

NIDM

Himachal Pradesh

National Disaster Risk Reduction Portal

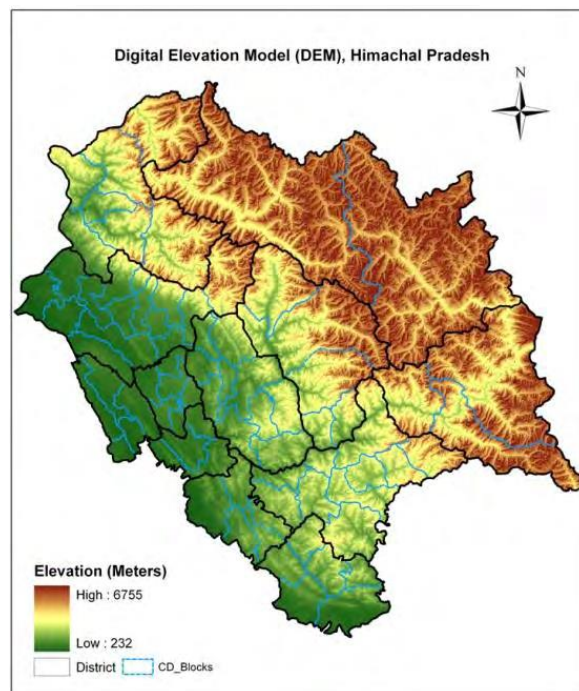
Map of Himachal Pradesh¹



1. STATE PROFILE²

1.1 General:-

Himachal Pradesh is predominantly a mountainous State located in North – West India. It shares an international border with China. The State has highly dissected mountain ranges interspersed with deep gorges and valleys. It is also characterized with diverse climate that varies from semi tropical in lower hills, to semi arctic in the cold deserts areas of Spiti and Kinnaur. Altitude ranges from 350 meters to 6975 meters above mean sea level. It is located between Latitude 30° 22.40 N to 33° 12.20 N and Longitude 75° 45.55 E to 79° 04.20 E.



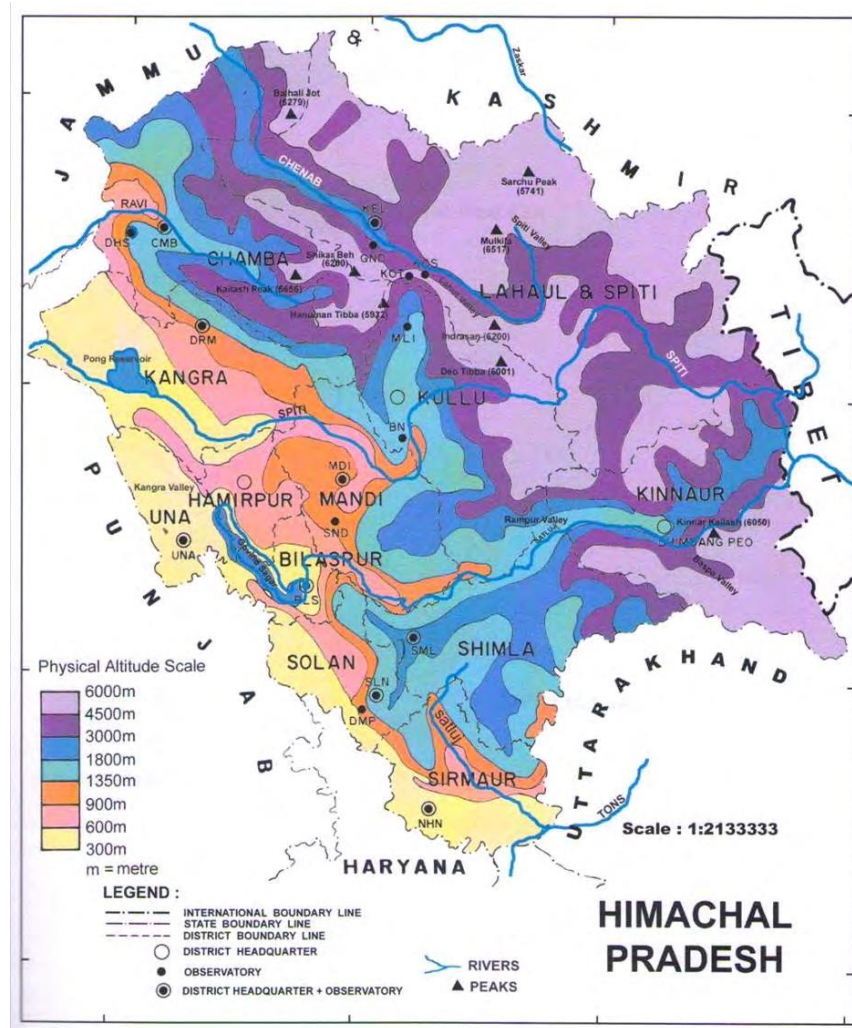
Digital Elevation Model, H.P.

1.2 Administrative Units:-

Twelve districts of the State have been divided into 3 Divisions, 52 Subdivisions, 77 Development Blocks and 3243 Panchayats. The PRI's are in place in all the 12 districts comprising 12 Zila Parishads, Panchayat Samitis in 77 Development Blocks, and Gram Panchayats in 3243 Panchayats. One Municipal Corporation in Shimla, 20 Municipal Councils and 28 Nagar Panchayats, besides 7 Cantonment Boards, represent the Urban Local Bodies infrastructure in the State.

1.3 Geology and Geomorphology:-

Himachal Pradesh with its complex geological structures presents a complicated topography with intricate mosaic of mountains ranges, hills and valleys. Composed of recent Alluvium, Shiwalik hills are made up of rocks such as sandstone, shale and clay that came into existence during the Eocene, Miocene and Pliocene period. The central part that extends from Chamba district in the north to Shimla district in the south is mainly represented by Jatog group of rocks which originated in middle Proterozoic period. In the north eastern portion unclassified Granites borders the central part in between Kullu, eastern Shimla, LahaulSpiti and parts of Kinnaur district. The eastern greater Himalaya presents the Triassic formation which is found in Kaza tehsil of LahaulSpiti district. The oldest rocks are Granites found at Jeori-Wangtu and Bandel near Lari in Kullu district. These granites date back to a stage of the crust at a time when India was located 8000 Km southwest of its present position.



Geography of Himachal Pradesh

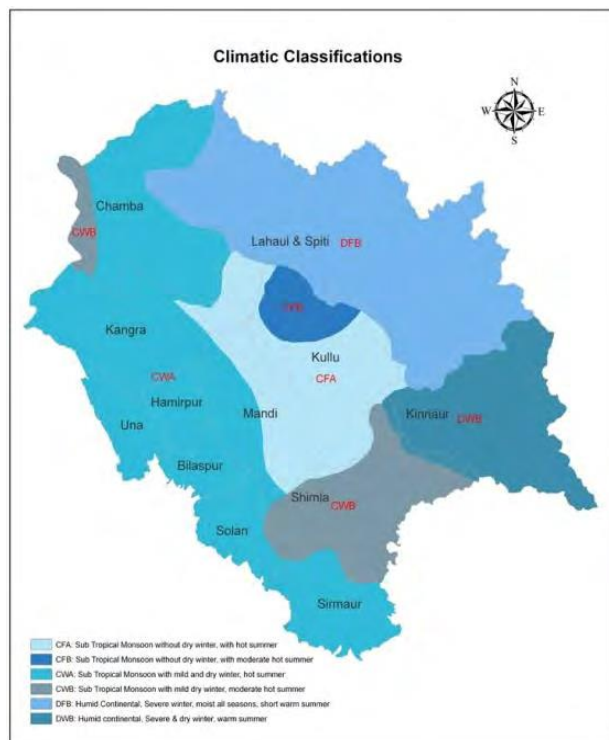
1.4 Topography:-

Topographically, the state can be divided into three zones:

1. The Shiwaliks or Outer Himalayas: It covers the lower hills of Kangra, Hamirpur, Una, Bilaspur, lower parts of Mandi, Solan and Sirmour districts. Within this zone, altitude varies from 350 m to 1500 m.
2. Inner Himalayas or mid-mountains: Altitude varies from 1500 m to 4500 m above mean sea level and includes areas such as the upper parts of Pachhad and Renuka in Sirmaur district, Chachiot and Karsog tehsils of Mandi district and upper parts of Churah tehsil of Chamba district.
3. Alpine zone or the greater Himalayas: Has altitude above 4500 m above mean sea level and comprises areas of Kinnaur district, Pangi tehsil of Chamba district and area of Lahaul&Spiti district.

1.5 Climate:-

The climate varies across the state with the altitude. In the southern low tracks between an altitude of 400-900 it is hot sub humid type, between 900-1800m altitude warm & temperate, between 900-2400m cool & temperate, cold alpine & glacial above 2400-4800m altitude. Bilaspur, Kangra, Mandi, Sirmour, and Una districts experience sub tropical monsoon, mild and dry winter and hot summer. Shimla district has tropical upland type climate with mild and dry winter and short warm summer. Chamba district experiences, humid subtropical type climate having mild winter, long hot summer and moist all season. Kullu district experience mainly humid subtropical type of climate with mild winter moist all season, long hot summer and marine. During the period from January to February heavy snowfall in higher reaches create conditions for low temperature throughout the state making it unpleasant and series of western disturbances also affect the state.



Climate Pattern of Himachal Pradesh

Climate Pattern	Districts
Sub-tropical Monsoon (Cwa type) Mild and dry winter, hot summer	Bilaspur, Kangra, Mandi, Sirmour, Una, Hamirpur, Solan, Chamba
Sub-tropical Monsoon (Cwb type) Mild and dry winter, moderate hot summer	Shimla, Parts of Chamba
Sub-tropical monsoon (Cfa type) Without dry winter with hot summer	Chamba, Major parts of Kullu, Mandi
Sub-tropical monsoon (Cfb type) Without dry winter with moderate hot summer	Minor parts of Kullu
Humid continental (Dwb type) Severe and dry winter, warm summer	Kinnaur
Humid continental (Dfb type) Severe winter moist all seasons, short warm summer	Lahaul & Spiti

Average Annual Rainfall

Districts	Year		
	2008	2009	2010
1. Bilaspur	867.9	811.1	1079.7
2. Chamba	857.2	1019.0	1117.5
3. Hamirpur	1414.6	1179.2	1247.1
4. Kangra	1947.9	1386.0	1619.6
5. Kinnaur	354.1	269.4	1107.8
6. Kullu	1215.3	825.1	1732.5
7. Lahaul & Spiti	411.6	706.3	847.1
8. Mandi	1173.8	775.0	1495.4
9. Shimla	1211.4	825.6	1272.3
10. Sirmour	1432.6	905.9	1896.9
11. Solan	1368.2	862.8	1377.1
12. Una	1437.4	1329.8	1182.3
Himachal Pradesh (Average)	1141.0	907.9	1242.8

Source: Meteorological Department, Govt. of India.

1.6 Agriculture:-

As per the state department of Agriculture, Himachal Pradesh is predominately an agricultural state and provides direct employment to about 71 percent of the total population. The Agriculture sector contributes nearly 30 percent of the total state domestic product. About 18-20 percent area is irrigated and rest is rain fed. Food grains production was 1440.66 thousand tonnes in the Year 2007-2008. The production of major crops of the state i.e. maize, rice and wheat for 2007-2008

was 682.61 thousand tonnes, 121.45 thousand ton and 61.2 thousand tonnes respectively. The vegetable production for 2007-2008 was 1060.00 thousand tonnes.

1.7 Demography²:-

Population of Himachal Pradesh is 68.56 lakh persons as per the Census report for the year 2011. 89.01% of the total population inhabits 20,604 villages in the rural areas of the State. These villages are sparsely distributed across the State having population density as low as 1 person per square kilometer in the remote and tribal area of Lahaul&Spiti, Hamirpur district has largest population density of 369 persons per square kilometer as against 123 persons per square kilometer for the whole State. Himachal Pradesh is one of the few states of the country where gender equality is an integral part of the social ethos as well as the overall development strategy. Female literacy is well above the national level and women employment is much higher than in most states of the country.

Description	2011
Population	6,856,509
Population Growth	12.81
Population Density/sq. km	123
Male	3,473,892
Female	3,382,617
Sex Ratio	974
Percentage of total Population	0.57%
Literacy	83.78
Male Literacy	90.83
Female Literacy	76.60
Total Literate	5,104,506
Male Literate	2,791,542
Female Literate	2,312,964

2. DISASTER RISK PROFILE³

2.1 Vulnerability to Disaster:-

Himachal Pradesh is vulnerable to 25 out of 33 types of hazards identified by the High Powered Committee (HPC) of Government of India and categorised into 5 sub-groups. Apart from identified hazards by HPC, the state is also confronting the emerging threats of climate change and man and animal conflict.

Water and Climate Related Disasters:

1. Floods
2. Hailstorm
3. Cloud Burst
4. Heat Wave and Cold Wave
5. Snow Avalanches
6. Droughts
7. Thunder and Lightning

Geologically Related Disasters:

1. Landslides and Mudflows
2. Earthquakes
3. Dam Failures/ Dam Bursts

Chemical, Industrial and Nuclear:

1. Chemical and Industrial Disasters
2. Nuclear Disasters

Accident Related Disasters:

1. Forest Fires
2. Urban Fires
3. Major Building Collapse
4. Serial Bomb Blasts
5. Festival related disasters
6. Electrical Disasters and Fires
7. Air, Road and Rail Accidents
8. Boat Capsizing
9. Village Fire

Biologically Related Disasters:

1. Biological Disasters and Epidemics
2. Pest Attacks
3. Cattle Epidemics
4. Food Poisoning

2.2 Potential Hazard Threat to the State:-

Hazards both natural and manmade are of immediate concern to the State of Himachal Pradesh as it faces the fury of one or the other disaster every year. The fragile ecology and geology of the

State coupled with large variations in Physio-climate conditions render it vulnerable to vagaries of nature in one way or the other.

District-wise Hazard Threat in Himachal Pradesh

District	Earthquake	Landslide	Floods	Avalanche	Forest Fire	Drought	Cloud Burst
Kangra	VH	L	M	M	H	H	M
Chamba	VH	VH	H	M	H	M	H
Hamirpur	H	L	L	-	VH	M	L
Mandi	VH	H	H	-	VH	M	H
Kullu	VH	VH	H	H	H	M	VH
Bilaspur	H	M	L	-	VH	M	L
Una	H	L	H	-	M	H	L
Sirmour	H	L	L	-	VH	M	M
Solan	H	M	L	-	M	M	L
Kinnaur	H	H	H	VH	M	M	VH
Lahaul & Spiti	M	M	M	VH	M	M	H
Shimla	VH	H	H	M	H	M	H

a) Seismic Hazard (Earthquake):-

The seismic sensitivity of the state of Himachal Pradesh is very high as over the years a large number of damaging earthquake has struck the state and its adjoining areas. Seismically it lies in the great Alpine Himalayan belt running from Alps Mountain through Yugoslavia, Turkey, Iran, Afghanistan, Pakistan, India, Nepal, Bhutan and Burma. Due to its location the state experiences dozens of mild earthquakes every year. Large earthquakes have occurred in all parts of Himachal Pradesh, the biggest being the Kangra earthquake of 1905. The Himalayan Frontal Thrust, the Main boundary Thrust, the Krol, the Giri, Jutogh and Nahan thrusts are some of the tectonic features that are responsible for shaping the present geophysical deposition of the state. The seismic vulnerability of Himachal Pradesh is primarily attributed to northward movement of Indian plate and to the major dislocation tectonic features such as MBF, MBT, Punjab thrust and MCT etc. Besides the longitudinal tectonic feature trending parallel to the Himalayas there are a large number of transverse fractures, faults that have been responsible for the seismic activity in the Himalayan region in general and Himachal Pradesh in particular. The Kinnaur earthquake of 1975 was associated with transverse Kaurik fault. In fact about 250 earthquakes with magnitude 4 and 62 earthquake having magnitude of 5 and above have impacted the state so far. It is also pertinent to note that the state of Himachal Pradesh is not only highly sensitive from the earthquake point of view but the risk has also grown manifold as the population and

infrastructure have increased considerably over the last 20 years. Chamba, Kullu, Kangra, Una, Hamirpur, Mandi and Bilaspur Districts lie in Zone V i.e. very high damage risk zone and the area falling in this zone may expect earthquake intensity maximum of MSK IX or more. The remaining districts of Lahaul and Spiti, Kinnaur, Shimla, Solan and Sirmour lie in Zone IV i.e. the areas in this zone are in high damage risk with expected intensity of MSK VIII or more. The spatial distribution and district wise history of past seismic events is given as below.

District-wise occurrence of Earthquakes (1800-2008)

No.	District	Number of earthquakes	Percentage of Total
1	Chamba	186	33.63
2	Lahaul & Spiti	99	17.90
3	Kinnaur	93	16.82
4	Mandi	53	9.58
5	Shimla	49	8.86
6	Kangra	39	7.05
7	Kullu	19	3.44
8	Sirmaur	8	1.45
9	Solan	4	0.72
10	Hamirpur	2	0.36
11	Bilaspur	1	0.18
12	Una	0	0.00
	Himachal Pradesh	553	100

Source: Vishwa, B. S. Chandel & Karanjot Kaur Brar

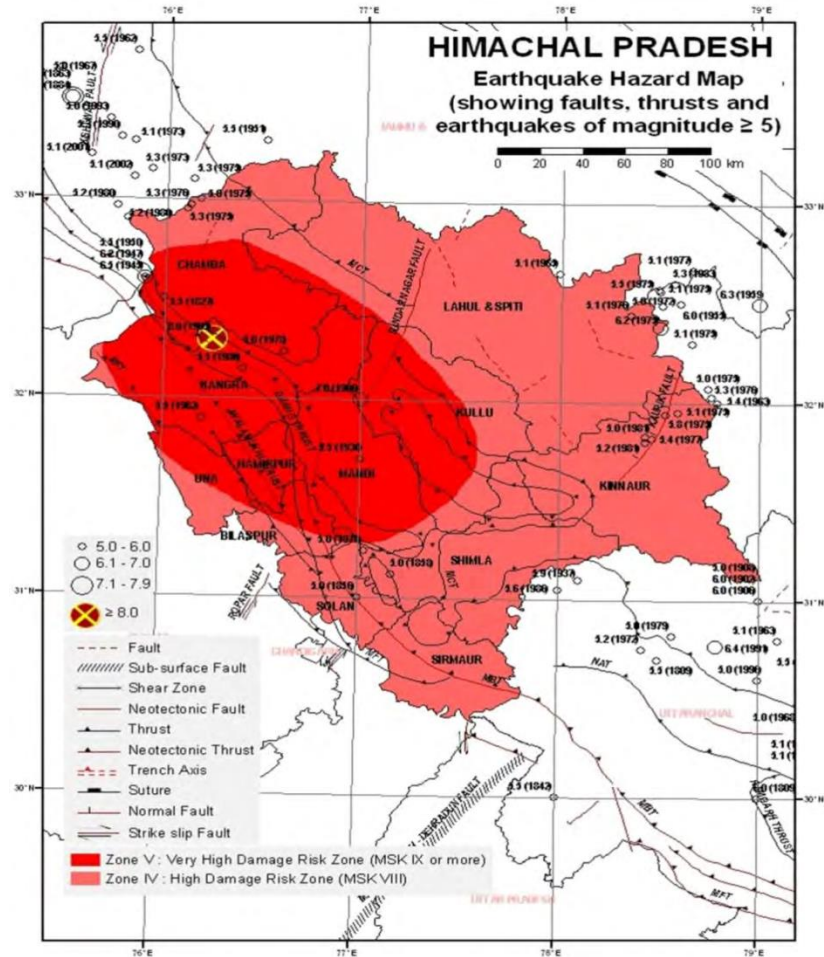
Some of the important earthquakes that the state experienced and for which instrumental records are available are as follows:

- 4rd April 1905 – Kangra (Mw 7.8) 33N, 76E, OT= 00:50 UTC About 20,000 people were killed in the Kangra- Dharamshala region. Damage and casualties also occurred in adjoining parts of Punjab including in the cities of Amritsar, Lahore, Jalandhar, Ludhiana and Sialkot.
- 28th February 1906 – Near Kullu (Mw 6.4) 32N, 77E Damage and casualties in the Bashahr – Shimla hills states.
- 11th May 1930 – East of Sultanpur, 6.0 (TS) 11:30:36 UTC, 31.70N, 77.00E
- 22 June 1945 – Near Padua Kathwa District, J&K (H.P, J&K Border region), 6.0 (TS) 18:00:51 UTC, 32.5999N, 75.90E
- 10th July 1947 – Near Padua, Kathwa District, J&K(H.P, J&K Border region), 6.0 (TS) 10:19:20 UTC, 32.599N, 75.90E
- 12th August 1950 – Near Padua, Kathwa District, J&K(H.P, J&K Border region), 6.0 (TS) (TS) 03:59:06 UTC, 32.599N, 75.90E

- 12th September 1951 – Chamba – Udhampur Districts (H.P-J&K Border region), 6.0 (TS) 20:41:48 UTC, 33.30N, 76.50E
- 17th June 1955 – LahaulSpiti District (Himachal Pradesh), 6.0 (TS) 10:14:09 UTC, 32.50N, 76.60E
- 17th June 1962 – Chamba-Udhampur Districts (H.P-J&K border region), 6.0 (TS) 04:39:26:60 UTC, 33.30N, 76.20E
- 19th January 1975 – SW of Dutung, Himachal Pradesh (Indo-China Border region), Ms6.8 (NEIC) 08:02:02:05, 32.455N, 78.430N, 33Kms depth This earthquake struck in the early afternoon of January 19, 1975. It registered 6.2 on the Richter Scale. It caused havoc in parts of the Kinnaur, Lahaul and Spiti regions of India, 60 people were killed in this sparsely populated region.
- 11th November 2004 – Bharmour, Kangra region, Mb 5.1 32.442 N, 76.512 E, D=34Kms, OT=02:13:45 UTC A moderate earthquake struck the Kangra Valley and the Dhauladhar Mountains on 11th November, 2004 at 07:43 AM local time. It was felt strongly in the Kangra-Dharamshala region and event caused minor damage to buildings in this region. It had a magnitude of Mb=5.1

(Source: www.asc.india.org)

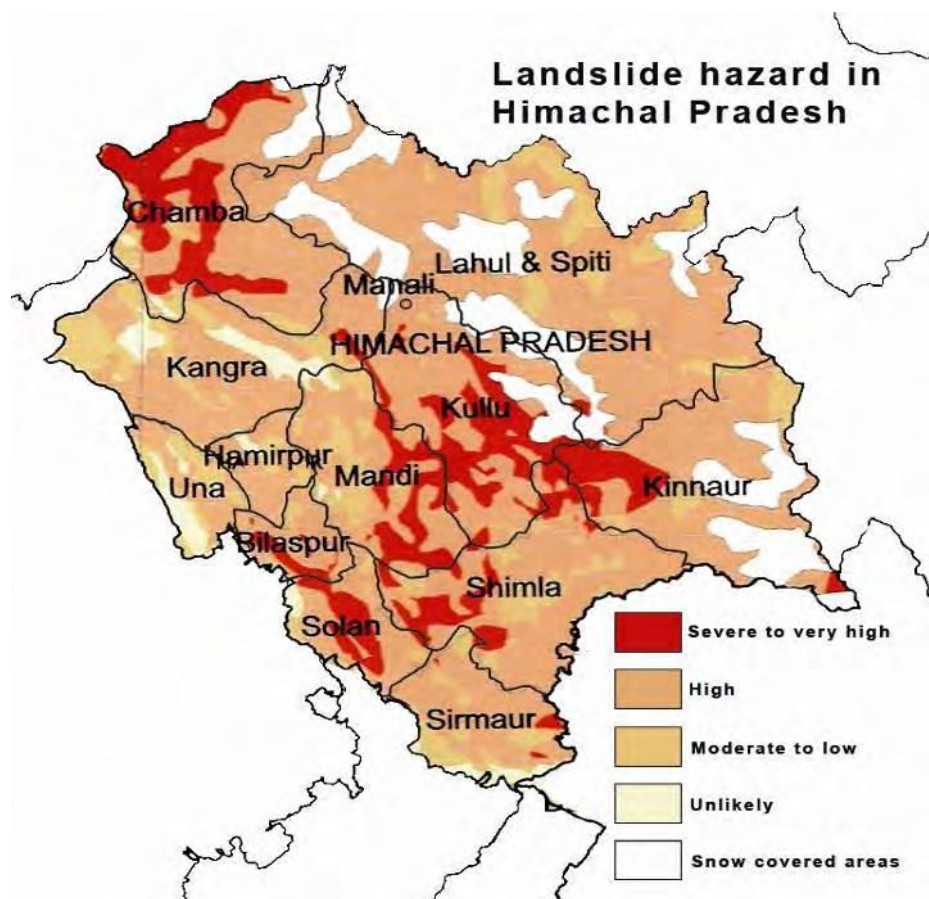
The Earthquake Hazard Map of BMTPC, 2006 shows that Himachal Pradesh lies in one of the highest risk zone areas of the state (Zone IV & V).



Earthquake Hazard Map of Himachal Pradesh
 (Source: BMTPC Atlas of India)

b) Landslides:-

Landslide is the most common hazard in Himachal Pradesh, which causes immense risk to life and property. Almost every year the state is affected by one or more major landslides affecting the society in many ways. Loss of life, damage of houses, roads, means of communication, agricultural land, are some of the major consequences of landslides. The fragile nature of rocks forming the mountains, along with the climatic conditions and various anthropogenic activities has made the state vulnerable to the Landslides. District wise landslide vulnerability in the State is as follows.



Landslide Hazard in Himachal Pradesh

Landslide Vulnerable areas in Himachal Pradesh (District area in square kilometres)

District	Severe to very high	High	Moderate to low	Unlikely	Total area
Bilaspur	216	842	83	1	1142
Chamba	2120	3829	351	70	6370
Hamirpur	0	851	204	45	1100
Kangra	123	3698	1233	557	5611
Kinnaur	868	4956	498	0	6322
Kullu	1820	3513	65	3	5401
Lahaul & Spiti	127	11637	1825	2	13591
Mandi	968	1978	826	98	3870
Shimla	893	3345	767	14	5019
Sirmaur	95	1805	614	228	2742
Solan	556	1118	157	79	1910
Una	2	678	517	311	1508

Triggering of landslides is both a natural and anthropogenic phenomena. As in other parts of Himalayas the landslide activity in Himachal Pradesh also varies with altitude, geology and topography. Various geophysical factors such as steepness of slopes, saturation by heavy rains, melting snow and ice, rock vibrations, excess load from embankments, fills, waste & debris dumps change in water content, frost, change in vegetable cover and toe cutting by rivers and streams are some of the other natural factors influencing the occurrence of landslides. The vulnerability of course has increased many times in the recent past due to various developmental activities. Deforestation, unscientific road construction, terracing, water intensive agricultural practices, and encroachment on steep hill slopes are some of the anthropogenic factors that have contributed towards increased intensity and frequency of landslides. Jhakri, Pangi, Powari, Urni, Sholdan, Nichar, KhadraDhank, Thangi, Barua are some of the most common landslide that has affected the NH-22 in Satluj valley.

Experts point out that unscientific land use and unplanned expansion of urban areas is also overloading and destabilising the slopes in the towns and cities such as Shimla. Overloaded slopes may initially cause only minor landslides, but at later stage could trigger larger landslides. The state capital Shimla is also sinking at several places due to digging of slopes for construction and infrastructure development. First major landslide occurred in Shimla in February 1971 when a large northern portion of the Ridge slumped down threatening the safety of reservoirs below. Since then many areas of the town have become prone to landslides and situation worsens during rainy season when vulnerable roads are washed away at many places.



Major Landslides that caused heavy damage in the past

Location/ Highway	Year of Occurrence		Damage to highway
	First	Last	
NH-22	1988	1995	During the flood, of 1988, 1993 and 1995, 250, 350 and 475 m of the road was washed away.
NH-22 km 292-293	1988	1995	During the flood of 1988, 1993 and 1995, 200, 500 and 300 m of the road was washed away.
NH-22 km 307	1988	1995	During the flood of 1988, 1993 and 1995, 100, 150 and 600 m of the road was washed away.

Flash floods, particularly in narrow river gorges are also responsible for triggering the major landslides in Himachal Pradesh. Some of the flash floods triggered landslides are as follows:

Major Landslides due to flash floods

Name of Landslide	Year	Description
Jhakari	1993	Road (NH-22) stretch of about 1/2 km was completely damaged and slide debris blocked the river Sutlej. Traffic restored after two months.



c) Floods:-

Floods are another form of natural disaster the State experiences every year. South west Monsoonal rainfall during the months of June to August is the dominant cause for triggering floods when rainfall happens to be in excess i.e. 125% or more than the normal. Fig 2.5 shows the percentage frequency of excessive rainfall and successive years of excessive rainfall during the period from 1951 to 1999. During this period the Chamba district in the north western part of the state had received highest amount of rainfall expressed as percentage of the normal with more numbers of successive years of excessive rainfall. Table 2.11 gives the district wise excessive rainfall years and highest annual rainfall expressed as percentage of normal and Table 2.12 gives successive years of excessive rainfall. Fig 2.6 is the map of flood prone areas as prepared by Dr D.D Sharma of H.P University Shimla.

Years of Excessive Rainfall

Sr. No.	Districts	Years of excessive Rainfall > 125%	Highest amount of rainfall expressed (as % of the normal with year)
1.	Bilaspur	1973, 94, 96, 98	218.7 cm in 1998 (174 %)
2.	Chamba	1953, 54, 55, 56, 57, 58, 59, 60, 61, 64, 76, 77, 79, 88, 92, 93, 94	268.3 cm in 1977 (198 %)
3.	Hamirpur	1955, 61, 70, 90	210.6 cm in 1990 (144%)
4	Kangra	1976	233.4 cm in 1976 (126 %)
5.	Mandi	1954, 55, 63, 66, 67, 88, 90, 97	336.4 cm 1988 (215 %)
6.	Sirmaur	1959, 61, 62, 63, 64, 88	288.8 cm in 1963 (215%)
7.	Una	1955, 88	237.0 cm in 1988 (196 %)

Data Source: Indian Meteorological Department (IMD)

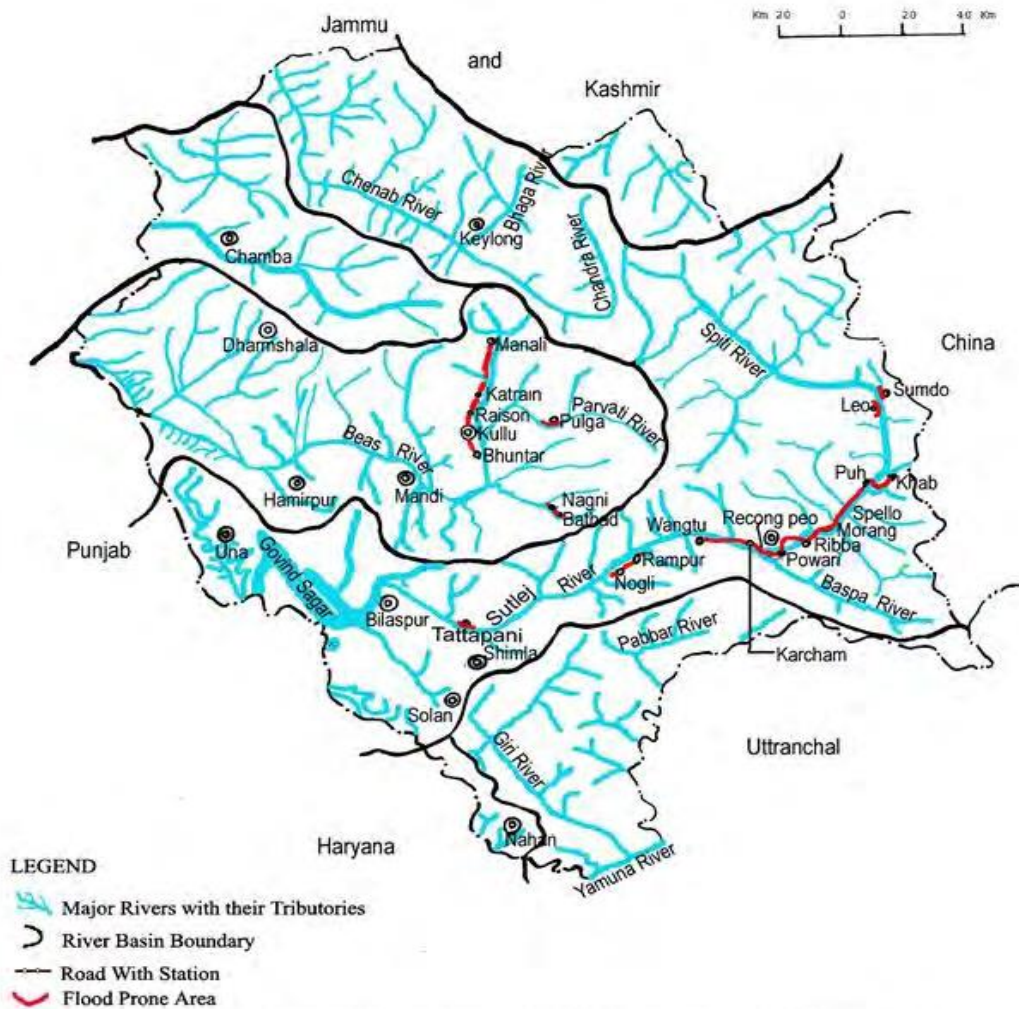
Successive Years of Excessive Rainfall (District-wise)

Sr. No.	District	Successive years of excessive rainfall
1.	Chamba	1953-54-55-56-57-58-59-60-61, 1976-77, 1992-93-94.
2.	Mandi	1954-55, 1966-67
3.	Sirmaur	1961-62-63-64

Data Source: Indian Meteorological Department (IMD)

Himachal Pradesh

Flood Disaster Map



d) Flash Flood:-

Flash flood is the most frequent and damaging floods that occur with little or no warning causing immense loss to life and property. Flash Floods usually takes place when rapidly rising and flowing surge of water reaching full peak within few minutes is generated as a result of excess rainfall or failure of impoundment. The major causes that are responsible for floods and flash floods in the state of Himachal Pradesh are

- Cloudburst in upper catchments of the river.
- Excessive rainfall in the catchments.
- Melting and Bursting of glaciers due to global warming.

- Sudden breach or failure of manmade or natural barriers.
- Change of river course.
- Landslides triggered due to slope failure or tectonic movements leading to LDOF phenomena.

Over 40 incidents of flash flood and cloudbursts occurred in Himachal Pradesh in the last 12 years and over 35 were feared dead. In August 1994, the Manimahesh cloudburst and flash flood washed away almost the entire length of Chamba-Bharmour road (62 km), over 50 people feared dead, and 2000 injured. The estimated loss was over 450 crore of Rupees. 1997 again saw a heavy flash flood in Maglad in Rampur tehsil of Shimla district. Some of the major flash floods reported in the State are as follows:

Major Flash Floods in Himachal Pradesh

Year	Location	Official Damage
July 2000	Satluj River, Kullu, Mandi, Kinnaur, Rampur	140 dead, 400 shifted, 12400 sq km. Affected
August 2001	Chamba	16 dead, 3010 sq km affected
July 2003	Gadsa valley – Kullu	35 dead
August 2004	Satluj river, Kinnaur, Shimla, Kullu, Bilaspur	3500 people and 56 villages evacuated
June 2005	Parchu lake, Kinnaur, Rampur	5 bridges damaged, 50 houses submerged



e) Glacial Lake Outburst Floods:-

This phenomenon constituting a sudden discharge of a huge volume of water from such glacial lakes is known as Glacial Lake Outburst Floods (GLOFs). The frequency of such events is increasing in the HKH region since the second half of the 20th century (UNEP, 2003) due to the combined effects of climate change and deforestation. Satellite observation of the mountain top lakes in the region have revealed a steady increase in the size and volume of many of these glacial lakes at high altitudes, enhancing the possibility of a devastating outburst flood affecting sizeable populations and damaging precious socio-economic infrastructure and development assets in the Himalayan belt. Over the years, countries in the region have built many high-value economic and infrastructure assets and the emerging threat from GLOFs has serious implications for their future development pathway.

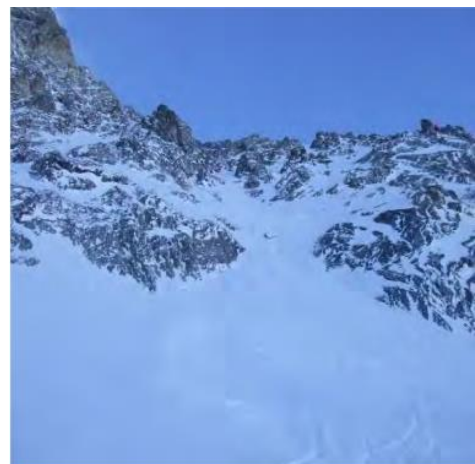
f) Avalanches:-

Snow avalanches are the sudden slide of large mass of snow down a mountain. There are several factors, which can affect the occurrence of avalanche, including local weather, slope, atmospheric temperature, vegetation; terrain and general snow pack conditions. Different combinations of these factors can create low, moderate and extreme weather conditions. Most avalanches are very dangerous and cause huge loss of life and property. The temperature variation and wind speed are directly proportional to avalanches. As per the Snow & Avalanches study established on an average 30 persons are killed every year due to this disaster in the Himalaya.

Areas normally prone to Avalanches include

- Region above 3500m elevation
- Slopes with inclination 30-45°
- Convex slopes.
- Slopes covered with grasses.

Higher reaches of Himachal Mountains receives considerable precipitation in the form of snowfall. The north western sector particularly receives maximum snowfall. In winter season the snowfall varies from 2 to 130cm in pre monsoon season, from 1-42cm and in post monsoon from 2 to 39cm. Annual amount of snowfall varies from 25 to 204cm and number of snowfall days from 6 to 77. Avalanches are common phenomena in the district of Kinnaur, Chamba&Kullu. In the past the only place where avalanches have caused destruction in Kangra District is the Bara Banghal area situated at an elevation of



8500feet above the sea level. The village which was located at the base of steep slopes and on the banks of Ravi River was destroyed many times by the avalanches in the past.

Damage caused by Avalanches in past

Date	Location	Damage
March 1978	Lahaul and Spiti	30 people killed
March 1979	Lahaul and Spiti	237 people killed
1988	Shimla	Lahaul-Spiti, Kinnaur and Solan districts blocked
March 1991	HP state affected	Road blockage for 40 days
September 1995	HP state affected	Flood caused by melting of snow brought by avalanche
September 2001	HP state affected	Devastated flood caused huge amount of damage

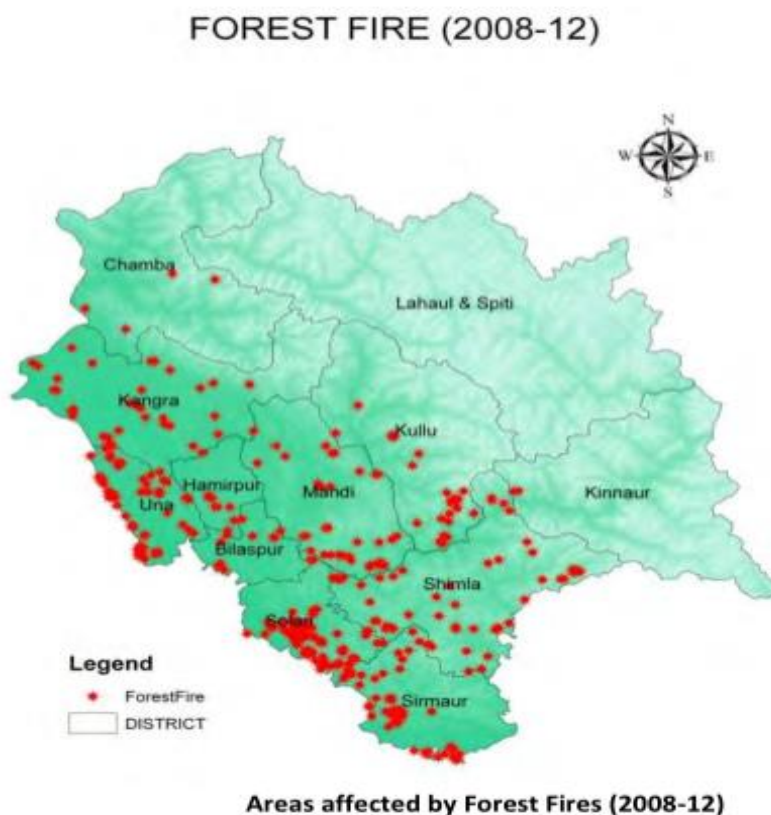
g) Forest Fire:-

Forest fire is a major cause of degradation of forest. With increasing population pressure, the forest cover of the country is deteriorating at an alarming rate. The forests of the Himachal Pradesh are more prone to forest fire compared to forests in other parts of India due to various biotic and geographic reasons. In Himachal Pradesh the recorded forest area is 10, 46900 hectares, of which around 9, 74800 hectares cropped area is fire prone. In Shimla district around 69% of the total area have a history of forest fires and in districts of Chamba, LahaulSpiti and Kinnaur it is 44.9% of the total area experience forest fires in summer and 20% area is prone to frequent fires.



About 90 % of forest fires are due to intentional or unintentional human interventions. In state like Himachal, forest fires also have a close link with livelihood. People residing within forests or nearby areas are dependent on forests for their source of income and for day to day fuel requirements. At times they ignite forests for collection of forest produce or for improving the productivity. Some fires are caused due to poor knowledge and the negligence of the people.

Throwing burning cigarettes and cooking food in the forest are such causes of forest fire. Remaining 10 % of forest fires are due to natural processes such as lightning, increase in temperature during summer etc.



The magnitude of forest fires as disaster can be gauged from the number of fire incidents and area affected as given below:

Forest Fires Affected Area in the State

Year	No of incidences	Areas affected (ha)
1995	1669	57143
2000	1900	36887
2001-02	301	5719
2002-03	282	4204
2003-04	550	9896
2007-08	580	7810

Table 2.17 Forest Fires Affected area during the Last 4 Years

Year	No. of Fire Cases	Kind of Area Affected by Fire (in ha)				%age of Fire Prone Area
		Chil	Plantn.	Others	Total	
2007-08	580	3104	1997	2708	7810	1.80
2008-09	572	2768	2015	1801	6586	1.52
2009-10	1906	13602	4054	7193	24849	5.73
2010-11	870	4308	1446	2082	7837	1.81

Table 2.18 Circle-Wise Fire Lines, Sensitive Beats & Private Ghasanis

Name of the Circle	Fire Lines		No. of Sensitive Beats	Ghasanis near Fire Sensitive Forest	
	No.	Length (Km.)		No.	Area Ha.
Bilaspur	55	175	78	3362	408
Chamba	61	133	83	0	0
D/shala	56	146	171	127	124
H/pur	180	294	171	1616	1809
Kullu	40	93	54	193	533
Mandi	141	518	300	3740	4561
Nahan	61	249	144	168	3040
Rampur	46	121	95	76	477
Shimla	43	142	49	8	140
W/ Life	60	320	100	79	2347
Total =	743	2301	1187	9369	13441

h) Drought:-

Drought is a long period with no or much less rainfall than normal for a given area. Meteorologically drought is defined as situation when the annual rainfall over any area is less than 75% of the normal. It is termed as moderate if rainfall deficit is between 25 to 50 % and severe if it is more than 50%. Area where frequency of drought is above 20% of the years examined is classified as drought area and areas having drought conditions for more than 40% of the years represent chronically drought affected area.



Areas affected by drought (1951-2000)

Table 2.19 and 2.20 give the years of successive drought and years of severe drought in the state of HP when rainfall was less than 50%. Taking into consideration the above historical data and above criteria the areas falling in the districts of Kangra and Una between the years 1951-99 could only be termed as drought area. There is not a single district in the state which qualifies to be called as chronologically drought affected area. However during the period of 49 years (1951-99) almost all the districts have suffered drought like situation Figure 2.8 shows the percentage of drought and years of successive drought for various districts with actual rainfall expressed as percentage of normal rainfall given in brackets against each district. Incident of wide spread drought was observed in the year 1972 and 2011. In the year 2011 in total 46.64 lakh human population and 0.88 lakh ha. cropped area was affected. The water storage capacity in the reservoirs in Himachal Pradesh was 13,774 TMC. Out of this, only 1,188 TMC water was in storage in 2001 as against 1,689 TMC the previous year.

Years of Successive Drought

Sr. No.	Districts	Years of successive drought
1.	Bilaspur	1974-75-76, 1992-93
2.	Kangra	1962-63-64
3.	Mandi	1982-83
4.	Sirmaur	1986-87
5.	Una	1972-73-74-75, 81-82-83

Source: Indian Meteorological Department (IMD)

Years of Severe Drought

Sr. No.	Districts	Years of Severe Drought R/F < 50%
1.	Bilaspur (37 %)	1975
2.	Hamirpur (45 %)	1974
3.	Mandi (44%)	1983
4.	Sirmaur (48%, 41%)	1979, 1986
5.	Una (43%, 40 %)	1975, 1981

Source: Indian Meteorological Department (IMD)

i) Road Accident:-

Amongst the man induced disasters the road accidents are major killer. Road accidents involve all kinds of vehicles leading to death and injuries. The topography of the state of HP is such that accidents can happen anywhere without any warning. The table below indicates the magnitude of the problem in the state.

Year-wise Road Accidents in Himachal Pradesh

Year	Cases Occurred	Persons killed	Persons injured	Vehicles involved
2003-04	2,794	843	4,293	3,195
2004-05	2,758	920	4,674	3,423
2005-06	2,868	861	4,755	2,868
2006-07	2,737	929	4,886	2,917
2007-08	2,953	921	5,272	3,756
2008-09	2,840	898	4,837	3,583
2009-10	3,023	1,173	5,630	3,705
2010-11	3,104	1,105	5,350	3,810

Source: Statistical Outline of Himachal Pradesh 2010-11

Road Accidents District wise (2011-11)

District	Cases Occurred	Persons killed	Persons injured
Bilaspur	254	42	331
Chamba	122	126	270
Hamirpur	160	28	265
Kangra	602	106	1,076
Kinnaur	51	65	67
Kullu	189	60	368
Lahaul & Spiti	20	15	30
Mandi	370	153	660
Shimla	430	211	801
Sirmour	227	88	324
Solan	407	134	678
Una	272	77	480

The causes for road accidents could be many but statistics shows that 70% of road accidents arise from driver failure. The other plausible factors contributing to disaster are:

- i) Lack of Vehicle Maintenance
- ii) Poor visibility due to Fog or Smog
- iii) Poor or untrained driving
- iv) Lack of emergency services like trauma centers
- v) Absence of stable geological strata leading to sinking of roads
- vi) Night time driving
- vii) Over speeding and Overtaking at curves
- viii) Non-use of horns
- ix) Use of Mobiles and Headphones while driving
- x) Use of alcohol

j) Temple Stampedes:-

The State of Himachal has large number of Hindu temples as pilgrimage centres. According to some estimates there are more than 2000 temples in the State. Some of the temples in the State like JawalaMukhi&Baijnath in Kangra, Chintpurni in Una, BijliMahadev in Kullu, Tarna in Mandi, Renukaji in Sirmour, Laxmi Narayan in Chamba, Bhima Kali in Sarahan Shimla attract large number of visitors and tourists every year. Stampedes are common during religious gatherings. Himachal Pradesh being a land of God's the people observe large number of festivals when mass gathering forms dense moving crowd.

On August 3, 2008 the Naina Devi temple experienced worst ever tragedy when 146 devotees, including 30 children and 38 women were crushed to death and 50 injured in Stampede triggered by a rumour of landslide. The tragedy took place in the holy month of Sawan and as per media reports there were about 3000 devotees present at the time of catastrophe. Rumours of landslide and rolling down of boulders from a nearby hill top spread fear among the devotees who had gathered in large number in the shrine to offer prayers during Navaratra festival. As a result of the rumour the Stampede occurred and the people died when they were crushed, trapped and forced over the side of nearby Nallah by the movement of a large panicking crowd. The primary factor leading to a stampede is pressure which is multiple of speed variance and density. In order to stop or prevent such mishaps in future the following measures are proposed to be taken:

- i) Ensure that the available infrastructure such as roads, corridors, entrances and exits are adequate for the gathering expected to assemble at religious places and there are no bottlenecks and compression points.
- ii) Every temple where large gathering is expected will have a crowd management plan.
- iii) Contingency plans for evacuation will be developed on priority.

k) Man and Animal Conflict:-

Though the damages & loss caused by wild animals is not yet included in the list of disasters identified in the relief manual yet the issue has now become very serious for the last couple of years. During public consultation the farmers identified the wild animal and monkeys as the dominant threat for their livelihood. The attacks of wild animals and monkeys are considered to be much more damaging as it happens regularly without any warning. The data for the period from 2009-2012 suggest that the wild animals attack on human and animals were as high as 2789 in which 21 people even lost their lives. The compensation and relief worth Rs. 145, 33,031 during the same period was also provided to the affected families. Minimising or preventing damage to crops by resolving man and animal conflict is emerging a major challenge. According to media reports there are about 3.5 lakh monkeys in the state affecting the farming community in about 2600 Panchayats. Annually damage to the crops has been estimated to the tune of Rs 500 crores. In order to tackle the menace the Govt. has planned to spend Rs 10 crores during the budget year 2011-2012.

3. INSTITUTIONAL SETUP²

The State Government has adopted the Disaster Management Act 2005 as enacted by the Govt. of India for providing effective mechanism for Disaster Management in the State of Himachal Pradesh.

3.1 State Disaster Management Authority:-

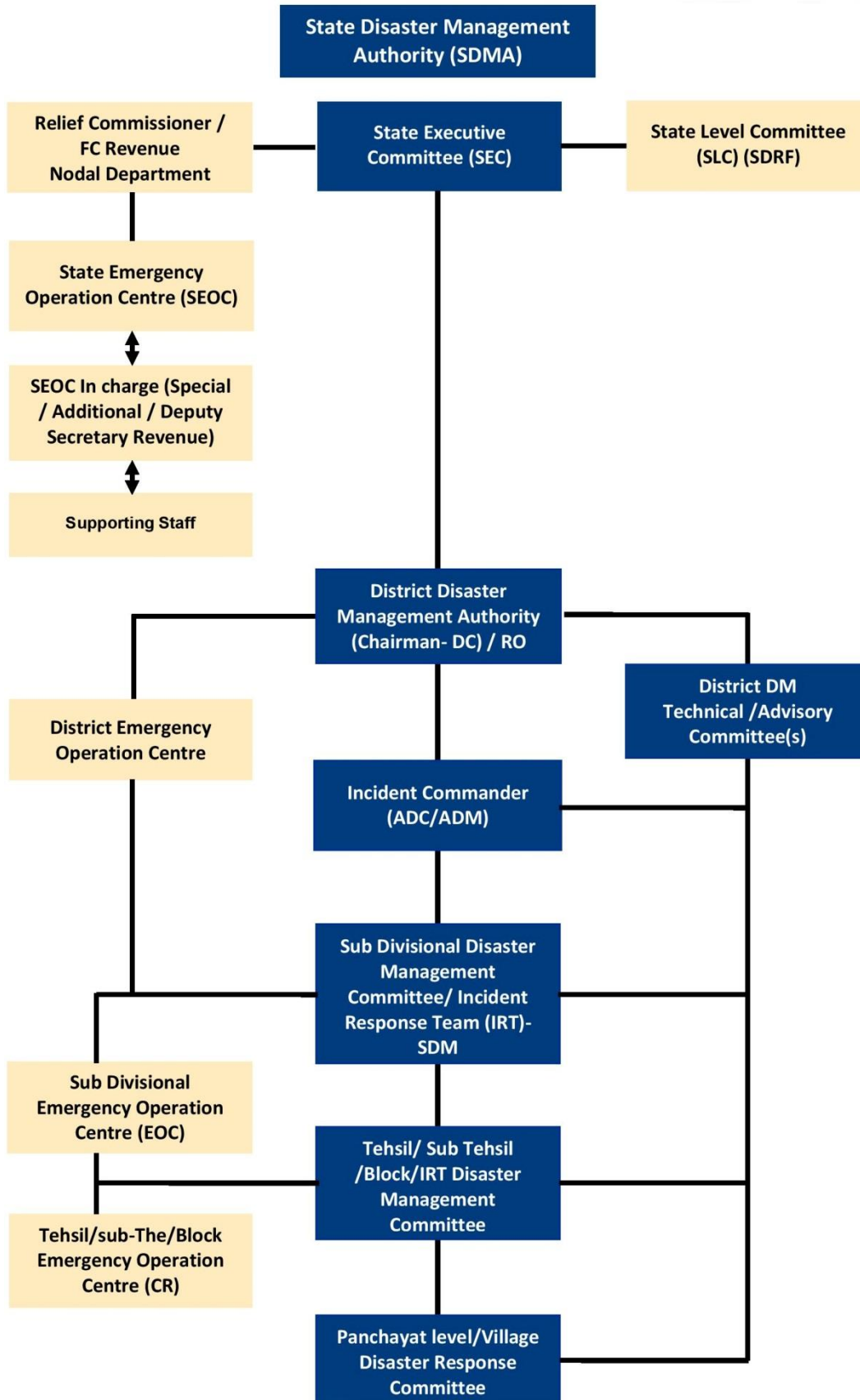
As per clause b of sub-section (2) of Section 14 of the Disaster Management Act 2005, the Himachal Pradesh Disaster Management Authority under the chairperson of the Honourable Chief minister was constituted on 1st June 2007 with the following persons as member of the HPDMA:

1. Honourable Chief Minister	Chairperson
2. Hon'ble Revenue Minister	Member
3. Chief Secretary	Chief Executive Officer
4. Principal Secy.(Rev)	Member
5. Principal Secy. (Home)	Member
6. Principal Secy. (PWD)	Member
7. Principal Secy. (Health)	Member
8. Director General Police	Member
9. Secretary/Add.Secy. (Rev.)	Member Secy.

The State Disaster Management Authority (SDMA) has the mandate to lay down the state policies and approval of State Disaster Management Plan, with the assistance of SEC.

Roles and Responsibilities:

1. Lay down the State disaster management policy
2. Approve the State Plan in accordance with the guidelines laid down by the National Authority.
3. Lay down guidelines to be followed by the departments of the State Government for the purpose of coordination and integration measures for prevention of disasters and mitigation in their development plans and projects and provide necessary technical assistance.
4. Coordinate the implementation of State Plan at State and District level.
5. Recommend provision of funds for mitigation and preparedness measures.
6. Review the development plans of different departments of the State and ensure that prevention and mitigation measures like earthquake resistance structures are built at least for life line structures.
7. Review the measures being taken for mitigation, capacity building and preparedness by the departments of the State Government and issue such guidelines as may be necessary.



3.2 District Disaster Management Authority:-

The District Disaster Management Authority (DDMA) will act as the district planning; coordinating and monitoring body in accordance with the guidelines laid down by the State Authority.

As per Section 25 of the DM Act 05, DDMA for every district in the State of Himachal Pradesh has also been constituted, consisting of the following members:

S.No.	Officials	Designation
1.	Deputy Commissioner	Chairperson
2.	Superintendent of Police	Member
3.	Chief Medical Officer	Member
4.	Superintending engineer (PWD)	Member
5.	Superintending Engineer (I & PH)	Member
6.	Superintending Engineer (MPP & P)	Member
7.	Chairperson of the Zila Parishad	Member

3.3 District Disaster Management Advisory Committee(s):-

District level Disaster Management Advisory Committee(s) will be appointed by the District Disaster Management Authority to take advice on various subject specific fields within the overall context of disaster management. The committee will comprise disaster management experts, which may be from government departments, research institutes and NGO's.

3.4 District Emergency Operation Centres:-

The District Emergency Operation Centres will be the hub of all the activities related to disaster response in the District. It will coordinate and communicate upward and down ward with regard to emergency response.

3.5 Tehsil/sub Tehsil/Block Disaster Management Committee:-

Subject to the directions of the District Authority, the Tehsil/Sub Tehsil/block disaster management committee will be responsible for the development and implementation of block level disaster management plans.

3.6 Gram Panchayat/Village Disaster Response Committee:-

Response committees will be constituted to be the first responders under the Chairpersonship of Panchayat Pradhan. The secretary of Panchayat will be secretary of the committee and local Patwaris and ward members shall be its members.

3.7 Technical Committee(s):-

Under sub-section (1) of Section 21 of the Disaster Management Act, 2005, the SEC has constituted a sub-committee to look into the issue of amendment to the TCP Act and building bye-laws of Urban Local Bodies.

3.8 The State Emergency Operations Centre:-

SEOC is an offsite facility which will be functioning from the HP Secretariat which actually is an augmented control room having communication facilities and space to accommodate the various ESFs emergency supports functions. It will be manned by various line departments of Government and other agencies, whose services are essentially required during incident response. It will allow all agencies and departments to share information, make decisions, activate plans, deploy IRTs, perform and log all necessary response and relief activities and make the EOC effective.

4. INITIATIVES

4.1 Act/Rules

- Guidelines on Constitution and Administration of the State Disaster Response Fund and National Disaster Response Fund.
<http://hpsdma.nic.in/Notifications/GuidelinesForNDRFSDRF100211.pdf>
- Standard Operating Procedure for Responding To Natural Disasters 2010.
<http://hpsdma.nic.in/Notifications/SOPNDM2010.pdf>
- Notification of SDRF
<http://hpsdma.nic.in/Notifications/SDRF.%20Notification.pdf>
- DM Act 2005, Rules & Notifications
<http://hpsdma.nic.in/Notifications/Disaster%20Management%20Act%20Final%20Draft%5B1%5D.pdf>
- Advisory Committee HPSDMA
http://hpsdma.nic.in/Notifications/Advisory_Committee_HPSDMA.pdf
- DM Rules, 2011 in English
<http://hpsdma.nic.in/Notifications/DMAct2011e.pdf>
- DM Rules, 2011 in Hindi
<http://hpsdma.nic.in/Notifications/DMAct2011h.pdf>
- DM Act, 2005
<http://hpsdma.nic.in/Notifications/DMAct2005.pdf>
- DM Act in Hindi
<http://hpsdma.nic.in/Notifications/DMActHindi.pdf>
- SDMA Notification
<http://hpsdma.nic.in/Notifications/SDMANotification.pdf>
- SEC Notification
<http://hpsdma.nic.in/Notifications/SECNotification.pdf>
- DDMA Notification
<http://hpsdma.nic.in/Notifications/DDMANotification.pdf>
- Ministry of Home Affairs Notification, 2008
<http://hpsdma.nic.in/Notifications/DMNo517.pdf>
- Ministry of Home Affairs Notification, 2007
<http://hpsdma.nic.in/Notifications/DMNo722.pdf>
- Ministry of Home Affairs Notification, 2006
<http://hpsdma.nic.in/Notifications/DMANotification.pdf>

4.2 PLANS

- Himachal Pradesh State Disaster Management Plan, 2012 (FINAL)
<http://hpsdma.nic.in/DisasterManagement/HPSDMPfinalindex.pdf#pagemode=bookmarks>
- District Disaster Management Plan for Kinnaur, 2012 (FINAL)
<http://hpsdma.nic.in/DisasterManagement/KNRDDMPfinal.pdf#pagemode=bookmarks>
- District Disaster Management Plan for Mandi, 2012 (FINAL)
<http://hpsdma.nic.in/DisasterManagement/DDMPMandifinal.pdf>
- District Disaster Management Plan for Kangra (FINAL)
<http://hpsdma.nic.in/DisasterManagement/DDMPKangra.pdf#pagemode=bookmarks>
- City Disaster Management Plan for MC Shimla, 2012 (FINAL)
http://hpsdma.nic.in/DisasterManagement/CDMP_MCShimla.pdf#pagemode=bookmarks
- District Disaster Management Plan for Shimla (FINAL)
http://hpsdma.nic.in/DisasterManagement/DDMP_SHIMLA.pdf#pagemode=bookmarks
- DDMP Lahaul&Spiti, 2012 (FINAL)
<http://hpsdma.nic.in/DisasterManagement/DDMALahual%20Spiti.pdf#pagemode=bookmarks>
- District Disaster Management Plan for Kullu (DRAFT)
http://hpsdma.nic.in/DisasterManagement/DDMP_Kullu.pdf
- District Disaster Management Plan for Hamirpur (DRAFT)
<http://hpsdma.nic.in/DisasterManagement/DDMP%20Hamirpur.pdf>
- District Disaster Management Plan for Una (DRAFT)
<http://hpsdma.nic.in/DisasterManagement/DDMPUna.pdf>

4.3 POLICY

- Himachal Pradesh State Policy on Disaster Management 2011
<http://www.hpsdma.nic.in/SDMP%20English%20for%20Website.pdf>
- National Policy on Disaster Management 2009.
<http://hpsdma.nic.in/Notifications/NdmPolicy2009.pdf>
- National Policy on Disaster Management 2009(In Hindi).
<http://hpsdma.nic.in/Notifications/NPDM150110Hindi.pdf>
- HP State Policy on DM - English
<http://hpsdma.nic.in/SDMP%20English%20for%20Website.pdf>
- HP State Policy on DM - Hindi

<http://hpsdma.nic.in/SDMP%20Hindi%20for%20Website.pdf>

References:-

¹<http://www.mapsofindia.com/maps/himachalpradesh/himachalpradesh.htm#>

²http://www.censusindia.gov.in/2011-prov-results/prov_data_products_himachal.html

³<http://hpsdma.nic.in/DisasterManagement/HPSDMPfinalindex.pdf#pagemode=bookmarks>