CHAPTER: V
EARTHQUAKE DISASTER MITIGATION MODEL OF SHIMLA CITY

5.1. Introduction

Modelling is executed mainly to fill the gaps or the unforeseen shortcomings which decision makers try to access for the future development of an area or an organisation. Modelling, a decision-making process, is a version of the real world where problems or gaps are proposed with the objective to form analogues which are simpler to handle, better manageable and easy to control. These can be used by government, public and private organisations, as well as individuals to overcome problems. A recent record of disasters indicates a high rise in both human and economic losses, scenario building and modelling can be beneficial in calculating the gaps, to accomplish the goals of disaster mitigation. The aim of modelling techniques is to manage controllable variables like research, training, awareness, resources, land use, people participation to mitigate and manage disasters so that the outcome variables of disasters which are uncontrollable lead to minimised impact (Satender, 2003). For disasters like earthquakes, which are without warning and whose intensity of occurrence cannot be estimated, scenario building process provides a way of testing strategies in the planning stage. Thus, modelling can be helpful in better functioning and planning process to mitigate disasters like earthquakes and help to ensure proper working in different types of realistic situations (College of Defence Management, 2004).

5.2. Scenario Building Process

5.2.1 Formation of Scenarios

Scenarios were formed by keeping in view the drivers of the environment within Shimla city, like topography, geology, climatic conditions persisting throughout the year, the evolution of the city - both past and present, population–residential and fluctuating, infrastructural development, social, economic, cultural and demographic set up of the city. Another major driver considered was the existence of the city in the lap of the Himalayan Range, one of the most seismically active regions of the world and of the Indian Sub-Continent. The unpredicted and sudden occurrence of earthquakes does not provide anyone with a chance to think of safety measures. The way Shimla region is outgrowing its developmental capacity
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over the decades is a concern for disaster managers. Another matter of concern is non-existence of any major seismic activity within the state of Himachal Pradesh since the Kangra earthquake of 1905. These parameters added to apprehension and thus led to conducting of scenario building process for Shimla city. The scenarios formed were keeping in with the different time of the day and seasons of the year. The wildcard or worst-case scenario formed for Shimla City was based on Earthquake of 8 Richter scale magnitude having epicentre within the city and occurring during the night on a cold winter season with heavy snowfall (Appendix XII). To illustrate the area of destruction during the worst-case scenario of an earthquake within Shimla city, a template was constructed (Fig. 5.1). It was utilized for brainstorming the consequences of preparedness and mitigation measures existing within the city or in its vicinity for measures necessary to be taken against such a high seismic activity.

Fig. 5.1: Template of Worst Earthquake Scenario showing Impact Zones Surrounding Shimla City with Epicentre of MMI Scale 8
5.2.2 Conducting of Scenarios and Brainstorming Session

Four Earthquake Scenarios were constructed for Shimla city (Appendix XII), to encourage divergent thinking and for creating a useful vision (Ringland and Schwartz, 1998). They were put forth for discussion and brainstorming with the officials of Stakeholding Departments within the jurisdiction of Municipal Corporation (MC), Shimla. MC as the Nodal agency of Disaster Management within Shimla city works in collaboration with other Stakeholding Departments of District Shimla, in which it is located. Hence, under the directions of the Deputy Commissioner (DC), District Shimla, nine (9) out of eleven officers of the Stakeholder departments attended the session, as summoned within the jurisdiction of DC’s office, Shimla District. The Scenarios were commenced in the presence of DC, in his office in association with the Additional District Magistrate (ADM), Shimla. The eleven departments beckoned were MC Shimla, Army, Police, Public Works Department, Electricity, Medical, Town and Country Planning, Transport, Telecom, Home Guards and Fire (Appendix VIII). However, brainstorming was carried out for Earthquake Disaster Mitigation Management of Shimla City with the nine stakeholders (Picture 5.1) beside the Army and Transport departments. The scenarios were presented one after the other with worst-case scenario in the end. The time taken to discuss and brainstorm the total four scenarios was two and a half hours.

![Picture 5.1: Scenario Building Session in the presence of Deputy Commissioner, Shimla and other Stakeholders](image-url)
5.2.3. **Analysis of Scenarios**

The discussion of the four scenarios brought forth certain issues. Some issues that arose under brainstorming were common to all the four scenarios, while few were specific to each scenario and others were marginal issues, not affecting the main or core issues.

**5.2.3.1.** The common issues that emerged from each discussed scenario have been labelled as the *core issues* (Fig. 5.2). Whatever may be the scenario, these core issues need to be dealt with first by disaster managers. The Core issues having originated out of the Shimla scenarios are listed below:-

- Lack of awareness and need for sensitisation of public and lifeline departments with regards to Earthquakes.
- Lack of community participation and civil defence.
- Congested areas with bye-lanes and pedestrian paths, raising the problem of help reaching devastated areas.
- Lack of public and inter-departmental framework of a communication network for disaster management.
- The inadequacy of medical support system in case of earthquake devastation.

**5.2.3.2.** The issues or points which are not common but can influence the core issues are referred to as *Hedging Issues*. The hedging issues that emerged during the discussion of Shimla scenarios are emphasized below:

- There was a requirement of developing a dedicated Command Centre and connecting it with the seismological centres and with the disaster coordination body system.
- Requirement for the creation of sub-centres in each ward (like the police beat formed ward wise).
- Need for alternate electricity supply.
- Need to be stricter with regards to structural building construction and codes implementation and auditing.
- More certified engineers and architects (presently approximately 150-200 registered with Town and Country Plan, Shimla).
Need for more number of fire brigade, better and light equipment for moving on foot.

Development of rescue camps or facilities for the homeless.

Health camp in every relief camp.

Using police beat committees and the chief beat officer (Head Constable) for awareness and rescue as well in different beat areas (presently city divided into 5 beats with 2-3 wards in one group).

Deployment of NDRF teams in each district headquarters for the quick response.

Need to integrate the use of Army/ Air Force/ NDRF and other Central Government Resources.

Need for developing shelters and facilities for homeless and injured people.

Masonry training with regards to Earthquake Structural Mitigation.

Securing economically important buildings like temples, banks, key offices of revenue from loot at time of the earthquake.

Development of Tourism Disaster Management System to handle and evacuate tourists.

Retrofitting of lifeline structures within the city.

Coordination cell to handle both internal and external resources including international help at the time of disasters.

No strict protocol to be followed at the time of the disaster like an earthquake.

Better coordination and quick response.

5.2.3.3. Under Scenario discussions, certain peripheral issues also emerge that can surprise and influence the core issues in a big way. These peripheral issues are called as Contingency Issues. Some such Contingency Issues that emerged under the discussion are listed below:

Preparing for Disaster Inventory.

Social Mapping.

Exploration of alternate pedestrian paths for disastrous situations.

Micro – zonation.

Development of alternate communication system.
Command Post establishment.

The model (Fig. 5.2) thus highlights the various issues risen from the brainstorming session of the four scenarios.

Fig. 5.2: Scenario Issues for Earthquake Disaster Mitigation Management of Shimla City
5.3. Strategies Formation

The outcome of scenarios led to the formation of strategies. Based on the outcome of Scenario discussion in the presence of Deputy Commissioner Shimla and his team of nine stakeholder departments, the issues highlighted became the basic strategies for Earthquake Disaster Mitigation Management within Shimla city. The strategies based on the core, hedging and contingency issues were stated as core strategies, hedging strategies and contingency strategies. Core strategies need to be given higher precedence by the disaster managers and should be implemented at all cost, as they address the core issues. Core issues are those issues the occurrences of which have a very high probability of effectiveness in disaster management. The hedging strategies will supplement the core strategies, however, the contingency strategies support the core strategies for meeting the disastrous situations that may arise during an earthquake of 8 Richter scale, having epicentre within Shimla city.

5.3.1. Core Strategies

5.3.1.1. Lack of awareness and need for sensitisation of public and lifeline departments with regards to Earthquakes

The first strategy emerging under core issue involves sensitisation of the public and various lifeline departments within Shimla City with regards to earthquake disasters and their management. This issue of lack of awareness among public and lifeline departments has also been proved under public and administrative questionnaires along with their hypothesis. This can, thus, be achieved through earthquake awareness training, workshops, street plays, use of IEC material like pamphlets and posters. Mass media, both print and electric, with means of social networking can be used for raising awareness among public and lifeline departments for earthquake management. Research presented non-existence of any such system for public or departmental sensitization, as well as putting to test the various resources available within the city or at the ward level. It is recommended that a minimum of two mock drills be organised per year, as per Disaster Management Act 2005, by the stakeholding departments of the city along with the community at the ward levels. Based on the drills, not only the local population but also the transient population within the city shall be educated regarding earthquakes and their measures, irrespective of age, gender, caste, creed and disability. The strategies should be formed in such a way that various departments get to learn from their shortcomings.
5.3.1.2. Lack of Community Participation and Civil Defence

Community participation includes capacitating the community in preparing, mitigating and coping with disasters effectively, by reducing their risks and vulnerabilities and increasing their resilience level to disasters like earthquakes. Strategies involving communities will help to decentralize the planning process within the city and provide the public with a feeling of ownership. Civil Defence should equally be made part of Earthquake Disaster Management Strategies, as they are the first responders of disasters and are trained to combat disastrous situations. Their participation will not only help in spreading awareness and mitigating disastrous effects in a better manner on the ground on one hand but also help to boost the public confidence in City Disaster Management Authority on the other.

5.3.1.3. Congested areas with bye-lanes and pedestrian paths, raising the problem of help reaching devastated areas

Roads are the lifelines of any city for uninterrupted movement, especially during disasters. Shimla city faces road congestions, traffic jams and parking problems on daily bases. The public survey has highlighted fair to poor conditions of transport infrastructure to sustain road traffic within Shimla city (Fig. 4.27). The strategies, thus, prepared by the civil administration should address the approachability problem of the city, either through decongesting the areas or by widening of the roads. This must be undertaken at all cost to reduce death and destruction within the ‘golden period’ of disasters. Lack of open spaces or ground (Fig. 4.29) within each ward must be established for parking of vehicles, so as to not allow any parking on the roads. Open grounds can also be used as evacuation areas during earthquakes. Strategies should also include earmarking of alternate footpaths under the total collapse of the roads during an earthquake of 8 Richter scale.

5.3.1.4. Lack of public and interdepartmental framework of a communication network for disaster management

Failure in the communication network at the time of an earthquake disaster of 8 Richter scale or more with an epicentre in the city, can completely shut down not only the administrative machinery but affect the search and rescue operations as well. Research has brought forth that inter-departmental communication and coordination with regards to disasters are non-existent within the city. Such a situation can be fatal at the time of a disaster. Strategies should look into developing interdepartmental communication process (Fig. 5.3) for the time
of disasters and ways in which disaster-related information can be provided to the public both as means of awareness and alert during pre and post-disaster phases. Strategies related to communication network should be one of the prime variables for disaster preparedness and mitigation. Use of alternate means of technology for communication like wireless/ Ham radio/ satellite radios should be looked for by city administrators.

5.3.1.5. Inadequacy of medical support system in case of earthquake devastation

Saving of lives during the ‘Golden Hours’ is the most crucial for any medical team during disasters. Strategies should have provision for trained first responder teams, sufficient medical facilities, an emergency plan for evacuation of casualties within hospitals and transportation of casualties by road, rail and air. Places should be earmarked for setting up mobile hospitals in case the local medical support system fails or becomes inadequate. Formation of quick response teams (QRTs), training of staff in mass casualty and psycho-social care should be included in the medical support system. Chief Medical Officer (CMO) should work out a detailed medical plan keeping in view the earthquake scenario and conduct and participate in mock drills on regular bases to learn from the lessons.

5.3.2. Hedging Strategies

In order to supplement the core strategies, the hedging strategies need to be worked upon as well to have a better understanding and planning for Earthquake Disaster Management.

- Setting up of Disaster Command Centre -

At the trigger of any disaster, the distress call needs to be made which should reach to the right person and at the shortest possible time for immediate response to be provided. Also during the crisis, there are several agencies at work and if their activities are not coordinated there will be total chaos and collapse. So first thing required to manage any disaster is the establishment of a Disaster (Emergency) Command Centre on a 24 x 7 basis. This centre should coordinate all the post as well as pre-disaster activities. This Disaster Command Centre should plan for mitigation, preparation and post-disaster rescue, relief and reconstruction strategies. The Centre must operate under the Home or Revenue Minister of the State/ Deputy Commissioners at Districts and must ensure the following Pre-Earthquake Mitigation measures:
Prepare mitigation strategy and plans and issue the same to all stakeholders

Equipped with vulnerability maps of the city

Maintain the database of the key contact persons during emergencies and resource inventory

Ensure dry rehearsals are conducted properly and regularly

Plan medical support plans, fire hazard plans, disposal of dead bodies, rescue and relief plans, rehabilitation plans, reconstruction plans.

Allotment of resources and their utilization through various plans.

Coordinate work of external and international agencies.

Coordinate resource sharing plans with neighbouring districts and states.

Establish liaison with Army, Air Force and NDRF.

Involve community and volunteering organizations in mitigation plans.

Hedging Strategies for issues with regard to training of the community as well as the officers/officials of the main stakeholding departments needs to be formed. Besides which strategies based on implementation of building codes as per Bureau of Indian Standards (Appendix VI) and retrofitting of important buildings both government and private like DC office, MC office, Hospitals, Schools, Fire stations, Police Stations, important community centres, etc. needs to be formed for better resilience of the community. Strategies for the formation of Beat committees for the wards for providing better law and order; sensitization of tourists against earthquake measures within city regards to their safety and security to be formed. Also, there is a need to develop alternate means for electricity, water and sewerage to prevent chaos and confusion among the community with regards to non-availability of utility services during an earthquake. Developing and earmarking rescue and health shelters and spreading the knowledge about their whereabouts among the public for earthquake emergencies is equally essential. Another important Hedging Strategy required is deploying of Army/paramilitary forces for not only post-disaster scenarios but through strategy development even for pre-disaster management for awareness programmes, through demonstrations, especially for earthquake disaster mitigation. These strategies will help build the confidence of the public in city administration and reduce their anxiety and fear with
regards to earthquakes. It will develop synergy for Inter-departmental coordination and also help find gaps for tackling the actual seismic event.

5.3.2. Contingency Strategies

The contingency issues influence and surprise the core issues, therefore contingency strategies formation is equally important as the core strategies.

5.3.2.1. Preparing for Disaster Inventory

Disaster inventory helps the disaster managers to have a better scenario for the preparation of disasters by attaining an idea of the disaster-related equipment and resources, their position, number and usage within an area. The India Disaster Resource Network (IDRN) registers all related disaster resources of the country, and, it should be taken into consideration while building strategies. The inventory can be prepared at the ward level, for quick response for a hill city like Shimla where road and transport failure can delay the process of search and rescue during high seismic activity. Topography will hinder carriage of heavy and big machinery on foot. In that case, IDRN will be able to determine which area requires which equipment, based on its already uploaded inventory. The same can be done for the ward levels within Shimla.

5.3.2.2. Social Mapping

Social Mapping are pictorial in nature and consist of various types. They should be undertaken for the wards of Shimla city, as their use is not only for those who are literate but also for non-literate since they are pictorial. Social Maps are Community Participation Appraisal Tools, bring authenticity to the maps as they are prepared by the community themselves, thus, giving the whole community of an area a feeling of belongingness. The social mapping of an area will not only direct the local administrators in planning but also will provide help to outside organisations and para-military forces who come for search and rescue during an earthquake disaster, as they are not familiar with the affected areas. They can also be useful during peacetime for training and capacity building of the community. Thus, disaster management strategies cannot only make mitigation planning better but also make relief and rescue much easier and efficient.
5.3.2.3. Exploration of alternate pedestrian paths for disastrous situations

Shimla has congested pathways and roads when blocked and destroyed by falling buildings and trees due to landslides. This can make relief and rescue in post-disaster not only difficult but impossible in certain areas. Hence the contingency strategies should take into consideration along with core issues to develop and prepare alternate routes within Shimla city for quicker and efficient post-disaster action. At the same time, awareness campaigns and mock drills among the community of the city with regards to those explored alternate paths have to be carried out. This will make public aware of alternate routes and help them use those routes during disastrous situations.

5.3.2.4. Micro–zonation

Micro–zonation done at ward level of the city can be beneficial for planning mitigation strategies for disasters as they highlight all the strategic locations and infrastructure within the mapped area. The Micro-zonation maps of wards of Shimla city can determine the strategic buildings and routes within each ward for future planning. Through it, vulnerable areas within the wards can also be highlighted and planning by the city authorities can thus be done accordingly to avoid large-scale loss of life and property during an earthquake. Micro-zonation maps and data should be maintained at the Emergency Operation Centre beside disseminating them to the major stakeholders within the city to plan out earthquake disaster mitigation management for the city and the wards.

5.3.2.5. Development of alternate communication system

As highlighted in the strategies of core issues, failure of the communication network can be fatal to disaster coordination and action during disasters like earthquakes, so, alternate means of communication network needs to be arranged at the city level. For hill city like Shimla, where the communication is blocked by the majestic hills in many areas, the measures of satellite phones, Ham Radios and wireless network would be the only means of communication when communication towers of BSNL and mobile networks would fail during high-intensity earthquakes. Thus, the formation of ‘Last Mile Connectivity’ needs to be defined within the city (Fig. 5.3). The earthquake disaster mitigation strategies should focus on such alternatives besides providing training and drills to the concerned officials for their effective use during disasters.
5.3.2.6. **Command Post Establishment**

Earthquake disaster strategies should involve the establishment of Incident Command Post within each ward of the city. From here the post-earthquake disaster management could be conveniently performed and the city administration would be provided information of the situation within wards. The Incident Commander of the ward could be the designated Counsellor of the ward (Fig. 5.7). Mitigation strategies for earthquake disaster management thus should involve training and carrying out of mock exercises with the incident commander and their team within the wards, involving communities at the micro level to build their resilience.

Strategic planning cannot be done in isolation but through proper knowledge and SWOT analysis of the strategic environment. Strategic Management involving SWOT Analysis includes two things- information required and techniques used. ‘Opportunities’ and ‘Threats’ are recognized through environmental analysis, while ‘Strengths’ and ‘Weakness’ of an area are recognised through organisational analysis (Satendar, 2003; Prasad, 2008). Through the use of SWOT analysis, one will attain clarification on issues related to mainstreaming of disasters and develop efficient earthquake management strategies.
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Fig. 5.4: SWOT Analysis of Shimla City

- State Capital of Himachal Pradesh
- Social, Economic and Institutional Strength
- Well developed and oldest Municipal Corporation of the country
- Coordination among various departments of the city possible due to provision of nearness among city and with district and state at one place.
- Provision for international coordination and support being provided by UNDP India to MC
- Provision for financing by the state for disaster management
- Available Draft of City Disaster Management Plan to initiate earthquake mitigation and DRR activities.
- HRVA under process by private organisation (TARU)

- About two century old city and its infrastructure
- Negligible capacity building and awareness with regards to seismicity of the area
- Lack in implementation of earthquake guidelines for safer tomorrow.
- Negligible use of technology related to earthquake disaster mitigation
- Lack of cooperation and coordination between public, departments and city administrators
- Lack of financial support for earthquake DRR within area.
- Lack of integrated development and sustainable livelihood
- Political will

- The State capital of Himachal Pradesh
- Presence of major stakeholder Departments within city, of district and state level
- Ample space for research and development with state of the art institutes within state of H.P.
- Use of expert advice in mitigating earthquake disasters
- To incorporate youth, NGO's and volunteers in earthquake disaster mitigation management
- Incorporating development with earthquake disasters
- Use of latest technology
- Role of media
- To develop culture of earthquake disaster mitigation management

- Earthquake Zone IV
- Rapid population growth and urbanisation
- Decentralisation leading to lack of authority
- Non Coordination among Departments
- Non availability of Technical information with regard to new methods of earthquake analysis.
- Research done by institutes and Research Departments are more theoretical than practical
- Capabilities of NGO's cannot be authenticated
- Lack of good governance
- Non utilization of Funds for disaster management
- Non registration of vulnerable groups at ward levels, especially PwD.
Understanding the gap between what is available and what is required after SWOT for mitigating and managing earthquake disasters, it will help re-build, an earthquake resilient society. It will further help in reducing the earthquake risk and vulnerability of the city. Based upon the public, administrators and scenario data analysed for the Earthquake Disaster Mitigation Management, the SWOT analysis was prepared for Shimla City as presented in figure 5.4.

5.4. Plan of Earthquake Disaster Mitigation Management for Shimla city

Formulation of strategies further needs to be put into action for creating efficacy in Disaster Management or they will just remain as procedural ideas. Disaster Management is not a single process but multi-faceted, involving planning as one of its major components. With the increase in urban population and construction within the city, risk and vulnerability level of its community is ever increasing. Thus, for making effective and efficient decisions in the management of disasters, planning is an important process besides analysis, cooperation, coordination and interpretation. Planning is the basic function of management which precedes a decision or a course of action. Plans provide a balanced approach for attaining the objectives and goals by bridging the gap between theory and practice. Plans include perception, assessment and mitigation at different levels for enhancing decision making and implementation.

Planning of urban centres requires integrating awareness of disaster mitigation processes into their daily normal planning programmes. Thus, the purpose of a plan is to recognise the hazards and provide a systematic way to respond to that particular disaster. It involves identifying the possible situations that may arise, using strategies for the future course of action, making optimal use of resources and identifying government bodies responsive for action (Modh, 2010). Generally, planning involves top-down approach where the community is merely involved to serve as an aid in its implementation instead of providing inputs. The Plan formed of Earthquake Disaster Mitigation (Fig. 5.5) paves the way to develop a capacity building of community at local levels as well as at organisational level by identifying the plan of action involving the community at grassroots level. The plan is thus, a vital constituent that helps to focus on specific elements for carrying out prompt and successful actions for future sustainable development.
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Fig. 5.5: Plan of Earthquake Disaster Mitigation for Shimla City
An action plan of city earthquake disaster mitigation has been prepared to act as a guide to the disaster managers and developmental authorities in preparing for future earthquake hazards. Based on scenario building exercise, SWOT analysis and findings as per public and administrators questionnaires, the procedural steps for formulation and implementation of the plan of Earthquake Disaster Mitigation for Shimla City is shown in figure 5.5. Today Shimla city, being the administrative and tourism centre of Himachal Pradesh, is in need of environmental sustainability and sound development for minimising future impacts of seismic activities of high intensity. Thus, the developmental plans and policies of the city from the British era, need to be revised, conceived and re-addressed.

5.5. Model Building for Earthquake Disaster Mitigation Management of Shimla City

The main objective of Model Building is to reduce risk and vulnerability, through monitoring and controlling developmental pattern of the disaster-prone area (Satender 2003). The Earthquake Disaster Mitigation Model suggests re-defining disaster management approach of the authorities with holistic viewpoint by inculcating decision-making process through scenarios, strategies and management practices at large. It is carried out through awareness, knowledge sharing, development of disaster-related skills, corporation, community participation, implementation and governance for mitigating earthquake disasters and building a resilient society without destroying the harmony of the environment, during development of the city.

The model has been developed by keeping with the required activities for earthquake mitigation within Shimla city and has also been provided with an action plan for its full functioning at the ground level.

5.5.1. Primary and Secondary Activities for Earthquake Disaster Mitigation Management

A glance at Primary and Secondary activities (Fig. 5.6) of earthquake disaster management for mitigating its effects by disaster managers is the prime concern before the formation of the Model of the Earthquake Disaster Mitigation Management for Shimla city. Based on the management strategic relevance table (Prasad, 2008), the Primary activities have been highlighted under Inbound Logistics, Operations, Outbound Logistics and Services and Secondary activities as Infrastructure, Human Resource Management, Technology Development and Procurement. These strategically relevant activities are interrelated and of value in earthquake disaster management. The Primary activities within the table refer to the
crucial activities needed to be conducted and prepared for by all organisations, in the wake of a seismic activity. While secondary activities provide support to the primary activities, on one hand, it facilitates the performance of the other secondary activities on the other hand for managing and mitigating earthquake disasters.

<table>
<thead>
<tr>
<th>Primary Activities</th>
<th>Infrastructure</th>
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<tr>
<td>Preparing Disaster Management Plans</td>
<td>Disaster management Cell</td>
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<td>Disaster Management Act</td>
<td>Emergency Operation Centre</td>
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<td>Human Resources</td>
<td>Communication network</td>
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<td>Medical Facilities</td>
<td>Transportation network</td>
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<td>Transport Facilities</td>
<td>Medical Facilities like hospitals, PHC’s, CHC’s etc.</td>
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<td>Search and Rescue equipment</td>
<td>Disaster Equipment Storehouses</td>
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<td>Communication</td>
<td>Granary and medical stocks</td>
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<td>Food and supply</td>
<td>Retrofitting</td>
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<th>Secondary Activities</th>
<th>Inbound Logistics</th>
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<td>Strategic Planning</td>
<td>• Human resource planning</td>
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<td>Awareness Campaigns</td>
<td>• Employment of Technical Experts related to Disaster Management</td>
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<tr>
<td>Implementation of IRS</td>
<td>• Training of technical people in latest technology within DM like GIS, remote sensing</td>
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<td>Formations of IRT’s</td>
<td>• Retaining of long-term jobs of the DM-related human resource</td>
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<td>Mock Drills</td>
<td>• Financing for DM-related research programmes</td>
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<td>Implementation of Disaster Plans at ground level</td>
<td>• Financing of DM human resource as per pay commission and International standards.</td>
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<th>Operations</th>
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<td>Awareness and Capacity Building</td>
<td>• Financing for mitigation of various earthquake-related activities.</td>
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<td>Training and Mock drills</td>
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<td>Implementation of Building Codes</td>
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<td>Documentation or Data Base of trained human resource</td>
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<td>Maintaining Database of Disaster Resource Inventory</td>
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<td>Scenario Building</td>
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<th>Human Resource Management</th>
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<td>Financing of DM human resource as per pay commission and International standards.</td>
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- Stakeholders of various Departments like: Medical, Fire, Police, PWD, I&PH, Electricity, Transport, Communication, Food and Civil Supply, horticulture, agriculture, forest and animal husbandry
- Para-Military, Armed Forces, NDRF, NCC, NSS
- Panchayati Raj Institutions
- NGO’s and various volunteering organisations
- International Organisations

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<tr>
<th>Stakeholder Departments</th>
<th>(Stakeholder Departments)</th>
<th>Technology Development</th>
<th>Services</th>
<th>Procurement</th>
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<td>HRVCA</td>
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<td>Hazmat and Radius Software for earthquakes</td>
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<td>Latest Early Warning systems for secondary effects of Seismic activities</td>
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<td>Cooperate Sector</td>
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**Fig. 5.6: Primary and Secondary Activities for Earthquake Disaster Mitigation Management within Shimla City**

5.5.2. **Earthquake Disaster Management Committee at ward level**

For proper monitoring and implementation of the Earthquake Disaster Mitigation Model with its plan and programmes activities, there is a need for the city to form Earthquake Disaster Management Committee at the ward level (Fig. 5.7). There already exists a City Disaster Management Authority at the city level for looking into earthquake or any other disasters. Formulation of committees at the ward levels can help the city authorities to implement the plan of actions related to earthquake awareness and reduction of risk and vulnerability in a much better and effective way. The disaster managers need to maintain a balance between providing directions towards specific pre-disaster activities and coordinating
Chapter V – Earthquake Disaster Mitigation Model of Shimla City

the overall management, to achieve the disaster goals. Thus, a leader should make use of consultative, decentralised, coordinated, decision-making process rather than control and command process for an effective earthquake disaster management. For the working of the model, the managers need to select his/her team with precision and sincerity rather than ambiguity. Each subunit needs to perform its specific task as per power designated and clearly defined responsibilities and standard operating procedures (SOP’s) laid down within the respective plan. These SOP’s are not only for pre-disaster mitigation process but are to be followed at the time of the earthquake disaster as well. All designated personnels and teams need to have centralised coordination along with training and mock exercises for the same.

Fig. 5.7: Shimla City - Earthquake Disaster Management Committee - Ward Level

5.5.3. Model of Earthquake Disaster Mitigation Management for Shimla City

With the sense of community empowerment and support to sustain a consensus approach in decision making for earthquake disaster the Earthquake Disaster Mitigation Model (Fig. 5.8) has been prepared for the hill city of Shimla. The Model has been drawn after taking into consideration all the components of disaster management till the grassroots level. It includes the topography of the city, earthquake history, public and administrative gaps and suggestions along with the main issues risen under scenario discussion of the administrators of stakeholder departments of Shimla city. The model is summarised in terms of approachability, efficiency, development and sustainability. It lays emphasis on various earthquake mitigation activities to be undertaken by disaster managers or stakeholders within the various phases of earthquake disaster management.
Earthquake Disaster Mitigation Model for Shimla City

Mitigation Plan and Strategic Actions

- Establishment of Disaster Control and Command centre within city and its sub centres at ward level
- Sensitising population - residential and commuting
- Enforcement of Earthquake Building Codes and Designs
- Certification and Training for Architects and Civil Engineers
- Training of Masons with regards to building codes
- Improving Accessibility through widening of roads
- Formation of open grounds for relief and rescue operations
- Decongesting traffic lanes by constructing more parking areas
- Procurement of lighter and portable fire-fighting equipment
- Logistic plans to cater for continuous supply of food, water, medicines and electricity.
- Establishing satellite communication and SMS alerts for all connected networks within the region
- Medical Plans including first aid training at grassroot level.
- Establishing more medical centres with trained staff and volunteers in earthquake disaster management and creating more Mobile Operation centres.
- Alternate sewerage disposal plan for earthquake hit areas.
- Security plans, to prevent unlawful chaos and confusion during earthquake
- Formation of Beat Units within each ward with local residents for maintaining law and order and assisting the city administration in earthquake disaster management.
- Developing inclusive approach for creating ownership and developing resilience of the community
- Evacuation Rehearsals with public and stakeholding departments

Mitigating Shortcomings

- Following of SOP’s by designated officials under the plan for both pre and post-earthquake disaster management
- Plans be practiced and rehearsed through mock drills
- Rehearsals with residential and commuting population within city mandatory
- Frequency of Rehearsals – once in six months
- Highly recommended in peak tourist sessions of summer and winter, especially during snowfall
- Rehearsals to sensitise population and prepare for worst, help in reducing death and destruction
- Rehearsals highlight weaknesses of plans, help in midcourse corrections and build up adequacy of infrastructure and plans.
- Development of Trauma Centres with trained professional counsellors to handle victims of earthquake
Mitigating Rescue Operations
- Preparation of rescue / evacuation plans ward wise within city
- Formation of Central Command Centre for receiving and dissemination of information
- Formation of Incident Response teams (IRTs) in city
- Training of the IRTs as per their roles (SOPs) specified
- Mock drills of IRTs to prevent chaos and confusion
- Stock maintenance of equipment and resources required during rescue
- Maintenance of data base of resources and trainees within wards
- Earmarking and maintaining Evacuation centres within wards
- Tie-ups and memorandums with NDRF and Paramilitary forces for earthquake like situation
- Plan to dispose of dead bodies and carcasses of animals to prevent breaking of epidemic within city after earthquake.

Mitigating Relief Operations
- Mitigation plan by each department involved in emergency operations and setting up of shelters
- Alternate relief plans also to be prepared in case the first one fails
- Pre arrangements to be looked into for the camps being setup like health, WASH, food, psycho socio care, forming of trauma centre for the victims within city after an earthquake
- Sensitization of the concerned staff designated for the relief camps.
- Plans for restoration of lifeline structures
- Means of compensation for loss of life and property during disaster
- Coordination plans for national and international agencies coming for relief operations
- Plans for VVIP visits at camps

Mitigating Rehabilitation Operations
- All plans and programmes of the city to have Rehabilitation Plan related to an earthquake
- Pre-Designation of rehabilitation areas for the victims within city
- Re starting school activities for the children affected by earthquake.
- Employment opportunities for providing economic stability to the victims
- Plan for re-shifting people to actual dwellings at the earliest.
- Re-building of Tourism industry
- Funding provision for build back better policy

Fig. 5.8: Earthquake Disaster Mitigation Model for Shimla City
Chapter V – Earthquake Disaster Mitigation Model of Shimla City

Mitigation which aims to reduce the risk, impact or effects of a disaster or a threatening disastrous situation consists of both Structural and Non-Structural measures. The model thus highlights mitigation activities for both Pre – Disaster and Post –Disaster Phases of earthquake disaster management. The Earthquake Disaster Mitigation Model will help build a resilient socio-economic community, which would be capable of bouncing back to normalcy quickly, after an earthquake with Modified Mercalli Intensity scale of VIII and peak ground acceleration of 4.0 meters per Square Second, ever strikes this hill city within the Himalayan ranges.

5.5.4. Earthquake Disaster Mitigation Action Plan for the Wards of Shimla City

Earthquake, which happens without warning and prediction, requires a different approach to action for its management. It would require education and awareness of the community, practical demonstration, legal obligations and local governance to deal with the future earthquakes. The major actions endorsed to be undertaken by disaster managers at ward level within Shimla city for earthquake disaster mitigation management have been depicted in the model (Fig. 5.9). The model highlights the specific parameters to be covered under the four variables of risk, awareness, response including funds in order to mitigate earthquake disasters within the 25 wards of Shimla city. These parameters are capable of moderating the scenarios of Earthquake Disaster Mitigation and provide a starting point for the administrators to undertake at ward level. These activities are complementary to each other and need comprehensive coordination in their actions. The coordination will further help in making earthquake disaster mitigation management efforts for the city comprehensive through the synergy of various disaster managers or stakeholders. The variables of risk and awareness also support the hypothesis testing of the research undertaken based on questionnaire method of public and administrators in chapter IV of analysis and interpretation. Thus, the model with its actions based on results of the research prove low awareness level with regards to earthquake mitigation measures and building codes, and high level of vulnerability within the community of Shimla city.

These models for earthquake disaster mitigation management are to redefine the approach to the key issues and points that require recommendations within Shimla city for comprehensive and holistic perspective with local community participation for governance, and to develop a resilient society against earthquake disasters which may be waiting to occur.
Fig. 5.9: Earthquake Disaster Mitigation Action Plan for the Wards of Shimla City