Urban Risk Reduction Through Effective Disaster Management Plan-A Case Study Of Shimla City, Himachal Pradesh, India

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Abstract: By 2050, 70% of the world's population will live in urban areas. In India the urban population has increased from 217 million to 377 million in last two decades .With increasing population the associated risk and vulnerability has also increased. As cities continue to grow, there is increased pressure on resources; exposure of lives, livelihoods and economic, social and environmental assets to risk is set to increase exponentially. Recognised as one of the best cities for public services and one of the oldest Municipal Corporation in India, Shimla city is situated at the traverse spur of the Central Himalayas at 31004' N to 31010' N latitude and 77005' E to 77015' E longitude, at an altitude of 2397.59 m metres amsl. This paper aims at underlying the role of Shimla Municipal Corporation (SMC) as local government in managing disasters in the city along with effective planning and risk assessments.

Key words: Shimla, governance, urban, disaster risk, exposure, vulnerability, plan

1. Introduction

Population pressure on urban areas is increasing exponentially in India. The government and authorities are facing challenges in managing cities and providing inhabitants the facilities, services as well as a safer environment. Unplanned and haphazard development is posing as a threat to the cities. This risk is further enhanced in the changing climatic conditions. It is estimated that by 2050, 70% of the world's population will live in urban areas. In India the urban population has increased from 217 million to 377 million in last two decades. This is expected to reach 600 million, or 40 percent of the population by 2031[1] (New Climate Economy Report, 2014). The disaster in year 2013 in Kinnaur district Himachal and neighbouring state Uttarakhand and 2014 Jammu and Kashmir floods exposed our unpreparedness in managing disasters. In Shimla too preparedness at city level was exposed in the response to the recent caved in road segment (Picture 1). The vulnerability of the city is also evident from some incidents like caving in of portion of road of about 40 m in length on the ridge in front of 'Gaiety Theatre' Shimla, caved in by about 1.8 m in monsoon in 2010, or the June 2012 heavy rain collapsing a dozen houses in Krishna Nagar ward. As per 2011 Census, Shimla is the only Class I City in the State of Himachal Pradesh and is registering almost 20% extra growth rate compared to similar other cities in India, which is resulting in rapid development of real estates, housing, complexes, shopping malls etc.

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In spite of knowing and acknowledging the vulnerabilities and increasing risks the administration has failed to address many other aspects of disaster management in similar incidents that are frequent and regular. This paper aims to look into the preparedness level of the city of Shimla for risk, vulnerabilities and disaster management. Good urban governance is characterized by transparent decision making, sound financial management, public accountability, equitable resource allocation and probity, and should lead to sustainable improvements in most urban indicators (MC Shimla).The word sustainability could be linked to being resilient. Shimla city is multi hazard prone and along with demographic change the city seems to be struggling to balance between development and sustainability. Apart from the city's population a floating population of close to 75000 also demands the basic facilities. With limited resources, limited workforce and limited expertise, the

[1] New Climate Economy Report by the Global Commission on the Economy and Climate, 2014 at http://newclimateeconomy.report/

Picture 1: *Cart Road Damage, Shimla (**Source:** Himachal Watchers)*

city administration has been working with experts and consultants to work with them in better planning in all the important spheres in making the city better, safer and more resilient. The city administration to some extent has started to recognize the issue of climate induced risks, safety and

response especially in view of the high vulnerability of the city to several hazards. However disaster management requires an effective planning and management and there could be two focus area to start with:

a) Planning and management – This is to plan and manage today .Every development plan should integrate disaster management concern in their planning.

b) Actions to mitigate the impact of any disaster in case of any disaster-This would include institutional strengthening and capacity building of concerned authorities for quick response.

Any disaster impacts infrastructure, physical settlement, failure of communication system, electricity supply, drainage system etc. In the absence of a well- defined implementable disaster management plan a disaster can create mass destruction. The plan should thus achieve the following objectives:

- Resource inventory.
- Integration with other stakeholders and departments.
- Allocation of specific responsibilities to the various agencies involved.
- Response plan and designated responsibilities during, before and after disasters.
- Effective management of the available resources.
- Developing the standard operating procedure for perfect co-ordination among various department and relief agencies involved.

The above mentioned components fulfill the primary criteria of drafting a plan. The concept behind the formulation of city disaster management action plan is to save the lives, properties and environment: provided quick relief to the affected area and restore the normalcy. The city has a disaster management plan which was passed by General house of the Municipal Corporation in year 2012. This is good start to work on because municipal corporation is the nodal body that looks after the city and is responsible for water supply, sewerage, waste disposal, health, planning, roads and maintenance of other amenities in the city (Table 1). It also contains the record of people, kind and type of housing, water supply connections, commercial settlements and so on.

Table1: Institutional Framework for Planning & Design, Construction and Operation & Maintenance

Services	**Planning & Design**	**Implementing Agency**	
		Construction	Operations & Management
Bulk Water Supply	Irrigation and Public Health (I&PH)	I&PH	I&PH
Water Supply and Distribution	Shimla Municipal Corporation (SMC)	SMC	SMC
Sewerage	I&PH/SMC	I&PH/SMC	I&PH/SMC
Drainage	I&PH/SMC	I&PH/SMC	SMC
Storm Water Drainage	I&PH/SMC	I&PH/SMC	SMC
Solid Waste Management	SMC	SMC	SMC
Main Roads and Bypasses	PWD	PWD	PWD
Internal Roads	SMC	SMC	SMC
Street Lighting	Himachal Pradesh State Electricity Board (HPSEB)/SMC	HPSEB/ SMC	SMC
Fire Services	SMC/Fire Dept	SMC/Fire Dept	SMC/Fire Dept
Open Spaces/Parks	Town and Country Planning(TCP) Department	SMC	SMC
Transportation	Himachal Pradesh Road Transport Corporation(HRTC) / HP Bus Stand Management and Development Authority (HPBMDA)	HRTC/ HPBMDA	HRTC/ HPBMDA
Vertical Transport (Elevator)	Public Works Department (PWD)	PWD	Tourism Department
Housing	Himachal Pradesh housing & Urban development authority (HIMUDA)	HIMUDA	HIMUDA
Basic Services to Urban Poor	DoUD/SMC	SMC	SMC
Urban Forest	Forest Department	Forest Department	Forest Department
Public Conveniences	I&PH/SMC	NGO	NGO

Source: *Municipal Corporation, Shimla*

For the human resource apart from the employees and workers Municipal Corporation has the councillors who are the elected public representatives to look after their wards. So the role and responsibility of Municipal Corporation is foremost and it is the nodal agency for city level responses to disaster situation and depending on the size of disaster and if required the help of district authorities should be sought later on. The present case study looks into the existing plan to show that the city district disaster management plan is a multi response plan and outlines the essential things required for managing any disaster situation. The plan is a step towards building resiliency. Resiliency here could be understood by the following definitions:

"The ability of a system, community or society exposed to
*City SanitationPlan Shimla city, 2012
Hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner" (United Nations International Strategy for Disaster Reduction)
"The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt to stress and change" (Intergovernmental Panel on Climate Change)
"The capacity of a system to absorb disturbance and reorganize while undergoing change" (The Resilience Alliance)

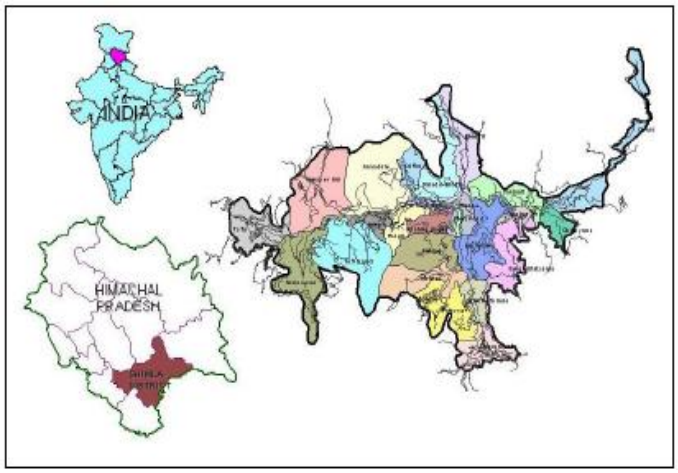
Shimla city has an interesting history of its origin. Termed as Summer capital of India by British, it was planned for a capacity of 25000-30000 people due to limited resources and space. Today the city has expanded unimaginably. The pressure on resources, unplanned development and unsafe practices all are making city mire vulnerable and it's high time to ensure the resiliency in the city. It is therefore important for both administration and community to understand the risk, recognise the changes and be prepared.

2. Objectives:

To recommend actions for Urban Risk Reduction through effective disaster management plan though Shimla city as a case study.

3. Location:

The Municipal town of Shimla, the head quarter of the district and summer capital of India during British regime, is situated on a range of entirely mountainous Middle Himalayas which forms the last traverse spur of the Central Himalayas, south of the River Satluj. Geographically, Shimla lies at 31004' N to 1010' N latitude and 77005' E to 77015' E longitude, at an altitude of 2397.59 m metres above msl (Picture 2). The existing town resembles an irregular crescent with a 9.2 km extension from one end to the other, covering a total area of 19.55 sq.km. Shimla town is situated in a seismic belt (Seismic Zone IV) as per IS-1893.



Map 1: *Location of Shimla City**

The eastern portion of the town is Chotta Shimla while the extreme western side is called Boileauganj. An outlying northern spur running at right angles to the main ridge is Elysium Hill. Five and half kilometers from the western end of the station is outlying hills of Jutogh. This town is spread over seven hill spurs. The average elevation above mean sea level and the name of the spurs are given below (Table 2). These spurs are interconnected by roads. The important character of the road network circumscribing these hills is that it is connected to the Mall road from Boileauganj to Chotta Shimla. Situated at the traverse spur of the Central Himalayas, south of the river Satluj the city is one of the most vulnerable zone of the Himalaya The city has an area of 19.55 square kilometres and has 25 municipal wards (Map 2) .

Hill Spur.	Elevation (m).
Jakhoo Hill	2454
Elysium Hill	2257
Museum Hill	2201
Prospect Hill	2177
Observatory Hill	2150
Summer Hill	2104
Potters Hill	2073

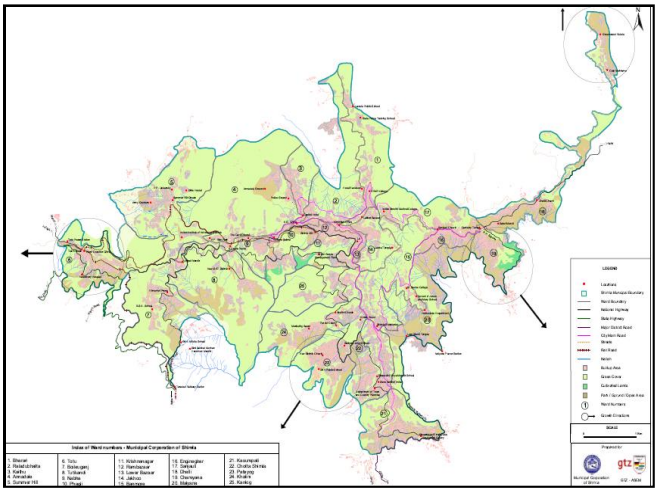
Table 2: Hill Spurs & their Mean Elevation

4. Geology:

Shimla town is situated on the rocks of Jutogh Group and Shimla Group. Jutogh group occupies main Shimla area and extends from Annadale-Chura Bazar – Prospect Hill-Jakhoo-US Club and highland area. Shimla Group comprising of earlier Chail Formation and Shimla Series represented by shale, slate, quartzite greywacke and local conglomerate is well exposed in Sanjauli-Dhalli area. It is also the headquarter of Shimla district and has important Government and non-government establishments including the State secretariat, district collectorate, High Court, Municipal Corporation.

5. Climate:

Chilly winds from the upper Himalayas make winters in Shimla cold. Around Christmas or last week of December Shimla gets snowfall. Temperature varies from 15 ~20ºC in summers and in winters its in the range 0~13ºC.



Map 2: *Administrative Map of Shimla City***

***Source: Municipal Corporation, Shimla*

The average annual rainfall in the region is 900mm.

Climatic variations:
Increasing heat in summers, declining quantum of show in winters, unusual behaviour of monsoon and frequent dry spells are the prime climatic concerns. The highest temperature during summer months of May-June goes even more than 300 C. Temperature, however goes down even – 400C during winters.

6. Governance:

As per HP Municipal Act, 1994, the key responsibility for providing basic urban services in Shimla lies with Municipal Corporation Shimla. These services include water supply, sewerage, solid waste management, land-use planning, construction and maintenance of internal roads, street lighting, and primary health and education facilities. All these services mentioned in section 12 of 74th Constitutional Amendment Act are transferred to Municipal Corporation Shimla except fire services and urban forestry. Various state level agencies are involved in providing various services in Shimla. Municipal Corporation Shimla has also used Public Private Partnership in various services which include sewerage, solid waste management, public convenience, transport.

7. Demographics:

The total number of households and population of M.C. Shimla is 46306 and 169578(Census 2011) respectively. Out of total population, 93152 are males and 76426 are females. The Sex ratio is 756 females per 1000 males.

Floating Population

As per Census analysis (Table 3), it has been observed that the growth rate of floating population has shown a little downward trend, while the total number of floating population has increased due to Shimla being a service city as well as tourist destination.

Table 3: Floating population of Shimla-Existing and projected

Year	Floating population	% Decadal growth rate
1971	23459	36.00
1981	30000	31.74
1991	40000	31.70
2001	56000	40.00
2011	76000	35.00
2021	100000	31.00

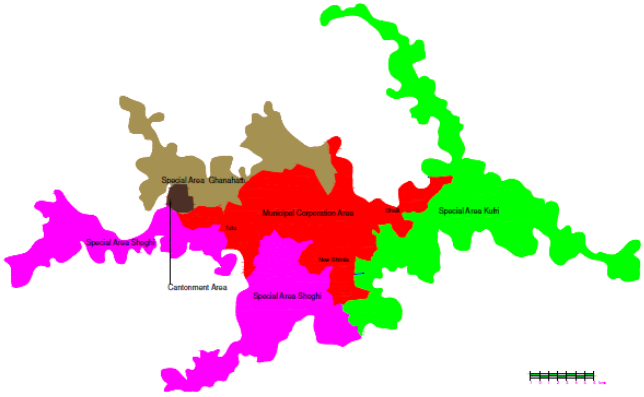
***Source**: Town and Country Planning Department, Shimla*

Population in the city is expected to grow because it being an administrative and tourist city, it is anticipated that the tertiary sector shall continue to function as a dominant sector of economy by year 2021. As a result the workforce participation in this sector will increase. Secondly better opportunities will attract rural population towards the city.

8. Planning area:

The 9950 Hectares of total area as taken into account for revision and formulation of Development Plan, includes, Municipal Corporation, Shimla, Special Area Development Authorities of Kufri, Shoghi and Ghanahatti (Map 3 and Table 4).

***Map 3:** Administrative boundaries: Shimla planning Area*



*(**Source:** Department of Town and country planning, Shimla, HP)*

9. Regional Linkages:

Shimla is connected by road, rail and air. Shimla is connected by road with Delhi (330 km), Chandigarh (117 km) and Kalka (90 km). Shimla is connected by narrow gauge railway line from Kalka (90 km). Shimla Airport at Jubbarhatti, 23 km from city is connected to Chandigarh, Kullu and Delhi

Table 4: Settlements Falling Within Planning Area

S.no.	Settlement	Area in hectares	%
1.	M C Shimla	2207	22.18
2.	SA Ghanahatti	1647	16.55
3.	S A Kufri	3173	31.89
4.	S A Shoghi	2923	29.38
Total		9950	100.00

10. Physical, Environmental & Hazard Considerations

10.1 Hazard profile of the city:

City is prone to the following main hazards:

- **Earthquake**- Situated in zone IV it has the high risk of earthquake which can further trigger other disasters like landslides.
- **Landslide-** The problem of landslides is common and frequent in Shimla. Every year the city faces one or more landslides affecting society in many ways. Loss of life, damage to houses, roads, and means of communication are some of the major consequence of landsides in the city.
- **Land Sinking-** Recent geological studies indicate that roughly 25% of the old town is in the sinking zone, and unless improvements are made in the drainage and sewerage systems ofthe upper reaches, more could go under. It is said by Geologists that when the famous Ridge of Shimla was constructed, the hilltop was sliced and all the debris was dumped on its northern slopes. Though it has compacted over the years, many parts of Lakkar Bazar and Rivoli bus stand do show a downward creeping movement. Slopes have become overloaded, and buildings in several heavily crowded localities in the central part of the town

have become unsafe as they fall in the sinking zone. The Ridge is not only a portion of land in Shimla; it contains its life line. The water reservoir beneath it has storage of ten lac gallons of water. The reservoir was constructed without using a ounce of cement in the eighteen eighties and only lime mortar has been used. A major port on of the flat land consist debris and has resulted into so called sinking zone. Monsoon and increasing pressure on the land often accelerated the sinking.

- **Hailstorm, severe Storms, including lightning and high winds (Thunderstorms) -** Every year severe storms, lighting and high winds cause huge loss to the economy of Shimla City. It results into tree falling, damage to electricity supply wires, telephone cables, street lights, etc. Due to tree falling much time it causes loss to life, buildings or vehicles.
- **Flash Flood/cloud Burst-** There are natural sources of water and the gorges in the city. Most of them are either drying or getting blocked .This do make city vulnerable to this hazard.
- **Heavy Snow Fall-** Though the data shows that timing, duration and amount of snow has decreased in the city but still the city comes to halt during snow season. The impact is seen in the form of no movement of vehicles, tree felling, breaking of electric poles, injuries and so on.
- **Fire-** The city has rich forest areas and is vulnerable to forest fire but the city in recent time has faced frequent human induced fire incidents. The presence of heritage building and old houses which contain more wood as building material often catch fire due to negligence and in effective fire management on people's part.
- **Tree felling –**During monsoon as well as snow time the city faces huge loss of trees. These trees often fall on houses/ cars and roads there by causing loss of life and property. The uprooting of tree further increases the slope instability making it more vulnerable to landslides.

10.2 Physical Deterioration: Shimla is becoming a concrete jungle. Greenery is fast disappearing. Encroachments, un-checked constructions , miunting water crisis,dried dains choked with waste all show the state of the city. Numerous buildings are in dilapidated condition and are about to crumble. The building collapses in Shimla are more frequent now. Multistoreyed RCC framed structures have come up for residential or commercial purposes in private sector due to lack of space. The settlements are connected with extremely narrow lanes.

10.3 Pressure on natural resources:

Population pressure is causing the disturbance to natural profile of land due to constructions and unplanned development. It has a congested built area. Then there is issue of encroachments on roads and public land. There is no integration or interlinking between population growth and urban infrastructure development. In short, there is a huge degradation in land, water and air quality .Nose pollution and vegetation loss has increased. The economic imperatives that drive urbanization play a large role in determining the status of the urban environment and ecosystems, as well as the extent and depth of poverty, wealth and inequality in the city. Consumption of natural assets (trees for fuel, groundwater, sand and gravel) and the overexploitation of natural services (water systems and air as sinks for sewerage or industrial waste) modify the environment and generate new hazards. These include deforestation and slope instability within and surrounding cities, encouraging landslides and flash flooding. This is what is exactly happening with Shimla city in the scenario of changing climate.

10.4 New issues for the city:

- **Solid waste management**- Multi level impacts including impact on health, water, land quality and green house gas emission.
- **Water availability and shortage**- The location of city which stores water through pumping before distribution is facing the crisis due to increased population and a large floating population. Loss of water due to old water supply system also adds to the shortage.
- **Increasing subsidence/sinking**- Construction activities is putting pressure on the land and a large part of Shimla falls under the sinking zone.
- **Increased Tree felling in rains and snow**- Instable slopes are causing increased number of tree felling incidents during rain as well as snow.
- **Sanitation-** Old sewerage network, unplanned settlements and increasing pressure is putting sanitation as a major issue.
- **Road Connectivity**- With limited alternate roads network, It is usually just one road that (Cart Road) that runs around the city and connects city with other districts. If any part of this road gets damaged the connectivity is going to serious issues and this may delay the rescue work by hours or days.
- **Communication in case of disaster**- This has been a concern for state government too.

Limited space and growing demand – With limited space available the growing urban needs like parking lots, more office spaces, more housing and so is forcing to build vertically and also in locations earlier marked vulnerable.

11. Discussion:

The existing City disaster management plan has been drafted well and lists the potential hazards and vulnerabilities. It has done the risk assessment of various hazards and associated vulnerabilities. The plan also features mitigation plans and a separate snow plan (in case of heavy snow in the city). A response plan and incident command system is the most important feature of the plan. The contents of the existing plan can be summarised as:

- Well defined profile of Shimla city including land use, geology, climate etc.
- Hazard risk analysis – for both natural and human induced
- Vulnerability of Shimla in context of various hazards
- Risk Assessment of Shimla in context of various hazards and associated vulnerabilities
- Mitigation Plan for Shimla City
- GO- NGO Coordination
- Trigger Mechanism and Disaster Specific Response Plans
- Incident Command System for Disasters in Shimla
- A dedicated snow plan

As a first plan it is a good base to start preparing more realistic and practical plan. Municipal Corporation needs to own it and make it more effective. The approach to improve it could be decided after the assessment of the plan. The plan needs to be update through the following steps: In hazard identification, new hazards like tree felling, slope failure and building collapse need to be assessed and added. Climate induced hazards like impact on health, impact of increased number of vehicles also need a place in the category of potential hazards. Detailed capacity assessment of city agencies in dealing with disaster is required which includes the resource inventory and preparedness level of all workers and officers. For example the existing plan does not have the information on the existing resources-human and equipments in Municipal Corporation. In response plan there is no incident commands system within the Municipal Corporation. The nodal officers have also not been listed. It has the existing plan with mostly district and state authorities with only Commissioner or Assistant Commissioner given a role in the whole plan. Vulnerability assessment: It lacks the ward wise assessment of the city and mention of the most vulnerable parts of the city. The assessment is generalised and requires a more detailed data like the bottle necks in the city, alternate routes, shelter places, safe building, hazardous places and so on. There is no mention of the identified shelter places within the city. Alternate paths in case the main road gets blocked have not been identified. There exists no Early Warning System as such so it is also missing in the plan. It is important to note that the city contains many areas that are connected by bridges and are near the water body, and breakage of these bridges would absolutely cut them off the main area and hinder the rescue and relief work. No study on them has been done from disaster management point of view. Also the plan is isolated one like most of other plans. There is lack of interlinking with the disaster management plans at district and state level. Land-use planning which is a particularly effective instrument that city authorities can employ to reduce disaster risk by regulating the expansion of human settlements and infrastructure lacks coordination between all concerned authorities. This is also due to the absence of accurate and up-to-date city level data. Examples like the construction of high-rise structures like the 10-storeyed High Court building and overloading of the buildings by paving floors, and even the outer walls, with marble, Kota stone and red sandstone gives a negative impression of the Municipal Corporation or the governments efforts in reducing risks.

12. Recommendations:

Municipal Corporation as responsible local governance should continue the work and update the plan with the already mentioned missing information. A dedicated time and effort is required for this. To make the plan as well as the response more effective through the following:

- Ensure that its all departments understand disaster risks that city faces and their role to disaster risk reduction and preparedness. This should also include the Municipal Councillors who can act as nodal person at ward level.
- Role of councillors extend to preparing a detailed resource inventory, capacity assessment, ward level data, alternate path and shelter pace designation and so on. So their capacity and participation must be enhanced and improved.
- Install early warning systems and hold regular public preparedness drills. There are no such systems for prediction of earthquake. However areas prone to possible landslides in the district can be earmarked and people residing in those areas can forewarned of any possible disaster by constant monitoring of such areas based on the weather forecasting so that loss of life and properties can be reduced to a minimum.
- Have shelter places and alternate routes identified to ensure emergency shelter and rehabilitation in case of disasters.
- Assign a budget dedicated for disaster risk reduction
- Conduct a detailed assessment of hazards, vulnerabilities and risk .The baseline data obtained would be used making for urban development plans and decisions.
- Ensure that the information and the plans for the city's disaster management initiatives are readily available to the public and fully discussed with them.
- Invest in and maintain critical infrastructure with risk reduction mindset.
- Look into the safety of critical infrastructure like schools and health facilities and upgrade these as necessary as important resources.
- Strictly apply and enforce realistic, risk compliant building regulations and land use planning or building byelaws. A close linkage with Department of Town and country planning, state geology department and urban development etc is thus strictly required.
- Identify vulnerable population and areas and work towards upgrading the situation wherever feasible.
- Special focus on the floating population and tourism.
- Run education programmes and training on disaster risk reduction for workers as well as community.
- Shimla being known for natural heritage plan to protect natural ecosystems and create natural buffers to mitigate hazards like landslides and tree felling.
- Bring policies on good risk reduction practices.
- Aim at building a culture of awareness and safety among public through public education and information programmes.
- It is especially important that disaster risk reduction is mainstreamed within national development and poverty reduction policies and planning**.**

Conclusion:

City lacks many aspects of disaster management like early warning system, tourism management, a clear, transparent and participatory role of government bodies and councillors, city level resource inventory. Risk and vulnerability assessment. The absence of up to date and accurate city level data is also a hindrance in planning. The lack of coordination and inter linkages couple with absence of dedicated institutional mechanism and low capacity of the stakeholders in disaster management all hinder the process of effective disaster management and resilient city. However, the Municipal Corporation has been pro in many things and has always worked towards making city an example of good governance and slowly the city is taking the disaster management as well as other risks seriously. Municipal Corporation must take the ownership and have a

dedicated workforce for the development of an updated, more effective, well coordinated and practical disaster management plan. This is essentially needed for moving towards making Shimla resilient and a safe city.

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