis as compared to reconstruction. Lack of awareness on these measures among official engineers	**Mis-perceptions, Lack of awareness**

TABLE 10.6:

VULNERABILITY PROCESS - Underlying Causes

Underlying Causes		Pre-disaster	Post-disaster
Social and economic poverty (Lack of access)	- Loss of traditional occupations, like: farming, crafts (skills) - Break up of mutual support system	Poor maintenance of existing Poor quality of new constructions Disappearing local knowledge and skills	Poor self-help reconstruction Incompatible additions/changes
Social Inequity	- Increasing social polarization	Decreasing cooperation among rural communities	Physical breakup of villages
Existing notions (Under)-Development Process	- Changing ecological relationships e.g. towards land (change in landuse and ownership) - Preference for 'modern' building and planning techniques by experts and local people	Selling of land to outside people. Loss of local resources (natural). Increasing dependencies Replacing traditional fabric by poor 'modern' fabric	Reinforce economic segregation through house criteria' City-like' village and housing
Political Factors			Adoption' and 'relocation' policies Hasty reconstruction
Inactive local governance	- Command and control top-down	No policies, roles and responsibilities	No policies, roles and responsibilities in rehabilitation

Appendix II

List of key points / questions to structure interviews with various stakeholders

1) NGOS WORKING IN GUJARAT

1. REFERENCES
Time and place of interview, how I got to know the informant, in what capacity does he represent a particular NGO?

2. ACTIVITIES
What are the various activities in post earthquake relief and rehabilitation? - Relief / Semi-permanent or permanent shelter / livelihood regeneration, visit to their activity areas.

3. STAKEHOLDERS
Who are the various stakeholders involved in various activities? -Low caste / artisans / women etc.

4. CHALLENGES
What are the main challenges encountered by the NGOs in undertaking rehabilitation activities? What are the lessons learnt?

5. ADDITIONAL INFORMATION

2) NGOS WORKING IN MARATHWADA

1. REFERENCES
Time and place of interview, how I got to know the informant, in what capacity does he represent a particular NGO ?

2. ACTIVITIES AND ACHIEVEMENT
What were the main activities of the concerned NGO in rehabilitation? How will they rate their acheivement? Are they still working in the region or have they left?

3. CHALLENGES
What were the main challenges encountered by the NGOs in undertaking rehabilitation activities?

4. ADDITIONAL INFORMATION

3) CBOs / NGOs IN KATHMANDU VALLEY / BUNGAMATI

1. REFERENCES
Time and place of interview, how I got to know the informant, in what capacity does he represent a particular CBO?

2. ACTIVITIES
What is the history of the concerned CBO? What are the various activities of the concerned CBO in the village? What are the challenges faced in carrrying out these activieties?

3. OTHER INFORMATION ABOUT THE VILLAGE
What are the main issues / problems confronting the village?

4) GOVERNMENT ORGANISATIONS

1. REFERENCES
Time and place of interview, how I got to know the informant?

2. ORGANISATIONAL STRUCTURE
What is the main organisational structure for management? Who are the key actors?

3. ACTIVITIES
What are various disaster management / rehabilitation activities undertaken by the respective organisation? What were the main challenges? What is the present status and future plans?

5) TRADITIONAL CRAFTSMEN

1.REFERENCE
time and place for interview, how I got to know the informant

2. SKILLS
What are the main skills possessed by a particular craftsmen? If they contribute to earthquake mitigation. Where did they learn these skills? Have they introduced some change in these skills from before?

3 ISSUES
What are the main issues / challenges faced by them for continuation of these skills or occupations?

4. SUGGESTIONS
What are their needs and suggestions for improvement?

5. OTHER INFORMATION

5) LOCAL PEOPLE AFFECTED BY EARTHQUAKE (MARATHWADA AND GUJARAT)

1. REFERENCE
time and place for interview, how I got to know the informant

2. OCCUPATION
The kind of occupation, economic status

3. IMPACT
The physical, social and economic impact of earthquake.

4. RECOVERY
Self-initiatives for recovery and coping strategies. Which organisations / agencies supported recovery after the earthquake, if at all? In what way? The level of satisfaction. What is the present status?

6. SHELTER
The kind of shelter after earthquake – reconstructed, retrofitted or status quo. The level of involvement after the earthquake. Various issues and problems.

7. OTHER INFORMATION
8.

6) LOCAL PEOPLE (HOUSEHOLDS) OF BUNGAMATI VILLAGE

1. REFERENCE
time and place for interview, how I got to know the informant

2. HOUSEHOLD STRUCTURE

How big is the size of the household? Who is the informant? – elderly, woman, child. How many children? Do they go to school?

3. OCCUPATION

The farmers, wood carvers, other occupations. How long are you practising? Is this traditional occupation? Do you have sufficient earnings from this occupation to make basic living? What are the issues and challenges?

4. LAND OWNERSHIP

Do you own agricultural land or working as tenant farmers? How much agricultural land is owned by a particular household, if any? Where is it located – distance from their house? Has it been subdivided? Has it been sold in recent past? To whom and why?

5. AGRICULTURAL PRODUCE

Is the agicultural produce from this land enough for a household to sell it in the market and make living or is it barely enough to sustain the household? In the latter case, this is enough for how long every year?

6. TRANSFORMATIONS

What are the changes observed in the village over life time for better or for worse? What will they like future changes to be made.

7. EXISTING SHELTER

How old is their existing shelter? How long have they been living there? What are their views on the general condition? What is their perception about the strength of traditional construction, especially for their response to earthquakes? What are their future aspirations?

8. OTHER INFORMATION

APPENDIX III - LIST OF KEY ORGANISATIONS AND RESOURCE PERSONS

KEY ORGANISATIONS

Ahmedabad Study Action Group (ASAG), Latur Unit, Mahrashtra, India

Collectorate, District Latur, Maharastra, India

Programme Management Unit (PMU), Maharashtra Earthquake Emergency Programme (MEERP), Sachivalaya, Mumbai, Maharashtra, India

Housing and Urban Development Corporation (HUDCO), New Delhi, India

The National Centre for Disaster Management (NCDM), New Delhi, India

Gujarat State Disaster Management Authority (GSDMA), Gandhinagar, Gujarat, India

Centre for People-centred Development and Planning (CPDP), Ahmedabad, Gujarat, India

Abhiyan, a consortium of NGOs, Bhuj, Gujarat, India

Unnati, an NGO based in Bhachao, Gujarat, India

Sewa Bharati, an NGO, Ahmedabad, Gujarat, India

Veerayatan Vidyapeeth, Bhuj, Gujarat, India

LIFE, an NGO, Rajkot, Gujarat, India

Rotary Patan West, Kathmandu Valley, Nepal

Village Development Committee (VDC), Bungamati village, Nepal

Amrapur Society for Environmental Improvement, Bungamati village, Nepal

Nepal Society of Earthquake Technology (NSET), Kathmandu, Nepal

Intermediate Technology Development Group (ITDG), Kathmandu, Nepal

Institute of Engineering (IOE), Tribhuvan University, Kathmandu, Nepal.

KEY RESOURCE PERSONS

Desai, Rajendra and Rupal, Structural Engineer and Architect

Dixit, Amond Mani, NSET, Nepal

Bansod, District Collector, Latur, India

Potdar, Ashok, ASAG, Latur Unit

Mistri, Bhanu Bhai, Unnati NGO

Koticha, Chandrakant, LIFE NGO

Mistri, Ravi

Shah, Haresh, World Seismic Safety Initiative (WSSI)

Maharjan, Prem Bhakta, VDC chairman, Bungamati

…… and many others