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Resilient Development for Human Settlements in Disaster Prone Area: A Case of Hill Area

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ABSTRACT: "Resilience" can be assumed as the capacity, in the first place to prevent or mitigate losses and secondly, if destruction does take place to maintain average living circumstances as far as possible, and thirdly, to manage recovery from the impact. Term 'resilience' and 'vulnerability' can be seen as opposite side of same coin, but are relative. In 21 century majorly of the population will living in urban cities. So, we need to improve urban settlement management combine with vulnerability factors for unplanned population density. The state of Himachal Pradesh is highly vulnerable to natural disasters and is highly lying to earthquakes as it drops under seismic zones iv & v and visiting the state from time to time. According to disaster management plan, 2014 nature, frequency and intensity of disaster in terms of structural failure is high level of vulnerability in Shimla. In this paper discusses existing development scenario and issues to over the settlement pattern of Shimla and future development interventions possible approaches to change existing settlement pattern for achieving contextually appropriate disaster resilient development. We used a visual survey and questionnaire based structural vulnerability assessment of social groups in Shimla city limits. Possible approaches to change the settlement management for achieving contextually appropriate resilient development.

I. INTRODUCTION

Through the UN-HABITAT Global Activity Report 2015, in the last century, the world has been rapidly urbanizing. In 2008, for the first time in antiquity, urban population be more than rural population. This milestone marked the beginning of a new 'urban millennium' and, by 2050, it is projected that two-thirds of the world population will be living in urban areas. With additional half of humanity living in cities and the amount of urban inhabitants rising by nearly 73 million every year it is estimated that urban areas account for 70 per cent of the world's gross domestic product and has therefore produced economic growth and prosperity for many.

The 2030 Agenda for Sustainable Development tackles this challenge through its Sustainable Development Goal 11, which aims to "make cities and human settlements inclusive, safe, resilient and sustainable". "Encouraging sustainable human settlements development" is the subject of following parameters:

1) Providing suitable shelter for all;
2) Improving human settlements organization;
3)Promoting ecological land-use planning and management;
4) Encouraging the combined provision of environmental infrastructure: water, sanitation, and drainage and solid waste management;
5) Supporting sustainable energy and transport systems in social settlements;
6) Encouraging human settlements formation and controlling in disaster-prone areas;
7) Promoting sustainable construction industry activities;
8) Helping human resource development and capacity-building for settlements growth. (affairs, 2016)

Spatial planning is gradually observed as one of the important instrument in disaster risk reduction. It assists judgement on the basis of future use of space in any organizational unit, in some cases may be challenged by natural hazards. This would be an important module of any society and government if they want to become spatially enabled. Multi hazards approach is required since a location may receive threat from numerous type of natural hazards. A coordinated policy, which covers laws and regulations, is needed to provide structural and technical guidelines for the combination of disaster risk reduction strategy in spatial planning.

Hill settlements are vulnerable to usual disasters, development over the years has increased the problem by upsetting various physical elements.

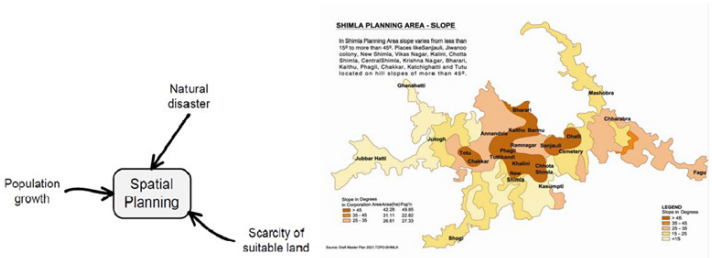

Fig. 1. Shimla Planning area – Slope.

It falls into two earthquake Zone IV & V of the seismic zonation map of India. The state of HP, which forms part of the North-western Himalayas, is environmentally delicate and ecologically vulnerable.A rise in the harshness and frequency of normal disasters in urban areas is closely related to the impact of human activities and urbanization (settlements). However, the pressure of population expansion in high risk areas is often mandatory. Situations of extreme exploitation of land resources, sudden urban growth conditions exacerbate the resistance to disasters, such as earthquake, mudslides and fire. Shimla has seen a very fast population growth in last three periods due to huge housing and tourism demand.

This collective with lack of planning and haphazard growth has resulted in the construction of structures on steep and unstable slopes with inadequate construction practices. High priority, Lifeline structures like hospitals, power stations, and telecommunication installations and water supply stations are situated in high-vulnerability areas with poor connectivity. The safeguards within the present system are insufficient and the risk involved is high. Reducing the risk connected with disasters cannot be dealt with in isolation valuation of risk factors is a key essential in planning and implementing methods to mitigate their impact. Mapping areas of extreme risk, strengthening existing buildings, protecting infrastructure, setting standards of construction through building codes and imposing compliance to set standards could be started to regulate or discourage development in vulnerable areas, so that future disaster impacts can be substantially reduced.

Shimla is urbanizing rapidly, with at least 50% of its projected 22 million population expected to be living in urban local body by 2020.The projected urban growth is 3% annually and the urbanization trends shows a rapid transformation of rural areas to urban. Government development framework recognizes the positive impacts of urbanization around 70% of population and 80% of national economy infrastructure is concentrated in cities in disaster prone hilly areas.

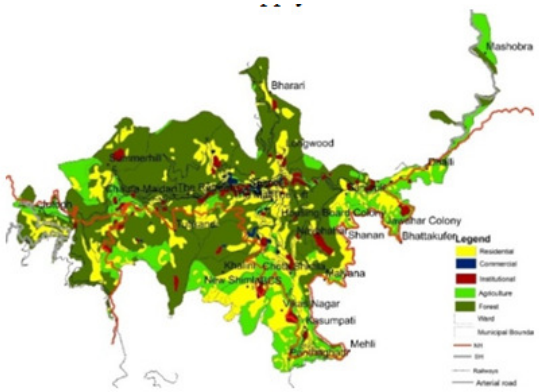

Figure 2 :Land use plan of

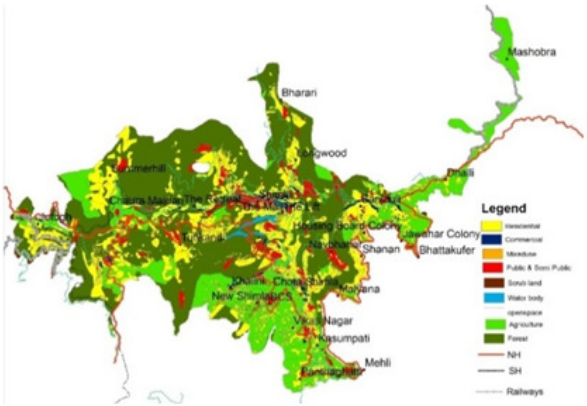

Figure 3 :Land use plan of

These cities are highly vulnerable to disaster and climate change impacts including landslides, cloud bust all of which negatively affects the human settlements, cities productivity and service delivery, especially for the poor at local level. The growth in the frequency and strength of regular disasters over the past few years has caused in major socio-economic effects on townships and human settlements.

Vulnerability, is an increasing trend to expand built-up areas through unplanned development activities and increase in localized disasters has necessitated a parallel increase in disaster awareness and response capability at the community and local level. Likewise, it is essential that Physical Planning should not occur in isolation. This scenario offering a unique opportunity to prepare development plans and land use plans taking into interpretation climate change impacts and the necessity for disaster reduction as an fundamental part of the planning process, with implementation of land use plans and development plans incorporating disaster risk reduction (DRR) features. (UN-Habitat, 2016). Nearby 10,000 survives were misplaced, houses and city infrastructure got damaged across Nepal and Northern chunk of India in the earthquake in 2013. This came as a reminder to Indians, particularly those living in high rise urban dwellings in the northern portion of the country, that their habitation falls in moreover of the seismic zones 3, 4 or 5 with zone 5 being most disposed to earthquakes.

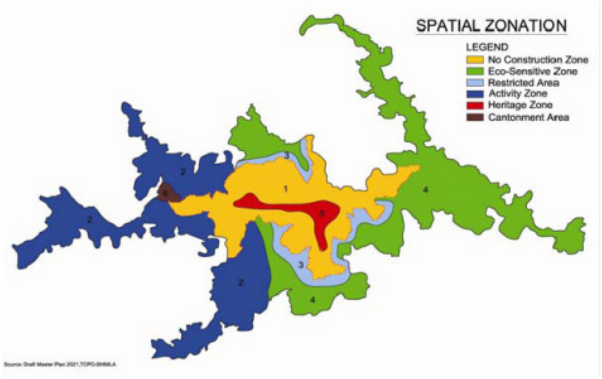

Fig. 2. Spatial zonation (Source: Draft development plan, 2015.)

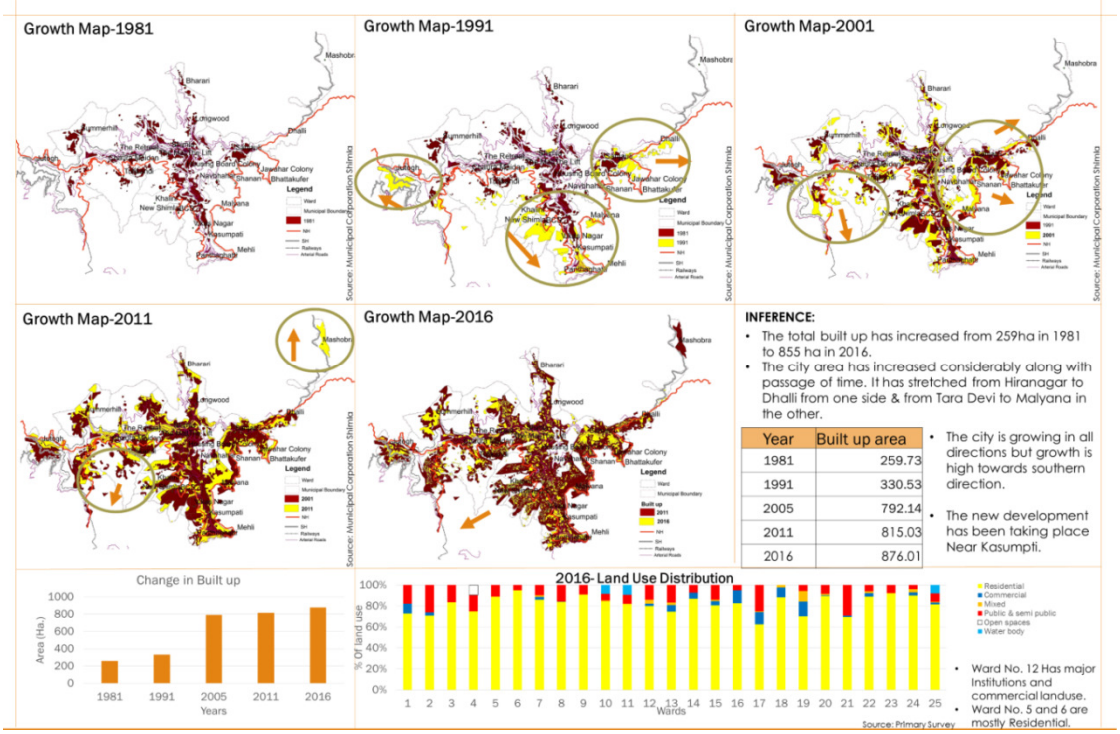

Fig 5. (Source: Studio exercise, 2015-17, MURP 3rd SEM. SPA)

(Other example: Doon Valley) The other example in hilly area, is Doon valley being the capital city of Uttrakhand massive development is going on in and around Dehradun. It has attracted thousands of people from other cities of Uttrakhand and other states which has caused increase in the density of the city. Seismic vulnerability wise Dehradun, Mussoorie and the surrounding areas in Doon Valley are quite vulnerable and falls in the Zone-4. Valley having the forest fire is a major problem and overcomes thousands of hectares of woodland every year. Sandy top soil and geology of the hill have made it prone to Seismic hazard. Dehradun and Mussoorie have been found more disposed to disasters and are at high risk in terms of lives and property. Building bye-laws have not been followed in both the cities.

The institutional set up specified in the Disaster Management Act, 2005 have not been followed in the valley and the Dehradun district. Dehradun has huge number of slum population which faces flash flood each year. In past years rainfall in the region occurred than the average amount normally and caused flooding in the river. Out of 113 slums of the city, 90 slums grew along the bank of the two rivers. More than 30% of the area has been experiential under high and moderate risk. Vertical slope, haphazard construction, high-rise buildings and thin roads are the major problems of Mussoorie which have risked thousands of lives and properly.

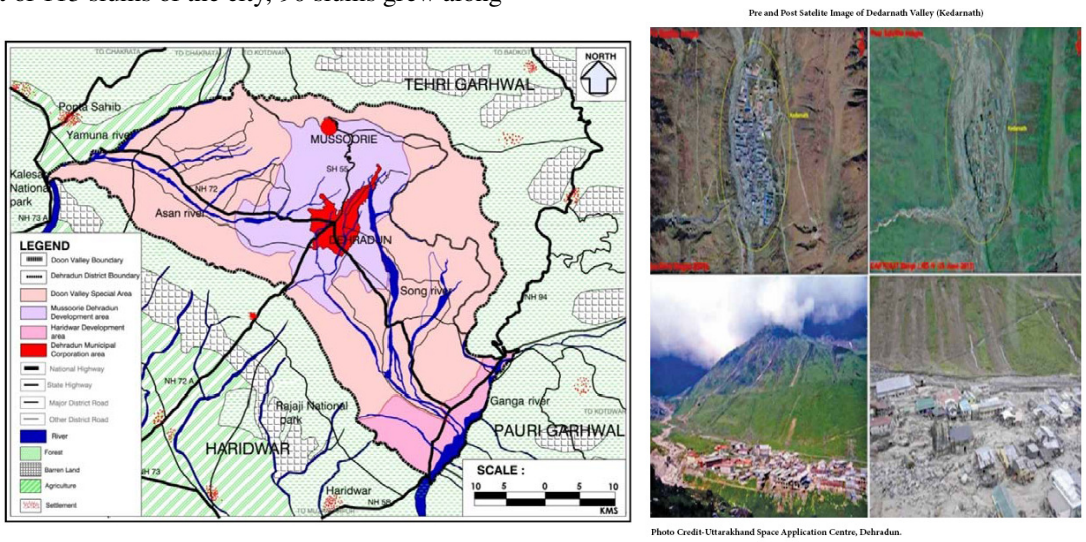

Fig. 6.

Landslide occurs every year in and around the city which blocks the highways and cuts off the city from rest of the valley and district. With such scenario the purpose of the Disaster Risk Management in Doon Valley is to express approaches to avoid and reduce the risk in the valley mainly in two major urban centers like Dehradun and Mussoorie. Planned development, compliance with planning, disaster management norms & building bye-laws and practical attitude can only ward off the danger of high risk in the valley.

Human Settlement: In India 30 to 60 % population lives in informal settlements. The major challenges for resilience lie in developing the essential infrastructure for water, sanitation, drainage, improving roads and supportive housing developments. In additional to improving health and residents quality of life, improvement makes low income settlements and cities additional resilient to a range of ordinary hazards, flooding, fires and diseases. While large population densities in urban areas create increased vulnerability, they also create the potential for changes that can mitigate human impacts on climate. Apply and enforce realistic, risk-compliant building regulations and land use planning principles; to identify the safe land for low income citizens and renovation the informal settlements, where feasible. Disaster resilient parameter and attributes: Robustness, Redundancy, Resourcefulness, Reformability, Recoverability and Rapidity. These are all interlinked through an area specific disaster Resilience Strategy.

Development paths as well as in disaster response and reconstruction to build resilient human settlements. The best building design is flexible. Families use houses differently and have diverse traditions of design and use. Those who will live in houses should be allowed to contribute in the design stage in order to diversify and make suitable use of architectural styles. Where vernacular housing design has proven resilient to hazards, this should be given preference. Urban disaster continues to be predominantly managed in low- and middle-income countries by emergency response and reconstruction, rather than mitigation, preparedness and investing in disaster-resilient development. Changes in international funding regimes can help move the risk reduction agenda forward. Traffic accidents, which are reviewed here from a human settlements perspective, include those involving road-based motorized and non-motorized vehicles of various capacities.

Uncontrolled and unplanned urban growth can increase the likelihood of occurrence of traffic accidents. This is especially the case in many developing country cities where rapid urbanization and the consequent explosion of motorized vehicles, unplanned settlements and human populations seriously threaten road safety. Many in inner-city slums or peripheral informal settlements.

Actually, development of economic and political strength helps to shift the influence of disasters from human to physical assets. This shows that disaster risk reduction planning, asset and management capacity are critical in shaping vulnerability in human settlements. Sustainable human settlements planning and management in risk reduction. Hazardous slums and squatter settlements. "A city is never smart unless it can survive smartly and to service smartly, it needs to make itself a disaster resilient city."

Shimla is a small settlement in India, with a population of 140,000. On 4 April 1905, an earthquake of 7.8 on the Richter scale damaged much of the city. While the city was designed for 25,000 occupants, it now houses up to 140,000 as permanent residents and another 100,000 transitory population. Urban development has proceeded apace and without due regard for hazard management. Risk has accumulated as the city has developed. Capacity for urban planning has not been able to keep step with development, although recent initiatives have built disaster management capacity. The non-governmental organization (NGO) Sustainable Environment and Ecological Development Society has worked with the municipal corporation of Shimla to build resilience. An earthquake risk assessment has been conducted that has flagged several urban processes as contributing to risk:

• Rapid unplanned growth has occurred so that residential districts – but also critical infrastructure are located in hazard zones. (Shown in image: 03)

• Most buildings are residential (over 75%) and the city is high density. Both of these factors limit the amount of extra capacity space that could be used for public shelter in the event of a large disaster.

Many of the buildings are not accessible from roads (72 %) and many are on sharp hill slopes, making journey and aid difficult.

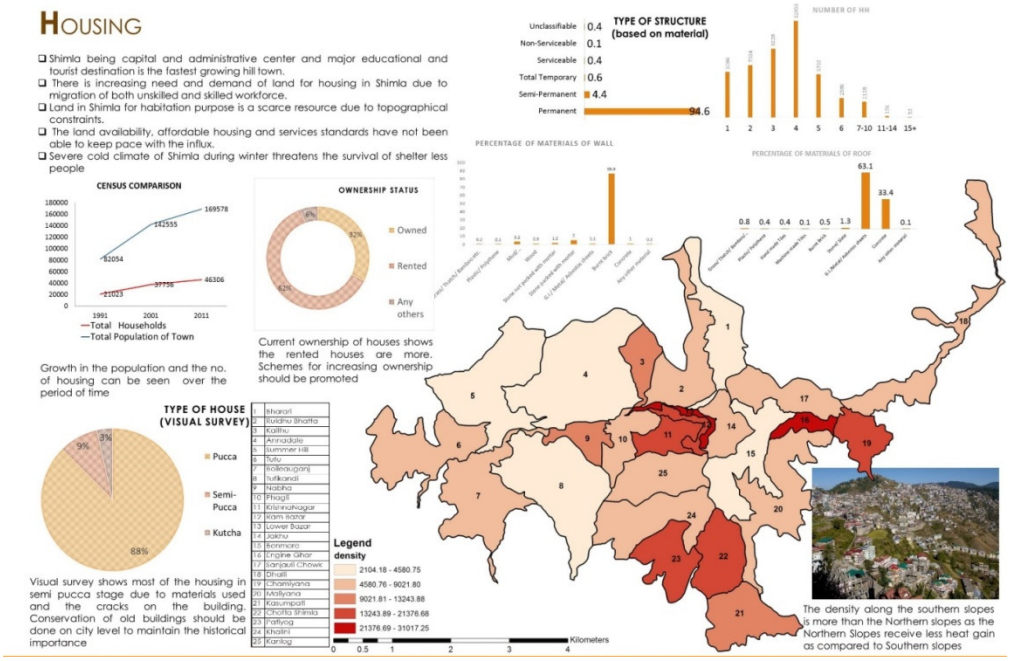

Fig. 7. (Source: Studio exercise, 2015-17, MURP 3rd SEM. SPA).

• Emergency services are under-funded. Only 100 fire fighters with six fire engines serve the city and its surrounding region.

• The building stock is predominantly of a poor condition. Existing building stock is poorly maintained, particularly in the rental sector, coupled with a preference for building with unsafe material, such as brick or concrete with minimal reinforcement. Some 36% of the city's building stock has been classified by the Sustainable Environment and Ecological Development Society as being of very poor quality.

• Many buildings are inappropriately high for an earthquake region. At least 24% of buildings have 3 or more stories, 40% of which are built on steep slopes on top of un-compacted soil.

• Around 15% of Shimla's building typical was constructed before 1925 and is built of wood. This is a concern for half of these structures, which have not been properly maintained, leading to decay. In the old districts of the town, the high density of building means that adjoining buildings are put at risk.

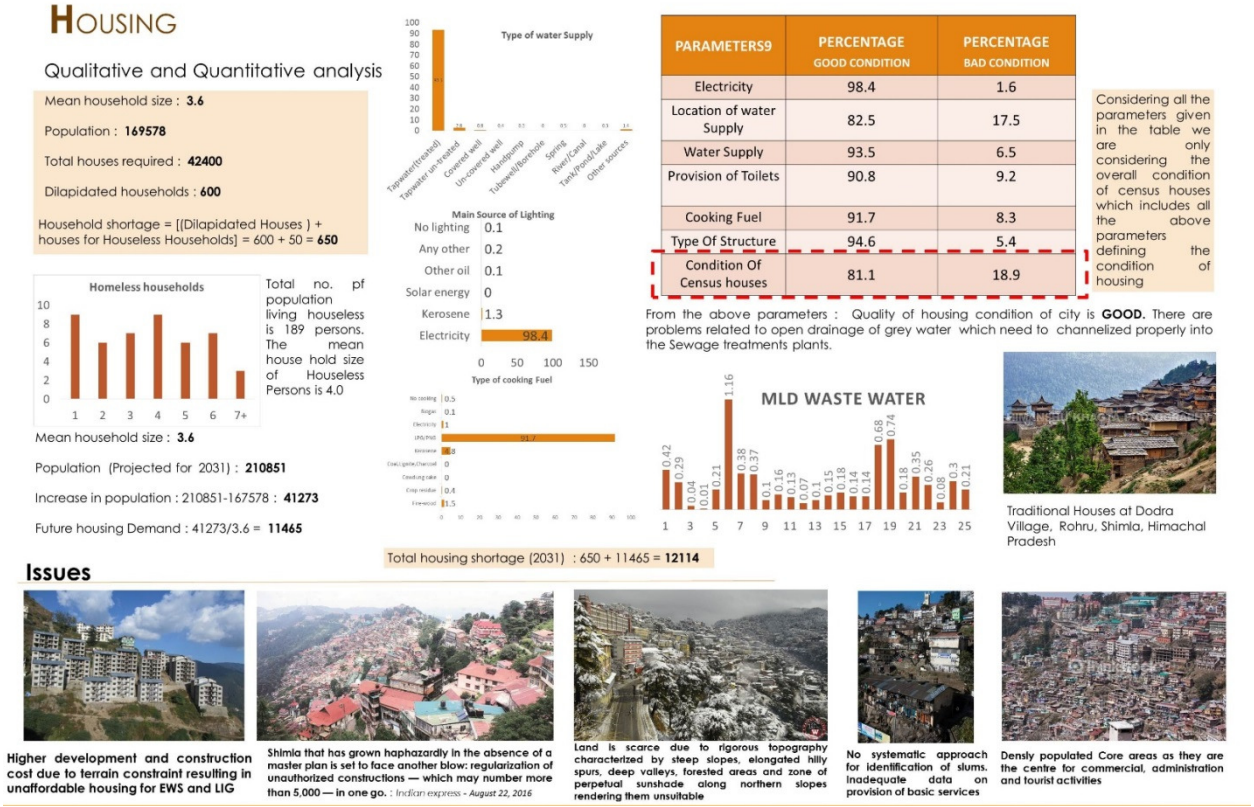

Fig. 8. (Source: Studio exercise, 2015-17, MURP 3rd SEM. SPA).

Fig. 9. (Source: Draft development plan, 2015).

• Seismic building codes were introduced in 1971. About 30% of the buildings were constructed before this ordinance was passed; but a lack of regulation enforcement means that some 80% of buildings do not meet standards. Resilient Development tools used: Strategies can be built on the basis on capacity building of the city's addressing main issues is mobility and security. Therefore, the city resilience strategy cover the challenges and functionality and capacity of the city in facing shocks and stresses. There are 6 pillar strategies as follows and interrelated to each other:

1. Sustainable water and Energy
2. New Economic opportunities
3. Preparedness for disaster and disease outbreaks
4. Integrated mobility
5. Transparent public information and governance
6. Competitive human resources

For resiliency and future space for housing (human settlement), we need to made land suitability map through following some factors with giving them weightage overlay accordingly their importance. We take road connectivity, land use, multihazard and density. Under this process we note down the hierarchy of issues and findings with suitable space for settlement in SMC.

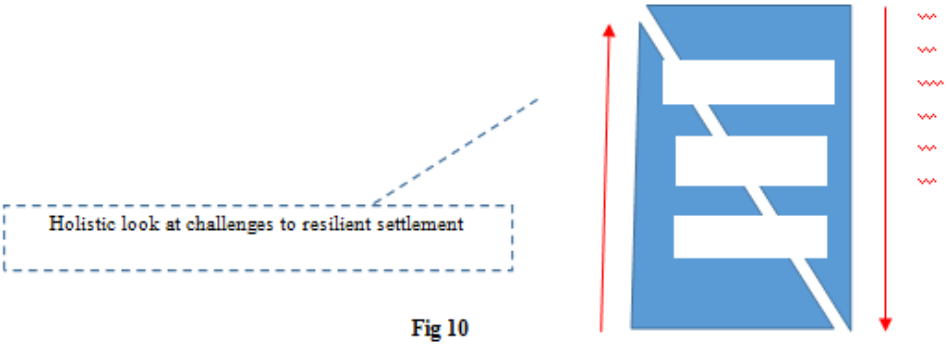

Fig 10

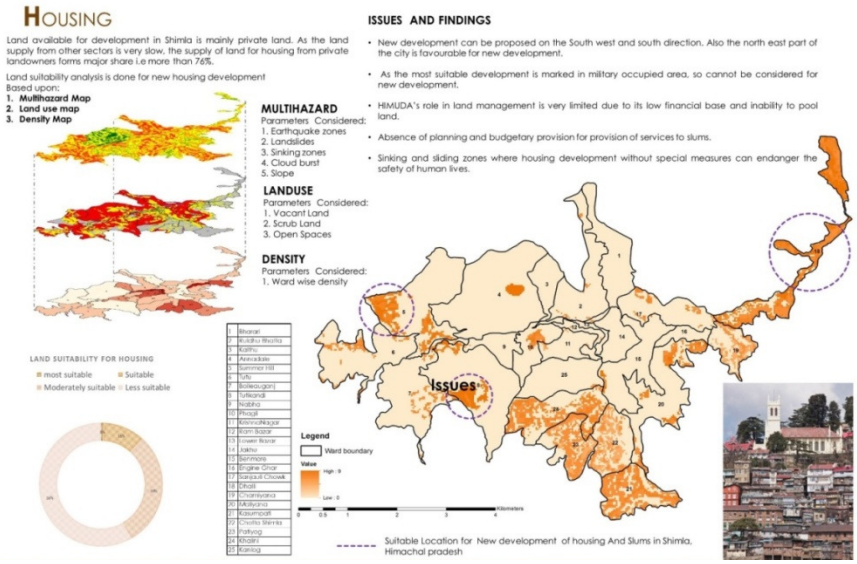

Fig 11. (Source: Studio exercise, 2015-17, MURP 3rd SEM. SPA)

II. CONCLUSION

City absences many features of disaster controlling like pre-warning system, tourism management, a clear, transparent and participatory role of government bodies and councilors, city level resource inventory, Risk and vulnerability assessment. The lack of coordination and inter linkages couple with absence of dedicated institutional mechanism and low capacity of the stakeholders in disaster management all obstruct the process of effective management and resilient city. Municipal Corporation must take the ownership and have a dedicated workforce for the development of an updated, more effective, well-coordinated and practical disaster resilient management plan. This is essentially needed for moving towards making Shimla resilient and a safe human settlement. Through the primary study of housing and human settlement sector, we found that structural system used in it is very unsafe or not following any norms and regulation as per ULB. So their need to be spatiality found out the best suitable space for housing in (SMC) hilly area.

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