Preparation of
Hazard, Vulnerability & Risk Analysis atlas and report for the state of Himachal Pradesh

Socio-Economic Vulnerability and Risk Assessment

Composite Final Draft Report

(T6)

Prepared for

Disaster Management Cell, Department of Revenue

Government of Himachal Pradesh, Shimla

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New Delhi and Ahmedabad, India

March 2015

VOLUME GUIDE

This series of reports present detailed technical and methodological documentation of the study entitled "Preparation of Hazard, Vulnerability & Risk Analysis Atlas and Report for the State of Himachal Pradesh" for DM Cell, Revenue Department, Himachal Pradesh.

Hazard Risk

This volume contains Technical papers on hazard risk assessment due to natural and man-made hazards within Himachal Pradesh as presented below.

1. Avalanche Hazard Risk
2. Climate Change & Flood Hazard Risk
3. Drought Hazard Risk
4. Earthquake Hazard Risk
5. Environmental & Industrial Hazard Risk
6. Forest Fire Hazard Risk
7. GLOF Hazard Risk
8. Landslide Hazard Risk

Vulnerability and Risk

This volume contains Technical papers on the Vulnerability and Risks to key elements at risk within Himachal Pradesh as presented below.

1. **Socio-Economic Vulnerability and Risk**
2. Building Vulnerability and Risk

Vulnerability and Risk

Socio-Economic Vulnerability and Risk Assessment

Composite Final Draft Report

(T6)

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Executive Summary

Himachal Pradesh had a population of 6.8 million out of which only 0.61 million was urban. It has a high literacy rate and one of the most progressive states in northern India. Its demography is dominated by younger age groups and it is showing signs of transition towards lower birthrates.

About 90 percent of population is reliant on primary sector, especially agriculture, horticulture and animal husbandry. Transhumant communities exist in the state who travel between the Shiwalik and higher mountains across the year.

Himachal has transformed from mainly primary sector dependency to industry, tourism and service sectors. With 90 percent of population still depending on primary sector with only 19.5 percent of GSDP, the income inequities are large between the primary sector and secondary and tertiary sector workers.

The land holding pattern is dominated by small and marginal farmers (86%). While some of the higher altitude regions grow remunerative cash crops, rest of the farmers depend on cereal crops for their sustenance. Complex and diverse risk pone terrains as well as small landholdings are major constraints of primary sector. Mechanization is not possible due to these limitations as well as small terraces in sloping lands.

Located near the Kashmir syntaxial bend, the whole state is prone to high intensity earthquakes. Also, heavy rains, landslides and flash floods are other hazard risks. One or the other district faces drought every year.

This study was conducted to understand the socio-economic vulnerability of rural and urban population across the state. The study covered all districts of the state and interviewed more than 6000 households.

High diversity in physical environment is reflected in the lifestyles and livelihoods across the state. The socio-economic contexts is undergoing major transformation as reflected by rapid progress in terms of education, industry and tourism.

Sustainable rural livelihood framework of Department for International Development U.K, (DFID) was used to capture the socio-economic vulnerability of the population. Separate rural and urban indicator sets were used for analysis. For urban areas, this framework was modified excluding natural capital, since the urban residents are not directly dependent on natural capital for their livelihoods. Each Indicator scores were derived from several variables defining each capital.

The villages for sample study were selected from each one of the tehsils (except one Block in Cold desert region). Altitude and distance from the road ware used to select villages across the state.

The sample for each Block was categorized in to three classes: bottom 20% of the households (Lowest per capita income quintile) were categorized as low income and highest per capita income quintile was categorized as the High income group and the three middle quintile was considered as middle income group. All the analysis was done using these three group aggregation at Block level. Considering the diversity in incomes from

land, a land conversion factor was used based on the average incomes per hectare of land from different CD Blocks.

The natural capital based vulnerability shows highest among all capitals. This indicates scarcity of NTFP, Fuel wood, Fodder and land ownership. There is no significant variation in Physical vulnerability between different economic groups except for type of houses owned by them. The financial vulnerability across different economic groups shows the highest diversity. The human vulnerability index is quite low across all social groups. Despite fairly high cohesion among the communities, the membership and participation in social and livelihood based groups seems to be low as evident from the social vulnerability index scores.

While the composite vulnerability index can be used for delineating and prioritizing development blocks or intervention, actual interventions can be best decided by using individual sports of five vulnerability indices. It is suggested that you individual your indicators may be used to focus on specific interventions.

Urban socio-economic Vulnerability:

The Himachal Pradesh is regarded as one of the least urbanized state in the country with only 10.04 percent of the population living in towns and cities. Shimla is the highest urbanized district within the state with 25 percent of the district population is urban. Shimla is the only city with a Municipal Corporation in the state. The Shimla, Solan, Kangra and Mandi districts have more than 10% urban population to district population and account for more than two thirds of the state's urban population.

Total working population in urban areas is 2,70,038 (40% of urban population). Administrative services, transport and tourism are major economic activities. Tourism is increasingly becoming an important economic activity, especially during peak summers and winters.

Approximately 99 percent of the houses in urban areas are *Pucca* buildings. About 80% of the urban houses are classified as livable. Some of the urban areas located on ridges and upper slopes face drinking water shortages.

A total of 781 urban household samples selected from 13 largest towns in the State covering a population of 4,207 (about 0.5% of state urban population). In each city, low, middle, mixed (households residing in buildings/neighborhoods with both commercial establishments and residential areas) and upper income dominated areas were identified by reconnoiter and samples were chosen from two areas from each of the above categories of neighborhoods.

Four indicators were used to analyse the socio-economic vulnerability in urban areas. They are based on Physical, Financial, Human and Social capitals based on DFID's Sustainable livelihood Framework.

The samples in each city were categorized as Low income, Medium income and High income groups, similar to the categorization done in rural survey. City level indices were used for presenting the results in maps.

The study has shown that the access **to** physical infrastructure and services is quite satisfactory in most urban areas. However the infrastructure, especially the water supply and road network is often prone to landslides in case of mountainous areas and floods in case of the riverine towns.

Himachal Pradesh state has one of the lowest urban poverty incidence as per planning commission studies. However a significant proportion of livelihoods informal and prone to risks and uncertainties. The financial capital vulnerability index among the LIG in urban areas is significantly high, even though it is lower than among rural households. Human vulnerability index is generally low even among the LIG households in urban areas. Despite being a less urbanized state, the membership and participation in social groups seems to be quite low as evident from the high social vulnerability index across all the income groups. The composite vulnerability index of urban areas is significantly lower than rural areas due to better infrastructure and services, literacy as well as better income levels.

Since more than two thirds of the urban population is located in four towns, any vulnerability reduction investments should focus first on these towns and set examples for other towns. Considering the high earthquake risk in most parts of the state, it is suggested that better housing and hardening lifeline infrastructure and services should be given top priority.

Chapter 1: Introduction

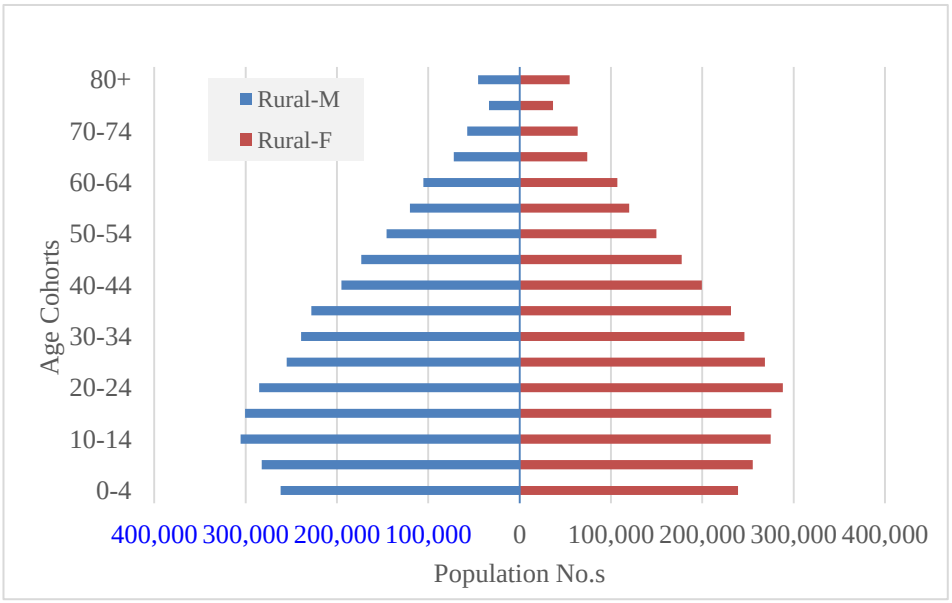
1.1 Background

The State of Himachal Pradesh attained Statehood on the 25th of January 1971. It has been given a special category status by the Government of India owing to difficulties in provision of basic services to dispersed populations living in remote geographical pockets, under harsh climatic conditions, limited tax base and high cost parameters (13th Finance Commission). The State has an area of 5, 5673 km^2. it has 12 districts, 77 blocks, 3,243 panchayats, 20,690 census villages, 59 towns, 49 urban local bodies, and 23 *Nagar Panchayats*. The administrative capital is Shimla. The state has road network of 33,722 km and it produces 6726 MW of electricity. The food grain production is about 1.579 million Tonnes and fruit production of 10.27 lakh Tonnes (CoI 2011).It is equivalent to about 230 kg/capita/year of food grain production.

1.2 Demography

The population of the State was 6,856,509 persons (Census 2011). The rural population is 6,167,805, while the urban population is 6,167,805. About 25 percent of this population belongs to the Scheduled Caste and 5 percent to the Scheduled Tribe. The other castes comprise of 70 percent of the State's population. The literacy rate of the State is 82.80 percent (male literacy-89.53 percent and female literacy-73.51 percent) (COI 2011). The distribution of rural population across different age groups is presented in the following Figure 1.

Figure 1: Age-wise Rural Population (2011)



Source: 2011 Census

The rural population is quite young with 10-14 age group dominating the age groups. The population growth rate is declining as indicated by comparatively lower numbers in <10 year age groups. The sex ratio is poor as indicated significantly lower female younger than 24 years. This can only be answered by son preference and medical interventions.

About 90 percent of the population is reliant on the primary sector of economy. Agriculture, horticulture and animal husbandry are most important primary activities pursued by the rural population. The agriculture in this state is diverse and reflects the terrain, rainfall pattern as well as cultural diversity across the state. Due to small and fragmented land holdings, most of the cereal cultivation undertaken in the state is only able to provide subsistence for the farmers. With the development of horticulture in the state, cultivation of fruits and vegetables are becoming important sources of income for the farmers across the state. While horticulture is economically a better option, changing climatic pattern as well as the recurrent phenomena like are posing risks to horticulture crops, especially apple crop. The animal husbandry is a major source of livelihood for the transhumant communities who migrate between underline grasslands and Shiwalik plains.

1.3 Economic Activities

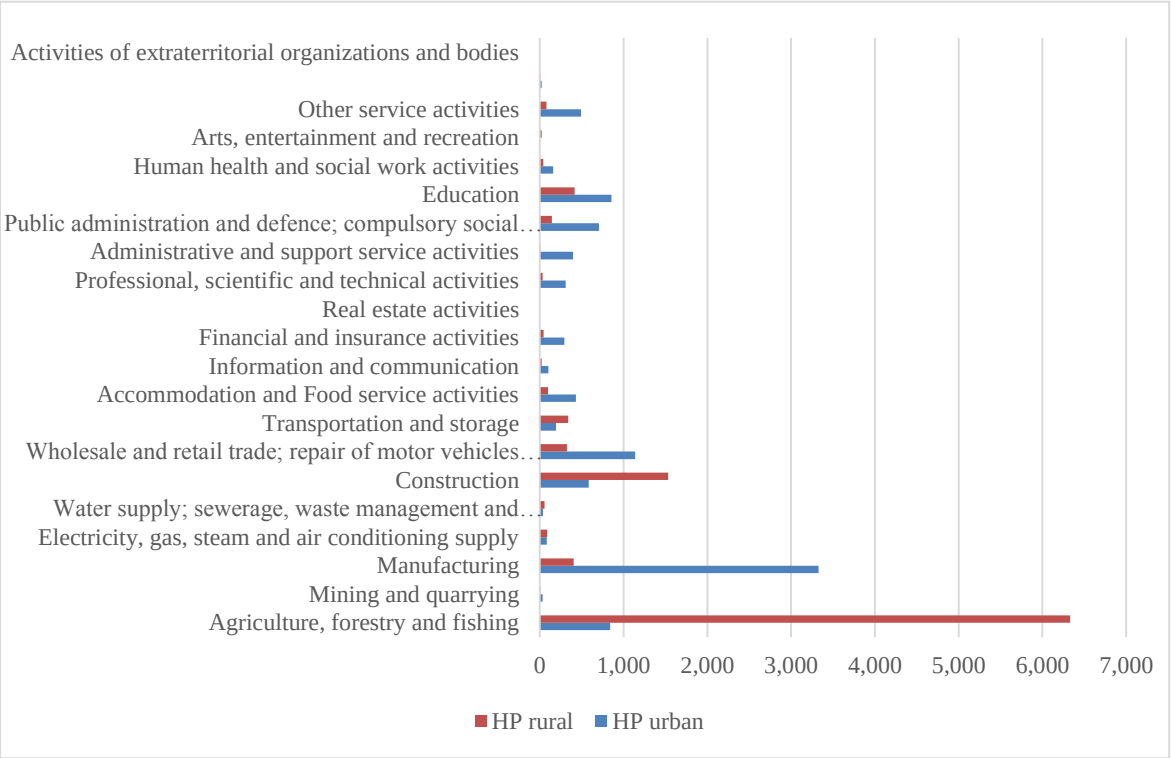
The Himachal Pradesh's economy has transformed from the high dependency on primary sector to secondary and tertiary sector. Himachal has been a destination for investment in manufacturing, hydro-electricity and tourism sector over last few decades.

The State Gross Domestic Product (GSDP) at 2013 prices, was estimated at ₹ 73,710 crore as against ₹ 64,957 crore in 2011-12 showing an increase of 13.5 percent during the year. About 19.5 percent of the GSDP of the primary sector, 40.06 percent is from the secondary sector and 40.43 is from the tertiary sector The Per Capita Income (at current prices)witnessed an increase of 11.6 percent as it increased to ₹ 83,899 in 2012-13 from ₹ 75,185 in 2011-12 (GoHP,2014[1]).

Employment across economic sectors shows diversity across rural and urban areas. The number of persons employed across NIC categories of economic sectors is presented in the following Figure 2.

[1] Economic Survey of Himachal Pradesh(2013-14), Dep't of Economics and Statistics 2014

Figure 2: Distribution of workers across different NIC economic categories (No.s/10,000 workers)



Source: NSSO 2013 68th round[2]

Nearly 63% of the rural workers are engaged in agriculture, forestry and fishing activities. Surprisingly, the proportion of rural construction workers (per 10,000 workers) is much higher than urban areas. In all other secondary and tertiary sectors, the urban workers show higher proportion compared to the rural workers.

About 32.3 percent of the population was found to be Below Poverty Line (BPL): 35 percent among rural and 7.6 percent among urban (UNICEF, 2009). The number of families in the BPL category is now 24 percent showing a reduction when compared to the 2009 data (ES- GoHP).

1.4 Livelihoods

As per 2011 Census, 30.05 percent of the total population of the Pradesh is classified as main workers, 21.81 percent marginal workers and the rest 48.15 percent as non-workers. Of the total workers (main+ marginal) 57.93 percent are cultivators and 4.92 percent agricultural laborers, 1.65 percent are engaged in household industry and 35.50 per cent in other activities. Among total rural population of 61 lakhs, 30% are main workers, 24% are marginal workers and 46% are non-workers.

About 62 percent of the main and marginal workers in the state are directly reliant on the agriculture while the total primary sector contributes only about 19.5 percent of GSDP.

[2] NSSO 2014: Employment and Unemployment Situation in India (68th Round 20ll- 2012) National Sample survey Organisation, Ministry of Statistics & Programme Implementation, GoI

Agriculture, horticulture and animal husbandry are most important primary livelihood activities in rural areas. Due to small and fragmented land holdings, most of the cereal cultivation undertaken in the state is only able to provide subsistence for the farmers. The land holding pattern as per 2005 Agricultural Census is presented in the following Table 1.

Table 1: Land holding pattern in Himachal Pradesh (2005-6)

Type	No. of holdings	Percentage	Area (hectare)	Percentage
Marginal Farmers (<1 ha)	6,36,619	68.2	2,58,247	26.7
Small Farmers (1-2 ha)	1,75,651	18.8	2,44,741	25.3
Semi-Medium Farmers (2-4 ha)	88,447	9.5	2,40,355	24.8
Medium Farmers (4-10 ha)	29,136	3.1	1,64,994	17.0
Large Farmers(>10 ha)	3,530	0.4	60,006	6.2
Total	9,33,383	100.0	9,68,344	100.0

Source: Directorate of Land Records, H.P.

With more than 87% of land holdings in small and marginal holdings, and low yields, food grain based agriculture can only be sufficient for self-consumption for the farming households. High value – Low volume agriculture in such contexts.

Himachal Pradesh being located in mountainous terrain neighboring large cities has multiple advantages in terms of horticulture. It is ideal for growing temperate and cold region fruits like apple, pears, and plums and also vegetables, which cannot be grown during monsoons in the plains. The suitability of Himachal for horticulture has resulted in shifting of land use pattern from agriculture to fruit crops in the past few decades. The area under fruits, which was 792 hectares in 1950-51 to 218,303 hectares (about 22% of land holding area) during 2012-13. Horticulture in the state has become an important source of income for the farmers across the state. While horticulture is economically a better option, changing climatic pattern as well as the recurrent phenomena like are posing risks to horticulture crops, especially high value fruit crops like apple.

The animal husbandry is a major source of livelihood for the transhumant communities who migrate between Alpine grasslands and Shiwalik plains. About 19 out of 20 households kept at least one species of livestock[3]. A significant proportion of the livestock depend on open grazing. Road access and transhumance are major constraints to organized diary development.

Complex and diverse risk pone terrains as well as small landholdings are major constraints of primary sector. Mechanization is not possible due to these limitations as well as small terraces in sloping lands. Since the traditional agriculture is labor intensive, incomes from traditional cereal cultivation is low and is done mostly for self-consumption. The horticulture offers opportunity to increase incomes from small holdings, but the risks as well as gestation periods are high.

1.5 Risk Profile

Himachal Pradesh is located in Himalaya mountain belt near the Kashmir syntaxial bend, which is geodynamical very active zone, as evidenced by several major earthquakes. Since Himalayas are still evolving mountains, landslide risks are also high. The southern edge of the state-facing the Indo Gangetic Plains-lies in high rainfall zones where flash floods and

[3] Planning Commission: Himachal Pradesh Development Report

extreme precipitation related risks are high. Himachal Pradesh also has several glaciers and glacial lakes and the some of these lakes occasionally cause glacial lake outburst floods affecting the valleys downstream. The north-eastern part of the state is located in the cold desert region.

The natural disasters can be broadly categorized into geological and climate related disasters. The geological disasters include earthquakes and landslides, while climate related disasters include droughts, floods, and hail storms. The glacial lake outburst floods can be caused by both climatic as well as geological causes. Also, since the Himachal Pradesh has significant forest cover, forest fire is another major risk in this state. As the State is becoming industrialized, and the transport network is expanding, other risks like industrial disasters as well as vehicle accidents are increasing the overall risk profile.

Table 2: Disaster Events Reported by the Sample Villages

District	Drought	Flood	Hail Storm	Landslide	Earthquake	Forest fire	Grand Total
Chamba	1	2	-	2	-	-	5
Hamirpur	5	1	1	2	-	4	13
Kangra	-	-	-	1	1	-	2
Kinnaur	-	4	-	1	-	-	5
Kullu	1	7	4	5	-	2	19
Lahaul & Spiti	-	-	-	2	-	-	2
Mandi	-	9	2	7	2	-	20
Shimla	3	4	10	6	4	3	30
Sirmaur	1	4	-	4	-	-	9
Una	1	-	-	-	-	2	3
Grand Total	12	31	17	30	7	11	108

Source: TARU Analysis, 2013-14 (Sample size 415 villages)

Floods and landslides are most frequent events reported by the sample households. The earliest events reported were of major floods (1962, 1975).During the 21st Century, people reported 17 flood events. Similarly, 28 landslides were reported since 2000. The above table indicates that people frequently suffer from the floods and landslides, and the pattern may show amplification with changes in climate as well as human interventions modifying the slopes(e.g. road building) and hydrology (e.g. hydroelectricity projects).

These disasters cause significant loss of life and property every year leading to high exposure of the population to these risks are as well as high vulnerability of the population. The108 events reported caused death of 54 persons and impacted 2511 households and impacted about 5600 ha of land.

The socio-economic vulnerability and risk assessment aims to disaggregate the risks and vulnerability across the state through secondary data analysis and primary studies. The findings are aimed to inform the disaster management, planning, policy in the state.

1.6 Objectives of the Study

This study is undertaken for developing risk and vulnerability Atlas for the state of Himachal Pradesh (DMC, Dept. of Revenue, 2011). The objectives of this atlas is to:

i. Map out all hazard prone areas at the State, Districts and Block level, covering water and climate, geological, environmental, chemical and industrial, biological and accident related hazards in the State of Himachal Pradesh (with projections for at least the next 20 years).

ii. Assess the extent of vulnerability, the exposure of people, infrastructure and economic activities to these hazards in consideration of potential growth for the next 20 years.

iii. To identify and propose location specific detailed solutions to avoid disaster risks by implementing both structural and non-structural mitigation and prevention measures.

The report focuses on the second objective of socio-economic vulnerability and risk assessment. This report is based on secondary data analysis and primary studies. This study is aimed at assessing socio-economic vulnerability at sub-district levels.

Chapter 2: Rural Vulnerability studies

2.1 Constraints

Being located in mountainous region, this state shows high diversity across regions and communities and livelihoods. It has both caste and tribe population, with ST communities about 4% of total population) predominantly residing in higher altitudinal regions and also transhumant communities. The SC population is about 25% of the total population. It can be considered as a fast transforming environment lying in a transitional zone between Tibetan highlands and Indus Plains. Assessing risk profile in such diverse context is a major challenge. Decadal National Census is insufficient to capture the changes in demography and livelihoods in this fast transforming state. The 2011 census was not available during the sample selection.

The state is also undergoing rapid changes in livelihoods, and demography. The livelihoods show very high diversity even within a single valley depending on altitude, aspect, slope and availability of cultivable land. With the extension of road network, several alternate livelihoods options (especially in tertiary sector) have emerged in many villages.

The risk profile itself is changing with direct anthropogenic interventions like extending the road network and building of hydroelectric dams and mining activities in the fragile mountainous regions as well as indirect impacts of climate change. Previously rare phenomena like cloudbursts have reportedly become more frequent and impact settlements and livelihoods. Hailstorms and heavy rains significantly impact horticulture, which is becoming an important source of livelihood in the state.

Social segregation, social hierarchy and differential accessibility to resources and services across community groups is less prominent in these villages compared to the plains villages in neighboring Indo-Gangetic plains. The conventional approach of using communities and castes as a basis for delineating the poor communities is not often valid for hill environments, especially in this state. Therefore, the land ownership and livelihood patterns were used for analysis.

While 1905 Kangra Earthquake devastated large region, Himachal Pradesh has not faced major earthquakes during last three decades and the communities are often unaware of risks and vulnerabilities from major disasters. Disasters like flash floods and landslides are more frequent site specific small scale-large impact events. Evidence of past impacts from these events cannot be extrapolated to larger areas. The impacts of these local disasters often cannot provide a basis for analyzing the vulnerability even at Block/Tehsil levels.

The state has two types of administrative subdivisions namely Tehsils and Community development blocks, which are not contiguous. Some of the data is reported at Tehsil levels, while others are reported at CD Block levels. Conversion of this data from one unit to other is a major challenge. The analysis is reported at Community Development (CD) Block levels. During 2001, there were 72 blocks and they were expanded in to 77 CD

Blocks by 2011. Most of the older secondary data is available for 72 blocks and therefore these are used for reporting.

2.2 Methodology

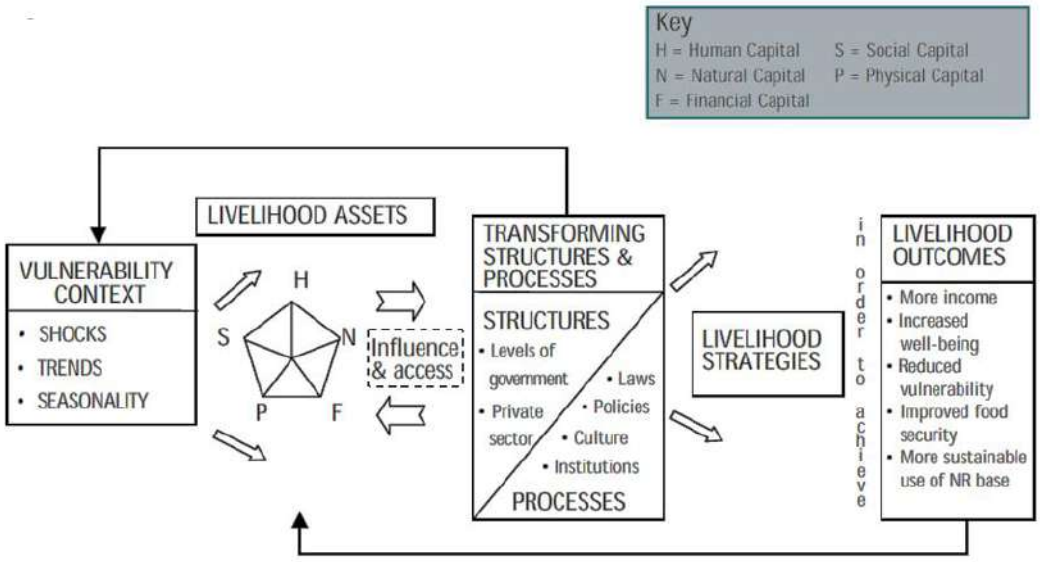
2.3 Approach

Different definitions of vulnerability and risk are in vogue in different contexts. Secondary review also indicated that there were different methods being used for assessing socio-economic vulnerability. The Literature review indicates a link between sustainable development, poverty and disasters established by DFID through its work in different countries. It has been established that disasters constrain sustainable development of societies and that poverty, sustainable development, and disaster risk reduction are linked; disasters impact lives, livelihoods and development substantially (ODG, 2004). The socio-economic vulnerability is the result of a number of factors relating to human, natural, physical, financial, social capitals as well as knowledge, attitude and practice of community as well as other stakeholders. The shocks, trends and seasonality can have a negative impact on the five capitals, which adversely impact on lives and livelihoods of people.

2.4 Livelihood framework

The vulnerability of people depends on ownership variety of assets and access to social networks to the households. While quantitative methods can be used for analyzing losses and damages to physical assets, such methods cannot be used for analyzing household/ community's social capitals and vulnerability to disasters, especially in rural environments. Therefore, this vulnerability analysis is based on five (Natural, Physical Financial, Human and Social) capitals developed under DFID's Livelihood framework, which is presented below Figure 3.

Figure 3: Sustainable Livelihood Framework



Source: DFID[4]

[4] http://www.efls.ca/webresources/DFID_Sustainable_livelihoods_guidance_sheet.pdf

The ability of the households to overcome the stresses and shocks depends on the access to five capitals reported above. These capitals can be also be used as indicators for assessing the extent of vulnerability of the households. Considering these ownership/access to these capitals was explored at household level through questionnaires. These data sets were used to develop vulnerability indices for five capitals and a composite index was also developed by aggregating these indices.

2.5 Reconnoiter Survey

A reconnoiter was undertaken to understand the regional diversity in livelihood patterns, risks this exercise covered test 7 districts and four agro climatic zones. These districts include Chamba, Kangra, Kullu, Mandi, Shimla, Solan and Sirmaur. The team visited 41 communities/settlements. More vulnerable people were specifically interviewed to understand the risks and impacts. Academicians were also consulted from the CSK Himachal Pradesh Agricultural University (CSK HPKV) on animal husbandry, agriculture and natural resources.

2.6 Addressing diversity

The land quality across the Blocks show high diversity. In the Shiwalik and lower altitude regions growing mail cereal crops, the agricultural income from land is much lower than higher altitudinal zones growing horticultural zones. To deal with a land conversion factor was developed using the average Block level incomes per hectare so that land ownership can be compared across the state.

2.7 Indicators and indices

A variety of indicators were used to define each capital at household levels. Various indicators used for assessing the vulnerability of each capital is presented below:

Natural Capital

Himachal Pradesh has mountainous topography and it exhibits a wide diversity in endowment of natural resources. People are dependent on natural resources for both income as well as consumptive use. These natural resources includes land, water sources, forests, timber, NTFP/ MFP, fuel wood and fodder sources etc. Natural capital is defined as resources needed for meeting basic needs (land, fuel wood, fodder, non-timber forest products). Access to NTFP, fuel wood and fodder were used as direct indicators, while land ownership was derived by a multiplying land ownership. Since the land quality as well as incomes were highly variable across CD blocks, a factor based on relative per hectare income across blocks was used (Equivalent land). Equal weightage was given to these four sub-indicators.

Physical Capital

Physical capital is one of the most important indicators because the households depend on the physical infrastructure for meeting basic needs (e.g. water supplies) as well as to improve efficiency. Physical Capital includes the private physical assets as well as public infrastructure and services, which are essential for wellbeing of households. These include access to water supply and sanitation, housing, health services, road connectivity, communication, production equipment or tools and goods etc. For assessing vulnerability of households following sub-indicators are used:

1. Type of house (*kucha/semi pucca/ pucca*),
2. Access to piped water supply

3. Drainage (sanitation),
4. Distance to public distribution system
5. Distance to primary health centers,
6. Distance to road
7. Location of the dwelling (steep hill/flood prone area/landslide prone area/near a garbage dump/industrial area),
8. Ownership of telephones/mobile phones.

Financial Capital

The financial capital was assessed by per capita household income and working to non-working members ratio. Equal weightage was given to both the indicators.

Human Capital

Human Capital is defined as factors that enable households or individuals to pursue livelihood activities. These include factors such as skills, knowledge, labour available at household level, education level etc. Each of these factors determine livelihood options. This index is based on three indicators- the highest education level in the household, dependency ratio and presence of members with disability or terminal illness. Equal weightage was given for each of the scores of sub-indicators.

Social Capital

Social Capital includes social networks and institutions from where households gain social security at the time of need, stress or shock. Often in an event of disaster, people rely on their networks, groups or institutions for support and for coping with the stress. However, without support from such networks, the household may take longer time to recover from shocks. To assess status of social capital, membership participation in such groups was used. Equal weightage was given for two indicators. A total of seven types of social groups were considered.

Composite Socio-economic Vulnerability index

The Rural Composite SEVI has been worked out for each block separately with the Rural SEVI scores falling between 0 to 10 and where 0 is the least vulnerable and 10 is the most vulnerable to natural disasters. The scale of vulnerability varies from very low vulnerability to very high vulnerability based on the score of the block as indicated in the figure.

These indicators were developed based on reconnoiter across the state. Indicators and the weightage assigned is presented in the following Table 3.

Table 3: Rural Vulnerability Index Scoring Scheme

Index	Indicators	Scores
Natural	NTFP	Reported Time spent per week: >17.5 hours =10; 14-17.5=8; 10.5-14=6; 7-10.5=4; 3.5-7=2; Nil-3.5 hours=0
	Fuel wood	
	Fodder	
	Land ownership	Equivalent land= Land owned X Land multiplier based on relative per ha agricultural incomes across blocks. Landless-<0.5=10; 0.5-1=8; 1-1.5=6;1.5-2=4; 2-2.5=2; >2=0
Physical	Drainage	No drains=10; Open drains=7.5; Partially covered drains=5; Covered drains =0

Index	Indicators	Scores
	PHC	Above 5 kms=10; 3-5 km=6;1-3 km=4;<1 km=2; In the village =0
	PDS	No access=10; >3 km=5;1-3 km 2.5; <1 km=0
	Road	> 2 km =10; 1-2 km=5; 0.5-1km=2; < 0.5 km =0
	Dwelling location	Steep hill, Landslide/Flood prone=10;Industrial pollution, Near garbage ground=5, Plains, None =0
	House type	Kuccha=10;Semipucca=5; Pucca=0
	PWS	Piped water supply =10; All others=0
	Mobile phone ownership	Yes=0; No=10
Financial	Per capita annual income (in '000 Rs.)	<9=10; 9-13.6=8;13.6-18=6; 18-25=4,25-35=2; >35=0
	Ratio of Nonworking to Working members	>2=10; 1-2=8;0.75-1=6; 0.5-0.75=4; 0.25-5=2; <0.25=0
Human	Highest education levels in HH	Illiterate=10; Primary=8; Secondary=6; Higher Secondary=4; Graduate=2; Post-Graduate=1; Professional =0
	Dependency ratio	>6=10; 3-6=7.5; 2-3=5;1-2=2.5;<1=0
	Disabled/ terminally ill members	2 or more 10; 1=5; None=0
Social	Social	Membership and participation in seven groups Score of 1 each for membership and participation in each group

Dependency ratio affects both the financial capital as well human capital and was therefore used in deriving the vulnerability in Human as well as Financial capitals.

2.8 Sample Selection and coverage

About 90% of the state population in Himachal Pradesh are rural. The distribution of population and population density across districts is presented in the following Table 4.

Table 4: Distribution of Population and Population Density

Districts	Population (2011)	% of State Population.	% Rural to District Population	Area km^2	Density (persons / sq.km)	Sex ratio
Bilaspur	3,82,056	6	93	1,167	327	981
Chamba	5,18,844	8	93	6,528	80	989
Hamirpur	4,54,293	7	93	1,118	406	1,096
Kangra	15,07,223	22	94	5,739	263	1,013
Kinnaur	84,298	1	100	6,401	13	818
Kullu	4,37,474	6	91	5,503	79	950

Districts	Population (2011)	% of State Population.	% Rural to District Population	Area km^2	Density (persons / sq.km)	Sex ratio
Lahaul & Spiti	31,528	0	100	13,833	2	916
Mandi	9,99,518	15	94	3,951	253	1,012
Shimla	8,13,384	12	75	5,131	159	916
Sirmaur	5,30,164	8	89	2,825	188	915
Solan	5,76,670	8	82	1,936	298	884
Una	5,21,057	8	91	1,549	338	977
Himachal Pradesh	68,56,509	100	90	55,673	123	974

Altitude range and distance to roads are important considerations taken in to account while selecting the villages. A total of 415 villages were covered by the survey out of a total of 14,584 villages. The altitudinal range determines the type of agriculture in the mountainous regions. The distance to roads are important for understanding the vulnerability due to access to various basic services. After examining various parameters from secondary data analysis, the villages were selected based on these two simple criteria. The distribution of villages in Himachal Pradesh and sample villages is presented in the following Table:

Table 5: Categorization of Villages of Himachal Pradesh based on Altitude Range and Minimum Road Distance

Altitude Range (m.amsl)	Minimum Road distance (in km.)							
	Total villages in the state				Sample villages			
	<5	5-10	>10	Total	<5	5-10	>10	Total
< 1,000	24	67	9	7,417	21	76	3	210
1000 - 1500	31	54	15	3,276	28	65	7	75
1500 - 2500	22	53	25	3,417	21	62	17	105
2500 - 3250	0	67	33	317	0	76	24	17
3250 - 4250	0	71	29	145	0	67	33	6
> 4250	0	100	0	12	0	100	0	2
Total	24	61	15	14,584	21	71	8	415

Source: TARU Analysis (2013-14)

A total of 6,684 household samples were interviewed with structured questionnaire. This represents about 0.5% of the rural households across the state. All 12 districts as well as all 72 blocks (Census 2001) were covered under the survey. The distribution of household samples across the districts is presented in the following Table 6.

Table 6: Household samples across districts

District	Income Class (based on sample percentiles)			
	Low (< 20)	Middle (20-80)	Upper (>80)	Total
Bilaspur	78	228	77	383

District	Income Class (based on sample percentiles)			
	Low (< 20)	Middle (20-80)	Upper (>80)	Total
Chamba	110	322	108	540
Hamirpur	106	288	101	495
Kangra	318	898	305	1,521
Kinnaur	18	47	17	82
Kullu	86	250	86	422
Lahaul & Spiti	7	16	7	30
Mandi	216	585	200	1,001
Shimla	140	403	139	682
Sirmaur	105	302	104	511
Solan	96	312	104	512
Una	101	289	99	489
Grand Total	1,381	3,940	1347	6,668

Source: TARU Analysis (2013-14)

Of the total respondents, 63.3 percent were male and 36.7 percent were female. About two thirds of the households were of APL category, 22% of BPL category, and 8% of Antyodaya category while 4 percent were of General category. The respondents were purposively selected from poor, medium and richer socio- economic classes from each village, based on quick assessment from village level enquiries. The distribution of sample households across socio-economic groups is presented in the following Table 7.

Table 7: Distribution of rural household samples across social Groups (% of District sample)

District	SC	ST	Other	Sample households
Bilaspur	38%	2%	61%	383
Chamba	18%	22%	60%	540
Hamirpur	19%	1%	81%	495
Kangra	30%	3%	67%	1,521
Kinnaur	30%	59%	11%	82
Kullu	21%	2%	77%	422
Lahaul & Spiti	30%	70%	0%	30
Mandi	30%	3%	67%	1,001
Shimla	19%	1%	80%	682
Sirmaur	31%	1%	68%	511
Solan	29%	2%	69%	512
Una	24%	0%	76%	489
Total	26%	4%	69%	6,668

Source: TARU Analysis (2013-14)

The Himachal Pradesh state has about 25% of SC population and about 4% of ST population to total population. The sample households fairly represent the distribution of these socio-economic categories present in each block as well as total state.

2.9 Tools

Household level and village level questionnaires were used for collecting the data. The questionnaires covered all the indicators necessary for developing indices for five capitals and also the collecting people's recollection of past disaster events. The questionnaires were based on reconnoiter and were pretested in the field before the survey. The formats are presented in the Appendix.

2.10 Aggregation method

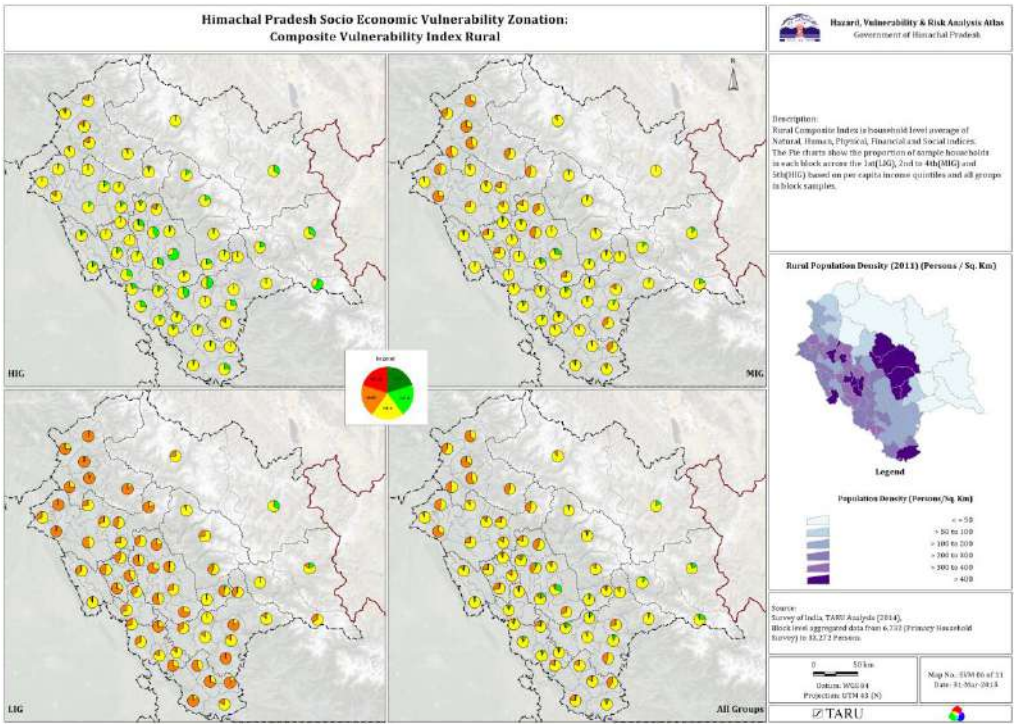
The household indices were calculated based on the scoring of indicators explained earlier and a database of household level indices was prepared. The block level aggregation was done based on income percentiles across the sample households. The first two deciles were categorized as "**Low Income Group**" (LIG) 3rd to 8th deciles were categorized as "**Middle Income Group**" (MIG) and the 9th and 10th deciles were categorized as "**Higher Income Group**" (HIG). All the indices were reported based on these three categories as well as total block data. The aggregation is done based on percentage of samples included in each index values in intervals of 2 in scale of 0 to 10. The value of 0 was assigned for least vulnerability and score of 10 was assigned to highest vulnerability.

2.11 Disaster incidence recollection from sample

2.12 Maps

The maps present block level indices representing the five capitals as well as composite index. In each CD block, percentage of samples in each category of vulnerability for a particular capital is presented. The outputs are presented for LIG, MIG, HIG as well as all the samples from the CD block are presented. This enables the viewer to see the variations across the economic groups. A sample map is presented.

Figure 4: Composite Risk Index (Rural)



Source: TARU Analysis, 2006

2.13 Conclusions

Being located in mountainous environment with altitudes ranging from few hundred meters to more than 4,000 m, Himachal Pradesh exhibits great diversity in livelihoods and cultures. Land productivity changes depending on altitude, precipitation pattern, slope and aspect and crop choices vary with altitudes and local climatic factors. The risks to livelihoods also vary due to local climatic patterns, topography and geological contexts.

While significant proportion of the villages are covered with roads, the quality and seasonality of the roads add another dimension to accessibility to basic services like health and school infrastructure and therefore the vulnerability.

Considering these diversity in geo-physical, cultural, infrastructure and livelihood contexts, a single quantitative metrics cannot be applied for assessing the vulnerability. Quantification of vulnerability is not possible in the data scarce environments, therefore simple ordinal and true/false (0-10) based scales were used to measure the vulnerability.

The natural capital based vulnerability shows highest among all capitals. This indicates scarcity of NTFP, Fuel wood, Fodder and land ownership. There are nearly 9.3 lakh land holders reported as per Agricultural Census 2005, 6.3 lakh farmers(68% of all land holdings) were marginal farmers (<1ha) and 1.75 lakh(18%) were small farmers (<2ha). With low yields of cereals (less than 2 T/ha) the marginal farmers are not expected to have food self-sufficiency. Only by major changes in cropping to high value horticulture and other allied activities, they can hope to have sustenance incomes from land. Given the low per capita land availability, creating livelihoods based on secondary and tertiary sector would be important.

The Himachal Pradesh state is one of the most developed states in Himalaya region. Over last two decades, the state has expanded the road network, water supply as well as health infrastructure across the state. Except for some of the less accessible high altitude regions, the physical vulnerability is comparatively low. There is no significant variation in Physical vulnerability between different economic groups except for type of houses owned by them. Risk proofing the physical infrastructure, especially roads and water supply infrastructure is critical, especially considering impacts of higher frequency risks like landslides, floods and cloudbursts.

The financial vulnerability across different economic groups shows the highest diversity. A significant proportion of low income groups across the state exhibits high financial vulnerability. Only in areas near large towns, the financial vulnerability seems to be lower. . It may be due to alternate livelihoods. Tourism is becoming a major livelihood option, especially along the major tourist centers as well as religious places. In the Trans-Himalayan region, dominated by tribes, and low population densities, the financial vulnerability seems to be lower.

The Himachal Pradesh state has investors on education, especially since last few decades. The human vulnerability index is quite low across all social groups. Only in a few pockets, the scores of 4- 6 are found. The Human development Index of Himachal Pradesh was 0.652 in 2009 and it had the third best HDI among all states in India after Kerala and Delhi (GoI 2011[5]). The sample studies also reflect it, showing least human capital based vulnerability.

[5] GoI 2011: India Human Development Report 2011 Institute of Applied Manpower Research, Planning Commission, Government of India

Despite fairly high cohesion among the communities, the membership and participation in social and livelihood based groups seems to be low as evident from the social vulnerability index scores. Only in a few pockets lower scores are seen.

The composite vulnerability index shows greatest diversity across economic groups. While most of the low income exhibit scores of 4 to 8, the high income mostly show 0 to 6 scores.

While the composite vulnerability index can be used for delineating and prioritizing development blocks or intervention, actual interventions can be best decided by using individual sports of five vulnerability indices. It is suggested that you individual your indicators may be used to focus on specific interventions. Some of the indicators like land ownership cannot be improved due to scarcity of land in the region, there is scope for interventions like further improving the quality of basic services and creating more alternate and secure livelihood options.

Chapter 3: Urban Vulnerability

The Himachal Pradesh is regarded as one of the least urbanized state in the country with only 10.04 percent of the population living in towns and cities. The total urban population of Himachal Pradesh was 6,88,704 persons in 2011. Shimla is the highest urbanized district within the state with 25 percent of the district population is urban (Census of India 2011). As per Census 2011, there were 59 towns as compared to 36 in 1971

Shimla is the only city with a Municipal Corporation. The towns in the state are governed as per three new Municipal Acts- HP Municipal Corporation Act 1994, Municipal Act 1994 and HP Municipal Services Act 1994. The Municipalities are responsible for activities of infrastructure building & improvement, maintaining public streets, bridges, town halls, embankments, drains, drinking water and sanitation, tanks and water courses, solid waste management, maintenance of schools, hospitals and public institutions.

Since the terrain is mostly mountainous, developing urban areas is a major challenge in terms of housing and urban services. The towns in the state can be broadly classified in to hilly and riverine towns. For example, Shimla is a hilly city, while Mandi and Bilaspur are riverine towns.

3.1 Demography

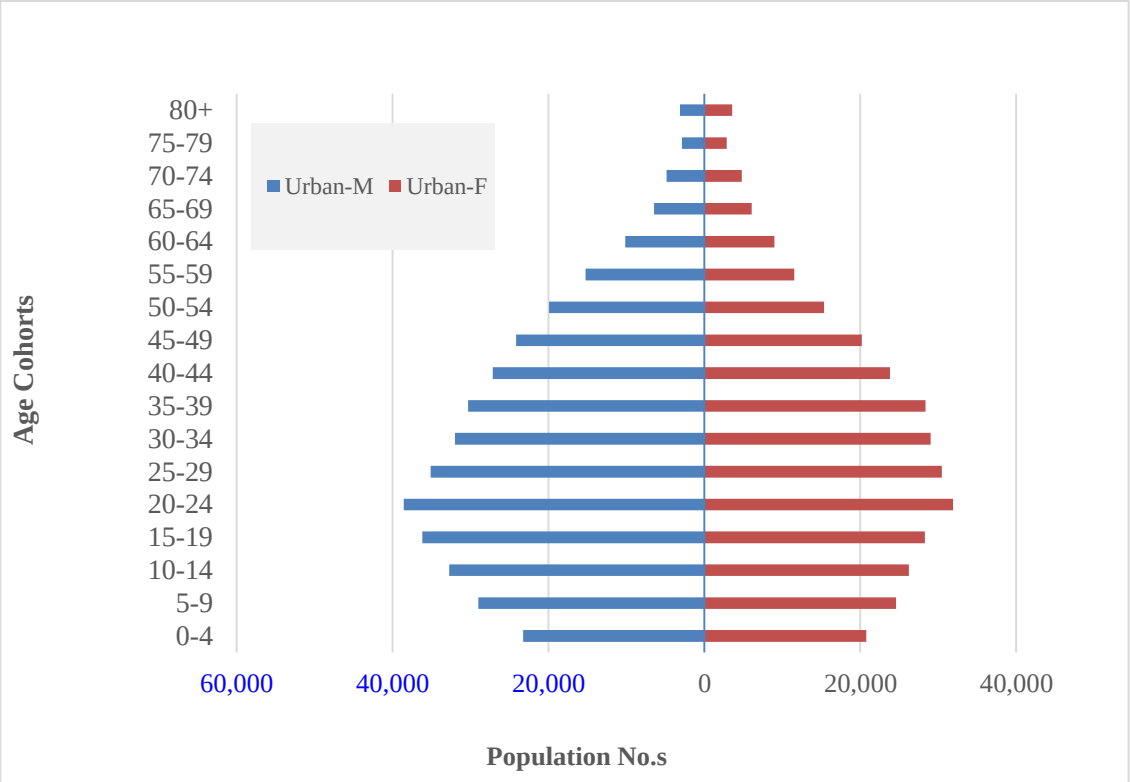
The proportion of district urban population as well as the proportion of district urban population to the state's urban population is presented in the following Table 4.

Districts	Population (2011 Census)	Urban Population (2011)	% Urban to District population	% urban to State urban population
Chamba	5,18,844	6,528	1	1
Kangra	15,07,223	86,359	6	13
Lahaul and Spiti	31,528	0	0	0
Kullu	4,37,474	41,258	9	6
Mandi	9,99,518	62,624	6	10
Hamirpur	4,54,293	31,413	7	5
Una	5,21,057	44,917	9	7
Bilaspur	3,82,056	25,126	7	4
Solan	5,76,670	1,02,078	18	15
Sirmaur	5,30,164	57,238	11	9
Shimla	8,13,384	2,01,500	25	31
Kinnaur	84,298	0	0	0
HP State	68,56,509	6,59,041	10	100

Source: Census of India 2011

The Shimla, Solan, Kangra and Mandi districts have more than 10% urban population to district population and account for more than two thirds of the state's urban population. Lahaul and Spiti district does not have any urban population although Reckong Peo is now being considered as an urban area. The age-wise urban population (2011) is presented in the following Figure 5.

Figure 5: Age-Wise Population in Urban Population (2011)



Source: Census of India, 2011

The sex ratio is quite skewed in urban areas. Also, the Age group of 20-24 dominate the urban population, indicating goring demand for employment for this group. The old and vulnerable age group population is very low, which is expected to increase over coming decades.

The percentage of urban population has grown from 6.99 percent in 1971 to 10.04 percent in 2011. Urban literacy rate is 91.1 percent (93.42 male and 88.37 female). The sex ratio of urban Himachal Pradesh is 853 per thousand males, way below the sex ratio of the State (972). Average household size is 4.6.). As per The NSS 68th round (2011-12), 4.33 percent of total urban households of Himachal Pradesh is below poverty line, which accounts for 30, 000 urban population. The average MPCE among the urban population of HP was ₹ 3,258 in 2011, which was fourth highest among the Indian states[6].

3.2 Economy

Total working population in urban areas is 2,70,038 (40% of urban population). Total number of main workers in urban areas is 2,40,392 in 2011. Administrative services,

[6] NSSO 2013, Key indicators of Household Expenditure in India (NSS 68th Round). National Sample Survey organisation, Ministry of Statistics and Programme Implementation, GoI.

transport and tourism are major economic activities. The total government employees in Himachal Pradesh was about 2,67,386 persons in 2012, out of which a significant proportion is expected to be located in urban areas[7].

Tourism is increasingly becoming an important economic activity, especially during peak summers and winters. The total number of tourists visiting HP was 161.46 lakhs (Indian (96%) and foreigners (4%)) in 2012[8].

3.3 Infrastructure

Approximately 99 percent of the houses in urban areas are *Pucca* buildings. About 80% of the urban houses are classified as livable however, their location on different areas such as steep hills, flood plains etc. make them vulnerable if they are impacted by any natural disasters.

In 2011, 93% of urban households had access to tap water from treated sources. Some of the urban areas located on ridges and upper slopes face drinking water shortages. The Irrigation and Public Health department building water supply facilities manage operations and maintenance in 49 towns. Sewage facilities are inadequate. 98 percent of households have electricity. About 10 percent of the urban population has access to internet. Total length of Municipal roads is 750.84 km.

3.4 Methodology

The sample urban households were interviewed with structured questionnaires. The questionnaire covered income sources, housing, access to basic services and different aspects of vulnerability. Sustainable Rural Livelihood framework was used to analyse the data. Four capitals were used for assessing the urban household vulnerability. They include Human, Physical, Financial and Social capitals. About 85% of the households in urban areas use LPG for cooking and only about 7.5 percent use firewood/crop residues for cooking (CoI 2011[9]). Also, the urban livelihoods are not based on primary activities like agriculture. The water and other natural resources are not directly used but managed/mediated by the urban infrastructure and services. Therefore Natural capital was not taken in to consideration, since the livelihoods and well-being in urban areas are not directly linked with natural capital.

3.5 Sample Coverage

A total of 781 urban household samples selected from 13 largest towns in the State covering a population of 4,207 (about 0.5% of state urban population). In each city, low, middle, mixed (households residing in buildings/neighborhoods with both commercial establishments and residential areas) and upper income dominated areas were identified by reconnoiter and samples were chosen from two areas from each of the above categories of neighborhoods. The survey team also consulted representatives of Municipal Corporation, Councils, Nagar *Panchayats*, and held group discussions with the communities for urban

[7] GoHP 2014:Labourt and Employment statistics http://himachal.nic.in/index1.php?lang=1&dpt_id=14&level=0&linkid=404&lid=728

[8] GoHP, 2014: Economic Survey:2013-14

[9]Percentage of Households to Total Households by Amenities and Assets (India & States/UTs - District Level) http://www.censusindia.gov.in/2011census/hlo/HLO_Tables.html

town profiling. The total number of households covered in each selected town is as follows:

Table 8: Town-wise Urban Sample Covered in Himachal Pradesh

District	Town	No. of Households	Population Covered
Bilaspur	Bilaspur	36	198
Chamba	Chamba	53	290
Hamirpur	Hamirpur	43	233
Kangra	Dharamshala	45	240
Kinnaur	Reckong Peo	17	96
Kullu	Kullu	50	277
	Manali	16	107
Lahaul & Spiti	Keylong	17	85
Mandi	Mandi	66	358
Shimla	Shimla	262	1,340
Sirmaur	Nahan	56	323
Solan	Solan	80	439
Una	Una	40	221
Grand Total		781	4,207

Source: Primary Data, TARU Analysis (2013-14)

3.6 Indicators and Indices

As described above four indices were used to define socio-economic vulnerability. They are based on vulnerability of the human, physical, financial and social capitals as explained in the rural vulnerability index section. Minor modifications were done to adapt to the urban context. A brief scoring scheme for analyzing the indices are presented in the following Table 9.

Table 9: Urban Vulnerability Index Scoring Scheme

Index	Indicators	Scores
Physical	Building age (years)	>40=10; 30-40=6;20-30=4;10-20=2; <10=0
	House type	Kuccha=10;Semipucca=5; Pucca=0
	Dwelling location	Steep hill, Landslide/Flood prone=10;Industrial pollution, Near garbage ground=5, Plains, None =0
	Water Supply Source	River Stream=10; Tanker supply=8; Open Well=6; Hand Pump=4; Stand-post=2; Piped water supply- Pvt connection=0
	Access to toilets	None=10; Community toilet/Shared toilet=5; Household toilet=0
	Mobile phone	Yes=0; No=10
Financial	Per capita annual income (in '000 Rs.)	<9=10; 9-13.6=8; 13.6-18=6; 18-25=4, 25-35=2; >35=0
	Nonworking to	>2=10; 1-2=8;0.75-1=6; 0.5-0.75=4; 0.25-5=2;

Index	Indicators	Scores
	working members	<0.25=0
Human	Highest education levels in HH	Illiterate=10; Primary=8; Secondary=6; Higher Secondary=4; Graduate=2; Post-Graduate=1; Professional =0
	Dependency ratio	>6=10; 3-6=7.5; 2-3=5;1-2=2.5;<1=0
	Disabled/ terminally ill members	2 or more 10; 1=5; None=0
Social	Social	Membership and participation in seven groups Score of 1 each for membership and participation in each group

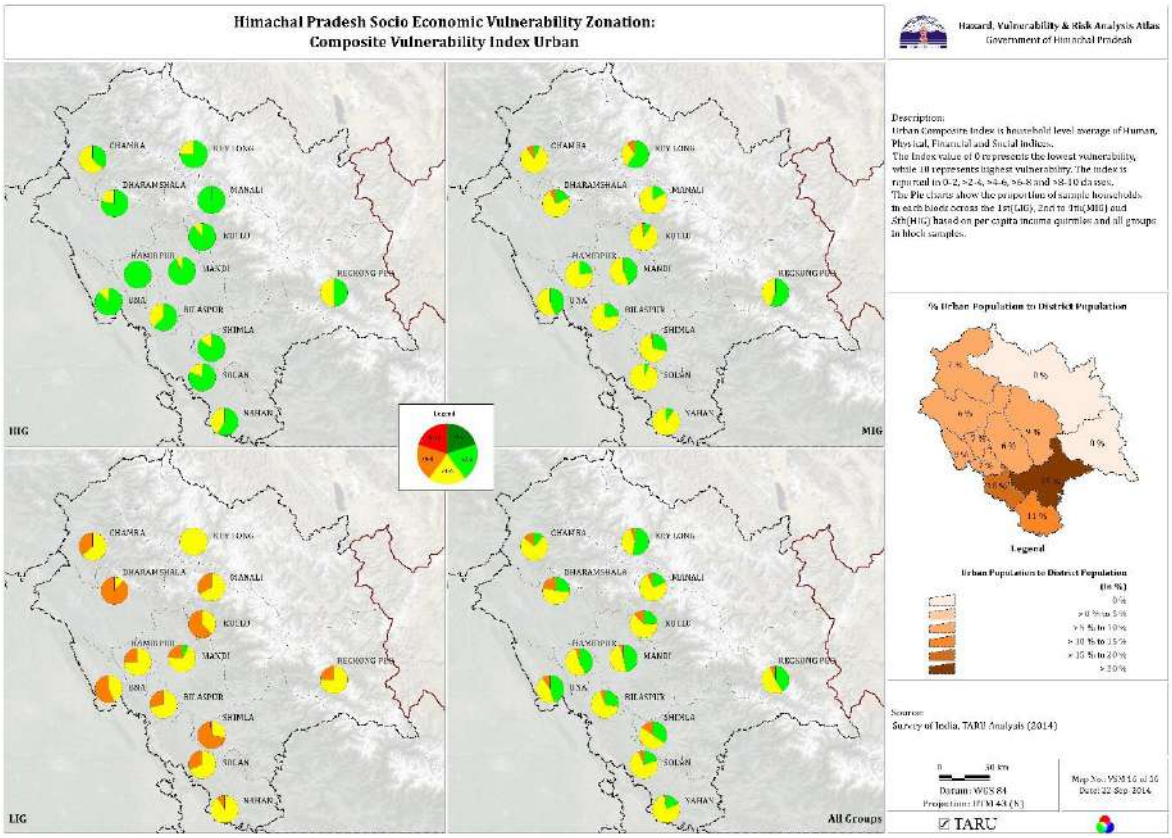
3.7 Aggregation

The vulnerability of each of the four capitals were analysed at household level and aggregated to town level. The reporting is done on poor (lowest 20 percentile) middle (20-80 percentiles upper (top 20 percentile) quintiles based on per capita incomes. This method assumes that the sample households represent characteristics of the city population. The Urban Composite Socio-economic vulnerability index is the equally weighted score of four capitals.

3.8 Maps

The maps present city level vulnerability indices representing the four capitals as well as composite vulnerability index. For each city, LIG, MIG and HIG's vulnerability indexes by percentage of households in each category of vulnerability for a particular capital is presented. The outputs are presented for LIG, MIG, HIG as well as all the samples from the town are presented. The score categories are 0 to 2(Dark green); >2 to 4(Light Green); >4 to 6(Yellow); >6 to 8(Light Red); and >8 to 10(Dark Red). The higher numbers indicates higher risks. Percentage of households falling in each category are shown in the pi-charts in the map. The inset map shows percentage of urban population to total district population. A sample map is presented.

Figure 6: Composite Risk Index (Urban)



Source: TARU Analysis, 2014

3.9 Conclusions

The Himachal Pradesh state shows quite low urbanization. About 70 percent of urban population is concentrated in Shimla, Solan, Kangra and Mandi districts. This implies that urban vulnerability reduction programmes need to concentrate on these four districts.

The urban areas have fairly good infrastructure and services, especially water supply and housing compared to the plains. However, the infrastructure- especially water supply and road network- is often prone to hazards like landslides in case of hill towns and floods in case of riverine towns. Some of the towns like Kangra are located farther off from the rivers and will not be flood prone. The vulnerability of buildings to earthquake risk is quite high both in hill towns and as well as riverine towns. The survey shows that physical vulnerability in general is low, as indicated by scores ranging from 0-6 with only LIG from Dharamshala showing scores of more than 6to 8 for about 10% of the households. The building vulnerability is dealt separately in a related study. It is suggested that all the lifeline infrastructure like water supply are assessed for hydro-meteorological and geological risks, especially the pumping stations and source reliability under climate change.

Himachal Pradesh state has one of the lowest urban poverty incidence as per the Planning commission studies. However, a significant proportion of the livelihoods are informal and prone to risks and uncertainties, which may become quite vulnerable after the disasters. The financial capital vulnerability index among the LIG in urban areas is significantly high, even though it is lower than among rural households.

Human vulnerability index is generally low even among the LIG households in urban areas. This is due to higher literacy rates as well as higher proportion of young population. Only a small proportion of LIG shows index scores of >6.

Despite being a less urbanized state, the membership and participation in social groups seems to be quite low as evident from the high social vulnerability index across all the income groups. The scores show higher social vulnerability among the urban population compared to rural areas also.

The composite vulnerability index of urban areas is significantly lower than rural areas due to better infrastructure and services, literacy as well as better income levels.

Since more than two thirds of the urban population is located in four towns, any vulnerability reduction investments should focus first on these towns and set examples for other towns. Considering the high earthquake risk in most parts of the state, it is suggested that better housing and hardening lifeline infrastructure and services should be given top priority.

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