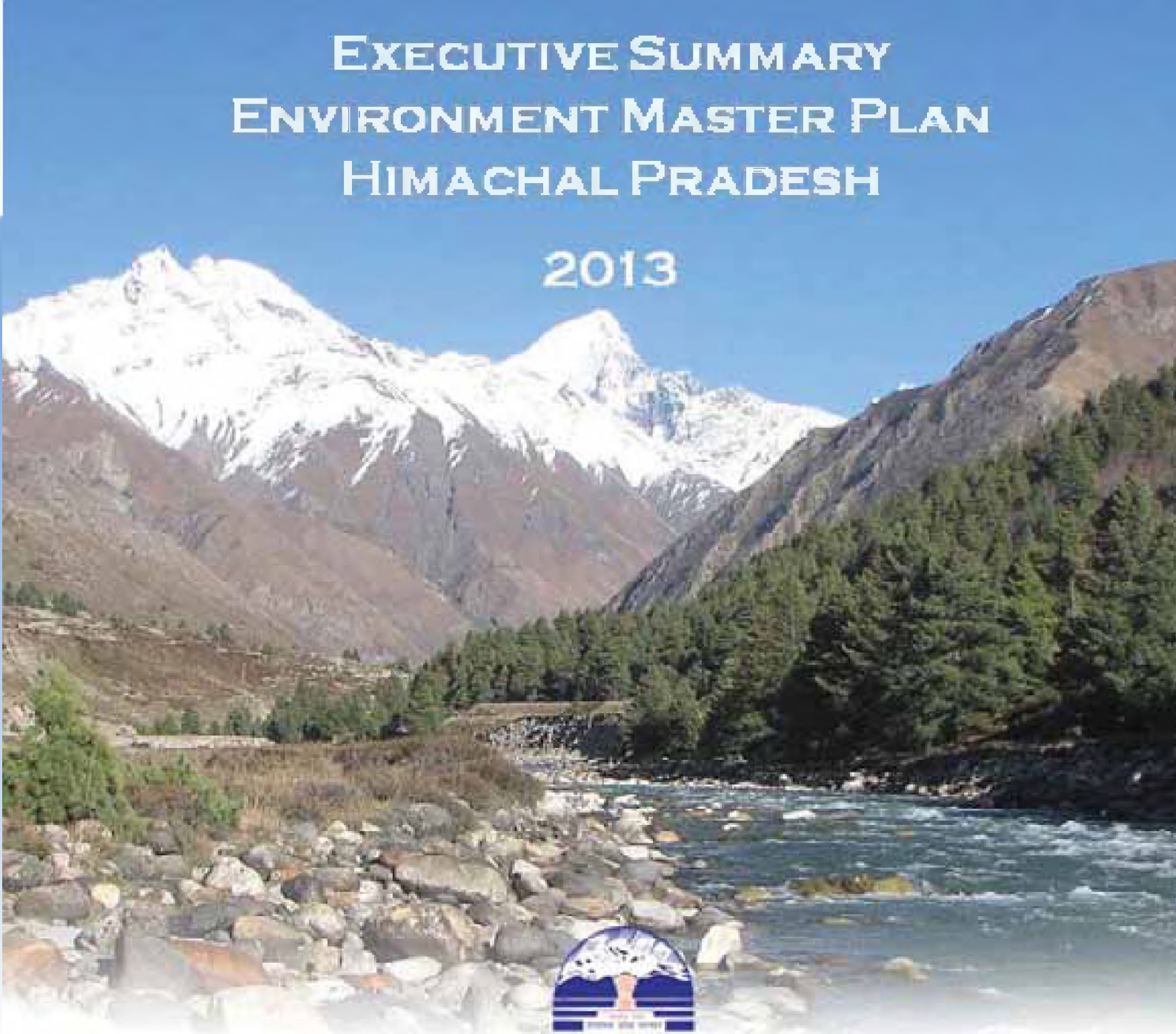
Executive Summary
Environment Master Plan
Himachal Pradesh

2013



Government of Himachal Pradesh

Department of Environment, Science & Technology

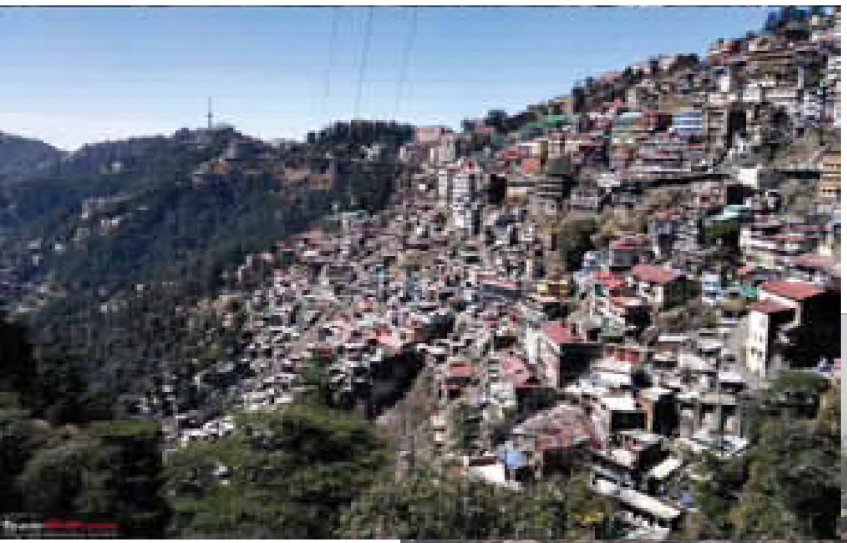
"Earth provides enough to satisfy every man's needs, but not every man's greed."

- *Mahatma Gandhi*

Key Challenges-INDIA

India is characterized by the variety of soils, climate, biodiversity and ecological regions it is endowed with. As a developing economy, the country depends heavily on its natural wealth; however, excessive use of natural resources is depleting the very resource base that sustains it.

The country today faces key environmental challenges, especially because of the nexus of environmental degradation and economic growth. These challenges pertain to the state of environmental resources, such as air, land, water flora and fauna.



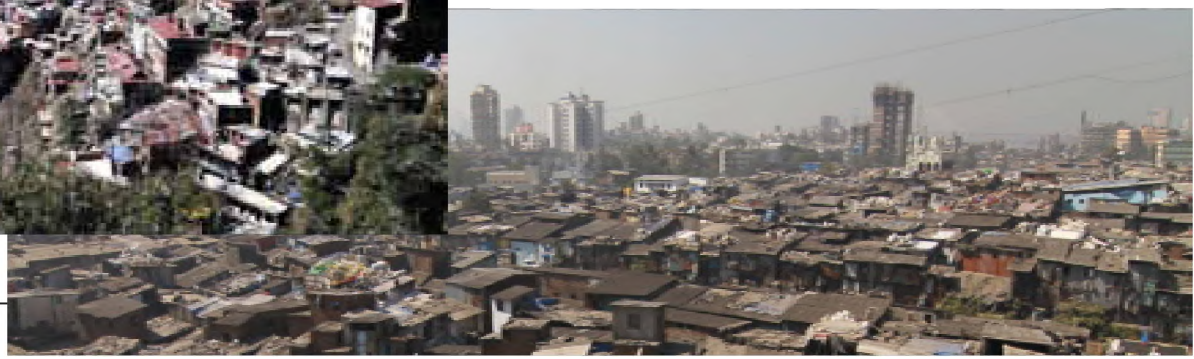
To a large extent, the environment degradation is caused by:

- Population growth
- Inappropriate technologies
- Poverty
- Intensive agriculture
- Polluting Industries
- Unplanned Urbanization

Environmental challenges in India are enhanced by nexus of environmental degradation and economic growth.

Environmental degradation also perpetuates poverty, since it directly affects soil fertility, quality and quality of water, air, forests, wildlife and fisheries.

Recognizing the problem the country has now been classified into agro- climatic, agro-ecological and agro-meteorological zones. The classification facilitates planning and implementation of various programmes and measures at the local level.



Background

The picturesque state of Himachal Pradesh is located between $30^0$22'40" N latitude to $33^0$12'40" N and $75^0$47'55" to $79^0$04'20" E longitude. It extends over a geographical area of 55, 673 sq. kms, which is 1.69 percent of the country's area and 10.54 percent of the Himalayan landmass. It is surrounded by Jammu and Kashmir in the north, Tibet on north/north east, Uttaranchal in the east/ south east; Haryana in south and Punjab in south west/ west. There are four agro-climatic zones viz. Shivalik Hill Zone, Mid Hill Zone, High Hill Zone and Cold Dry Zone. Shimla, which once was the summer capital of India, now serves as the state capital.

A Brief Profile of Himachal Pradesh

Total Geographic Area	55,673 km^2
No. of Districts	12
No. of Towns and cities	57
Population	68,56,509
Population Growth rate	12.81%
Literacy Rate	83.78%
Total Length of Roads	31,512 km
Apple Production	592.57 MT
Total Forest Area	37,033 km^2
Area under Tree cover	14,679 km^2
Dense Forests (Crown density 40%)	8,976 km^2
Unclassed Forests	976 km^2
Deodar	811 km^2
Kail	809 km^2
Chil	1436 km^2
Ban Oak	540 km^2
Fruit Production	712.84 MT
Reserved Forests	1,896 km^2
Sub-Alpine & Alpine Forests	2,512 km^2
Himalayan Moist Temperate Forests	4,064 km^2
Mohru Oak	35 km^2
Kharsu	246 km^2
Flowering Plants	3120 species
Conifers	13 species
Orchids	38 species

Himachal Pradesh

Key Challenges - Himachal Pradesh

The State of Himachal Pradesh is developing by leaps of bounds. The development activities if not undertaken in a scientific manner, invariably results into environmental degradation.

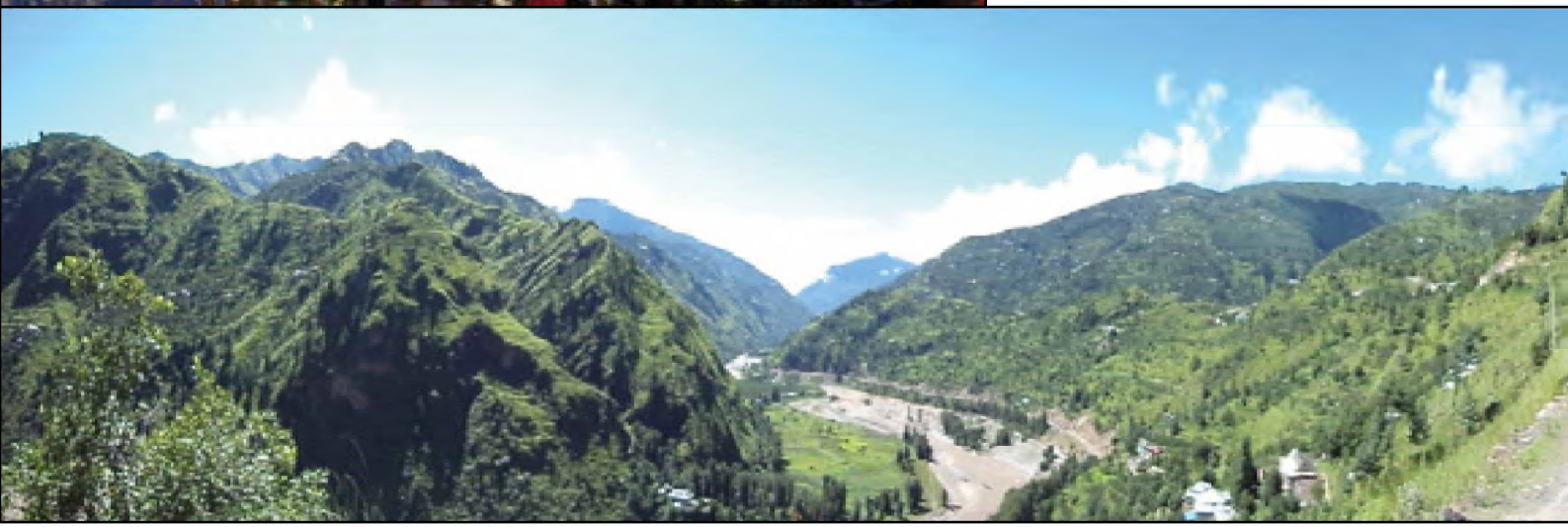
The control of environmental pollution has assumed a great significance. It is more relevant as the entire State of Himachal Pradesh falls within the Himalayan Region, which is ecologically and environmentally one of the most fragile regions of the world.

In the advent of increased pressure from the various facets of developmental, population explosion, infrastructure, urbanization, industrialization, establishment of mega hydro power projects, industrial projects, mining, tourism, encroachment of forest land, deforestation, excessive agricultural and horticultural activities etc. the fragile mountain ecology and vulnerable hill environment is under threat of degradation.

Himachal Pradesh, which has its own peculiar environmental problems, needs to tread the developmental path without compromising with its pristine environment. Climate change and biological diversity loss are the two major planetary environmental threats facing mankind today and they are closely interlinked. Himachal Pradesh has a sensitive and highly bio-diverse ecosystem. To conserve our Himalayan heritage, we must jointly strengthen our endeavours to tackle, climate change and curb the loss of biological diversity through adoption of sustainable environmental management practices.

Initiative- Preparation of Environment Master Plan

Government of Himachal Pradesh has undertaken the preparation of Environment Master Plan (EMP) for the State, in order to ensure the sustainability of environmental heritage and natural resources and to develop a long term perspective of achieving environmentally sustainable development. Further, the State has adopted the motto of '*fast-track development*' in harmony with environment protection with the involvement of citizens.



Objectives

Major objectives of the Environment Master Plan are to enable the State of Himachal Pradesh to:

- ✓ Simultaneously address issues of ecological and environment restoration and bring convergence along with the development activities taking place in the state;
- ✓ Engage and ensure close coordination with all the concerned development departments, both at the state and Government of India level;
- ✓ Decide future financing of investments for development in a sustainable manner, and
- ✓ Develop suitable institutional arrangements in order to implement the Government of Himachal Pradesh's policies and strategies.

Themes-tasks Undertaken for preparation of Environment Master Plan

- Establish Baseline conditions.
- Conduct a Spatial Vulnerability Assessment and Formulate Planning Principles.
- Develop Public Consultation and Communication Strategy for the Department of Environment.
- Develop an institutional mechanism for implementation of the EMP.
- Establish need for training and capacity enhancement.
- Develop Monitoring and Evaluation Protocols.
- Develop Sectoral Guidelines.

Major Sectors

Included in Environment Master Plan

Sectoral approach to Environment Master Plan (EMP) has been adopted to mainstream environmental concerns into the State's development planning in sectors of economy for thirty years. Three sectors namely Infrastructure, Natural Resources Management and Services have been identified for preparation of EMP.

Infrastructure

- ✓ Roads, highways, rural roads and Transport
- ✓ Hydropower (generation transmission, and distribution)
- ✓ Tourism, Ecotourism + Art, Architecture and cultural heritage
- ✓ Industry
- ✓ Mining and Geology
- ✓ Irrigation and Public Health
- ✓ Health
- ✓ Market Infrastructure (including horticulture and agriculture)
- ✓ Rural and Urban Planning

Natural Resource Management (NRM)

- ✓ Agriculture
- ✓ Horticulture
- ✓ Animal Husbandry Livestock
- ✓ Forests, Wildlife and Wetlands
- ✓ Fisheries

Services

- ✓ Education, and Vocational training
- ✓ IT and Telecom
- ✓ Livelihoods
- ✓ Waste disposal

Baseline Conditions.....

Baseline information for Infrastructure, Natural Resources and Services sectors based on common parameters namely resource inventory of existing assets of the sector, patterns of planning and development in the sector, technology adopted in the sector along with any changes in technology, stakeholder involvement in environment preservation and restoration, critical environment in environment preservation and restoration, critical environment issues / hotspots associated with the sector, environment initiatives taken by the sector to address critical environment issues, environment related studies carried out in the sector, environment monitoring (key parameters such as air and water pollution) carried out for activities related to the sector; institutional mechanisms within the sector to address identified environment issues, data/ documentation pertaining to addressing demographic issues in the context of the sectors, such as population changes; requirements of populations and changing lifestyles; migratory population including tourists; transhumant's; transit labor population; pressures felt by communities due to degraded environment conditions, information on human resource management issues which has relevance to environment management in the sector such as; manpower, vocational training, awareness levels etc., regulatory analysis to identify any regulations that have environment implications (negative or positive), and compliance with the same.

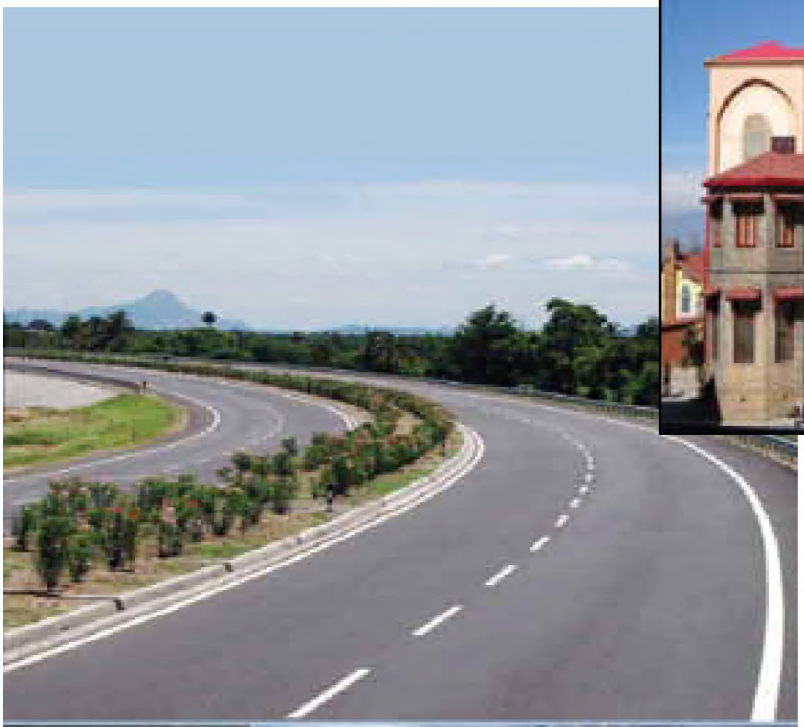
Parameters for NRM sectors also includes inventory of habitats and existing species, endangered species, exotic species, migratory species and scope for introducing new species based on climatic/ (agro-climatic) stability and information on biodiversity losses.

For services sectors information / data on environment health and quality of life related issues such as water and air borne diseases, changes in vectors etc have been collected and collated.

The sectoral baseline data/information has been based on Census of India, 2001 with relevant and available updates from Census of India, 2011 (Statistical Handbooks of Directorate of Economics and Statistics, Government of Himachal Pradesh, statistic obtained by line departments, State Agriculture Plan, District Agriculture Plan, State of Environment Report, State Biodiversity Strategy and Action Plan. Source of data have been provided in each sectoral reports.

Infrastructure

(Baseline Condition)



- Roads, Highways, Rural Roads and Transport
- Hydropower (generation, transmission and distribution)
- Tourism, Ecotourism, Art, Architecture and Cultural Heritage
- Industry
- Mining and Geology
- Irrigation and Public Health
- Health
- Market Infrastructure (including horticulture and agriculture)
- Rural and Urban Planning

Roads In Himachal (Kms)

Year	Total Road Length	Motorable Double Lane	Motorable Single Lane	Jeepable	Less than Jeepable
2009-10	33171	2384	28832	300	1655
2010-11	33722	2403	29464	290	1565
2011-12	34169	2411	29999	276	1483

Public Works Department H.P

Hydropower Potential in Himachal Pradesh

River Basins	Capacity (MW)
Yamuna	817
Satluj	10,361
Beas	5,357
Ravi	2,958
Chenab	2,973
Self Identified/New Identified	534
Total	**23,000**

Status Note By HPSEB

Tourism in Himachal

District	Tourists visited in Himachal during (2010-11)	
	Indian	Foreign
Bilaspur	695702	18157
Chamba	1035789	18092
Hamirpur	1201482	33557
Kangra	1617416	42339
Kinnaur	1424654	41420
Kullu	1636022	47735
Lahaul & Spiti	887061	62492
Mandi	815169	51152
Shimla	972312	55141
Sirmaur	1172670	39840
Solan	671982	23609
Una	681727	20082
HP	**12811986**	**453616**

Industries

District wise details of industrial units registered in the Small, Medium & Large scale Sector (upto 31-3-2013)

Sr. No.	District	No of units	Investment (Rs. in lakh)	Employment
1	Bilaspur	2350	550.018	10155
2	Chamba	1794	37.9369	6250
3	Hamirpur	2868	67.6624	10294
4	Kangra	9076	576.603	41397
5	Kullu	2574	89.4185	14206
6	Kinnaur	587	5.7087	1842
7	Lahaul& Spiti	583	3.5698	1612
8	Mandi	3962	115.002	16384
9	Shimla	3509	263.871	13388
10	Solan	5424	11594.40	108839
11	Sirmour	3322	2062.36	29751
12	Una	3463	1799.00	21337
	Total	**39512**	**17165.5503**	**275455**

Health

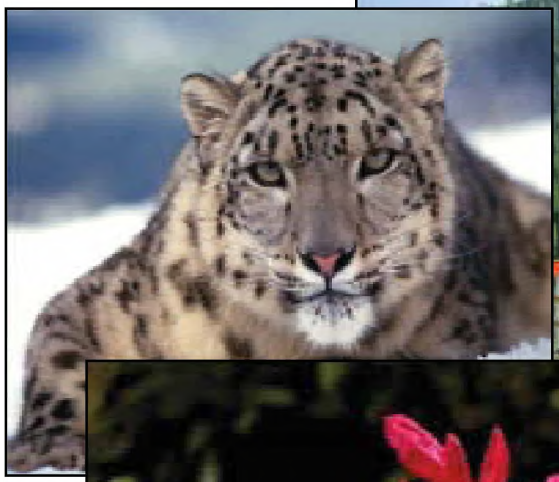
Institutions	Numbers (2012-13)
Allopathic Institutions	**614**
Ayurvedic Institutions	**1143**
Unani Dispensaries	**3**
Homoeopathy Dispensaries	**14**

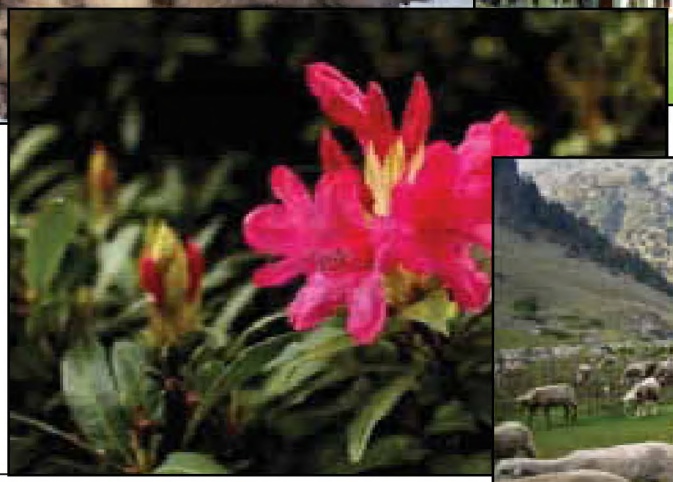
Rural Development

Natural Resource Management

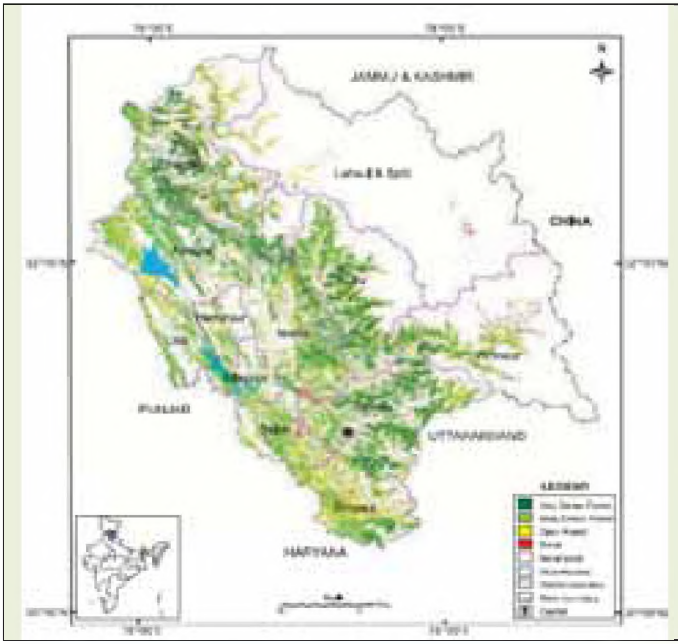
(Baseline Condition)

- Agriculture
- Horticulture
- Animal Husbandry Livestock
- Forests, Wildlife and Wetlands
- Fisheries





Forests Himachal Pradesh



The Forest Cover in the State, Based on Interpretation of satellite data of October-December 2008, is 14, 679 sq. kms. Which is 26.27% of the State's geographical area.

Designated Wetlands in Himachal Pradesh

Ramsar Sites	National Wetlands
Ranuka (Sirmour)	Rewalsar (Mandi)
Pong Dam (Kangra)	Khajir (Chamba)
Chandertal (L&S)	

Important Wild Life Sanctuaries of the State

Sanctuary	District	Area (Km^2)
Govind Sagar	Bilaspur	100
Shri Nainadeve	Bilaspur	123
Kugti	Chamba	379
Kalatop- Khajjiar	Chamba	69
Pongdam Lake	Kangra	307
Dhauladhar	Kangra	944
Rakchham-Chhitkul	Kinnaur	304
Rupi-Bhaba	Kinnaur	503
Kibber	L&S	1400
Nargu	Mandi	278
Shikari Devi	Mandi	72
Daranghati I&II	Shimla	167
Tarla	Shimla	40
Water Supply Catchment	Shimla	10
Churdhar	Sirmour	66
Simblabra	Sirmour	19
Renuka	Sirmour	4
Chail	Solan	109

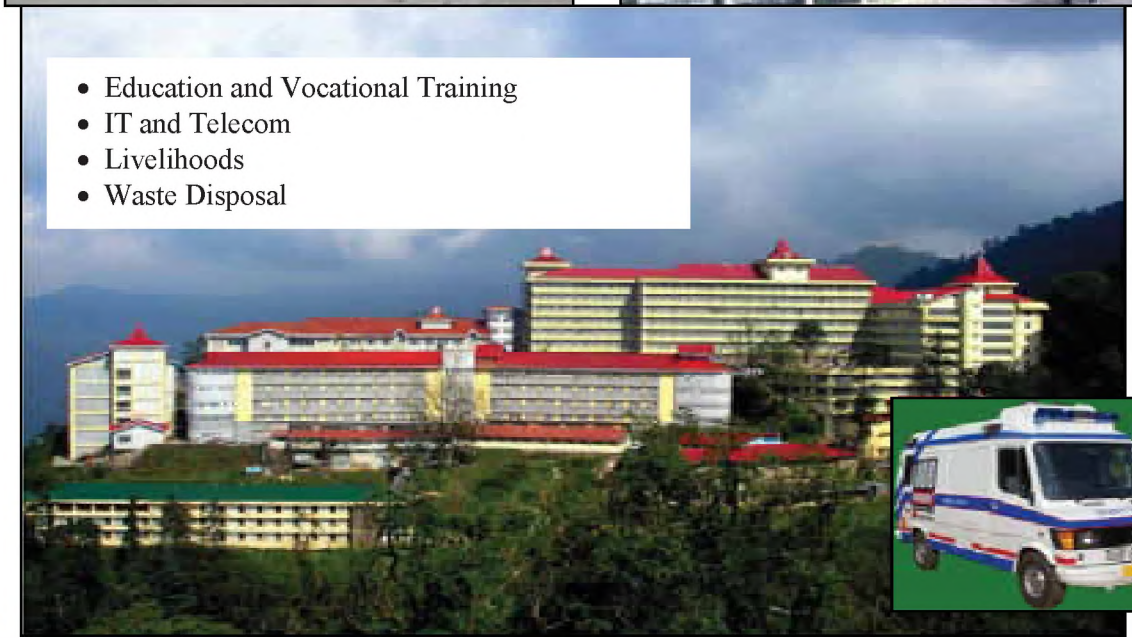
Animal Husbandry (Livestock & Poultry)

Livestock	In Thousands (2007)
Cattle	2,269
Buffaloes	762
Sheep	901
Goats	1,241
Horses and ponies	13
Mules and donkeys	26
Pigs	2
Other livestock	2
Total-Livestock	5,216
Poultry	809

Service Sector

(Baseline Condition)

- Education and Vocational Training
- IT and Telecom
- Livelihoods
- Waste Disposal



Education Sector

No. of Educational Institutions (Functional) Year 2012-13	
Primary	10,620
Middle	2,339
High Schools	836
Senior Secondary Schools	1,330
Degree colleges	75
Total	**15,200**

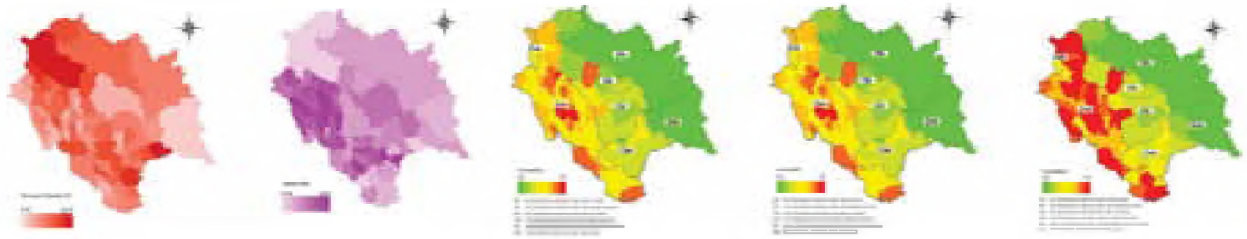
Inventory of Hazardous Waste Generation Units in Himachal Pradesh

(as on 31.03.2012)

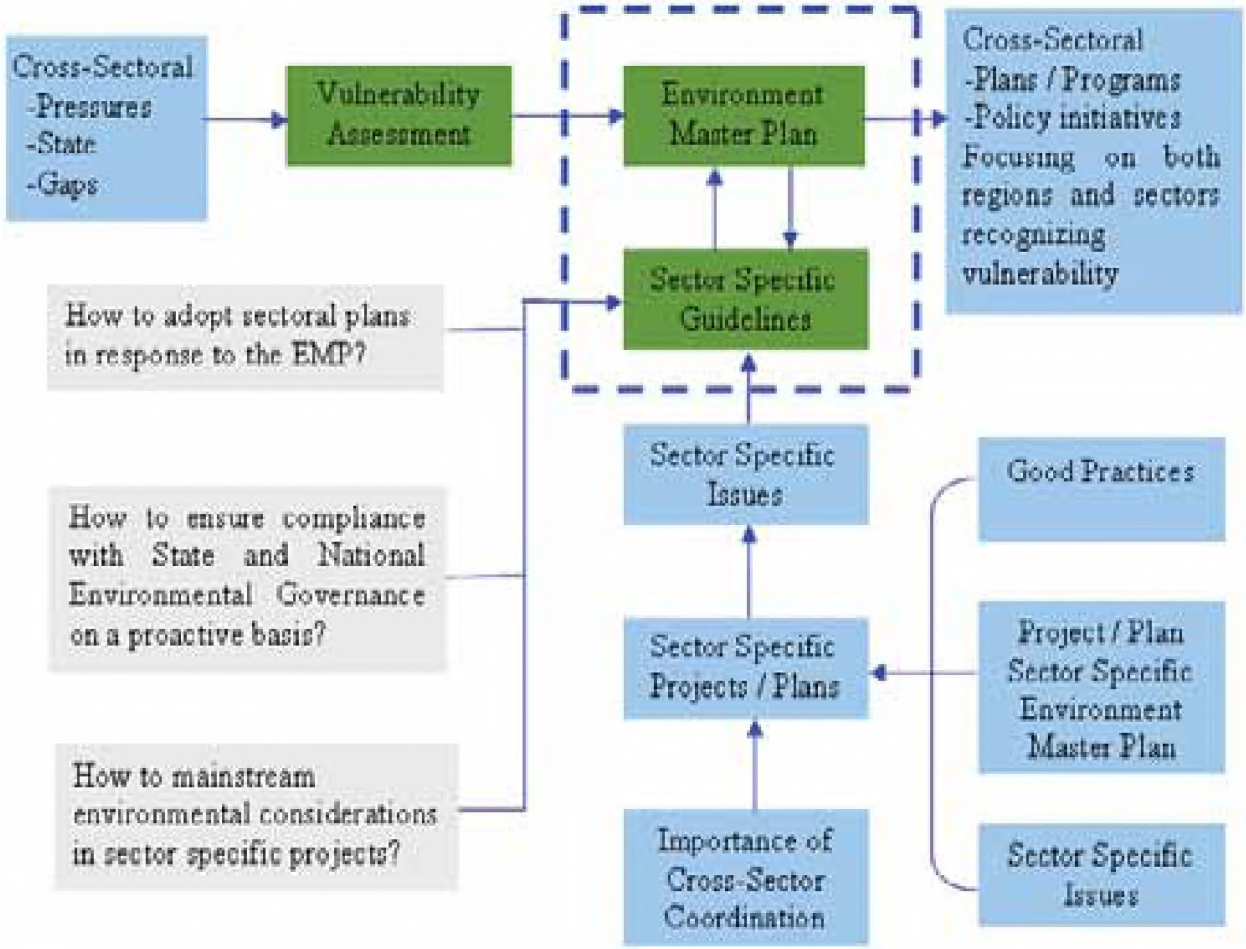
Sr. No.	Name of Area/ Regional Office	No. of Units Functional	No. of Units Closed	Units Authorized/ Operational	Units Under CTE	Units Under CTO	Hazardous Waste Generation				
							Used Oil (Ltr/ year)	Waste Solvent (Ltr/ year)	ETP Sludge (Kg/ year)	Process Residue (Kg/ year)	Others (Kg/Ltr/
1	Baddi	443	11	454	28	86	154904	71219	4180875	674765	556461
2	Barotiwala	142	17	90	5	22	20054	19079	50755	23864	1853600
3	Nalagarh	475	15	390	7	69	148296	63547	1096382	1284289	1869944
4	Parwanoo	277	29	224	7	17	116743	21035	140736	27566	36489
5	Paonta Sahib	139	26	420	26	67	382739	67952	10407312	538299	3425203
6	Una	157	16	110	4	27	61014	985	328427	549295	4343389
7	Bilaspur	32	0	24	7	5	24748	4	19168	300	600
8	Mandi	39	4	28	3	4	31715	73	7400	0	4040
9	Kullu	30	2	40	0	0	14650	0	42	7013	0
10	Jawar	73	6	56	3	0	704270	1300	111057	465120	65157
11	Chamba	11	3	7	0	1	3771	0	0	0	500
12	Shimla	75	14	53	1	7	36834	0	1440	12	5000
13	Rampur	19	5	13	0	2	21470	0	0	0	0

Vulnerability Assessment

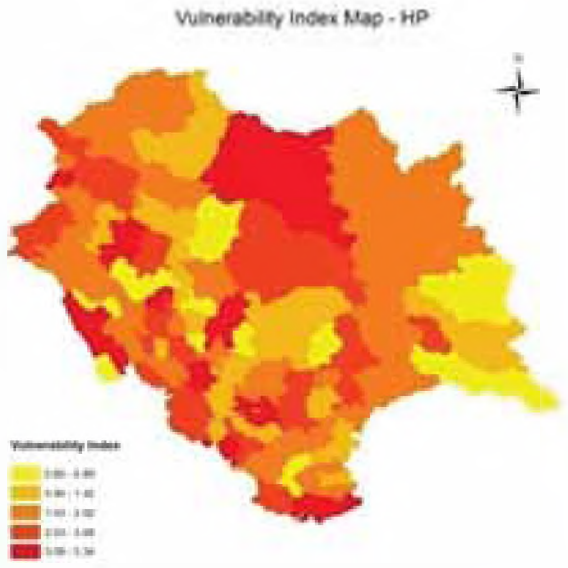
Vulnerability assessment has been done both sectorally and geographically. The unit for assessment of geographical vulnerability is tehsil and district, the scenarios have been prepared for year 2011, 2021, 2031 and 2041. Sectoral vulnerability has been assessed at tehsil level with respect to water, air, land, natural critical habitats, climate change, hazard susceptibility, spatial areas of conflict, quality of life (health) and quality of life (education).



Methodology Adopted to prepare Sector Specific Guidelines and Vulnerability Assessment



Vulnerability index is a measure of the exposure of a population to the vulnerability on account of pressure on natural environment which determines the quality of life. The vulnerability Index is a composite of multiple quantitative indicators that via some formula, delivers a single numerical result.



Here the '*index*' is designed to be used with economic and social vulnerability indices to provide insights into the processes that can negatively influence the '*sustainable development*'.

The reason for using indices for this purpose is to provide a rapid and standardized method for characterizing vulnerability in an overall sense, and identifying issues that may need to be addressed within each of the three pillars of sustainability, namely environmental, economic and social aspects of a region's development.

Through this study the vulnerability index has been derived for each administrative sub division (Tehsil/ sub-Tehsil) is an objective number with reference to similar numbers for other Tehsil/sub-Tehsils it helps in prioritization on a rational basis. A brief description of the criteria, variables, approach and methodology follows.

Range of Vulnerability Index

The Vulnerability Index has been categorized in six categories as under:

Vulnerability Index Range	Vulnerability Index Category	Color Code
Up-to 1.5	Very low vulnerability	
1.51- 2.5	Low vulnerability	
2.51- 3.5	Moderate low vulnerability	
3.51-4.5	Moderate high vulnerability	
4.51-5.5	High vulnerability	
≥5.51	Very High Vulnerability	

Steps followed for Vulnerability Assessment

Methodology

Step 1 Database for all the variables (Pressure & State) are tabulated for all the Tehsils. These data, for each of the variables carry a value expressed in the designated units (i.e. %, lpcd, ha etc). The values are expressed as V1, V2 etc. *Since each value is in separate units, they have to be naturalized on the same scale and in same manner of expression*

Step 2 These values are now rationalized in the following manner-

(i) For any given variable, across all the Tehsils of the District, the highest value and the lowest value is selected and designated as VH and VL. The highest value is assigned a rating of 10 while the lowest value is assigned a rating of 1.

(ii) The intermediate values are interpolated based on the formula

V_H- VL/9 = Naturalization Factor= N_F

(N_F State or $N_{F\ Pressure}$ as the case may be)

$V_{Naturalized} = 1+(V_{1,2,3\ldots}-V_L) \text{ X } N_F$

(iii) Thus all the interim naturalized values for all the Pressure and State variables for all the Tehsils in the District are tabulated. In this manner, the difference in units is eliminated

Step 3 A matrix with the State variable sectors (e.g. water, land, air, etc) on the x-axis and the Pressure variable sectors (e.g. Utilities and Infrastructure, roads, Industry etc) on the y-axis is plotted with the relationship of each sub-sector variable ascertained. Wherever a relationship exists, e.g. source of perennial water has a relationship with gap in potable water supply as the effort to bridge the gap is going to influence the perennial source of water. Or for that matter, the gap in sewerage is bound to impact the perennial source of water through pollution and thus has a relationship. Such relationship grids are assigned a value of 1 while those grids which do not display a relationship are assigned a value of 0.

Step 4 Now for each Tehsil, the Naturalization Factor for each variable is applied in the inter-relationship matrix which has been prepared in Step 3. In the grids where an inter-relationship exists, the assigned value of 1 gets multiplied both by N_F State and N_F Pressure, giving a grid value of G_{vuln} for each grid. Thus, we have G_{vuln}= 1 X $N_{F\ State}$ X $N_{F\ Pressure}$. The grids, which do not represent an inter-relationship, gets both the values of NF State and NF Pressure multiplied by 0 and thus result in the Grid value of 0.

Step 5 The grid value totaled up in the row format gives the vulnerability of the sub sector. So in the Utilities & Infrastructure Sector, the grids in the row of Gaps in potable water supply give a total vulnerability of the gaps in potable water, $V_{U\&I\ (Pot\ Wat,)}$. Similarly, the total vulnerability scores for other variables such as gaps in sewerage $V_{U\&I\ (Sewerage)}$, and gaps in solid waste collection $V_{U\&I\ (Solid\ waste)}$, are determined. The sum total of all the vulnerability scores in the Utilities & Infrastructure sector gives the sum total score of vulnerability in the sector as $V_{U\&I}$. Similar exercise is carried out for all the sub-sector variables in all the Pressure. Sectors. This Results in $\sum V_{Pressure\ Sectors}$, a sum total of all the vulnerability scores in the Pressure Sector.

Step 6 A similar exercise is carried out for the State Sectors also, the difference being that in place of rows, the sum total is arrived at in columns. This results in various sub sector vulnerability scores and the sectoral vulnerability score a sum total of which is $\sum V_{State\ Sectors}$, a sum total of all the vulnerability scores in the State Sector.

Step 7 To arrive at the Vulnerability Index the formula that is used is

$$\sum V_{Pressure\ Sectors} \text{ X } V_{State\ Sectors} \text{ / Total no. of State variables X total no. of Pressure variables}$$

Or

$$VI = \frac{\sum V_{Pressure\ Sectors} \text{ X } V_{State\ Sectors}}{53 \text{ X } 47}$$

$$VI = \frac{\sum V_{Pressure\ Sectors} \text{ X } V_{State\ Sectors}}{2451}$$

In this manner Vulnerability Index for each Tehsil is determined and the tabulated District wise.

Step 8 In order to calculate the Vulnerability Index of each sector, the Sum total of the Sector, such as $V_{U\&I}$ or V_{Water} is divided by the no. of variables in the State or Pressure themes. Thus, for example, water sector in the State theme is represented by say 11 variables, the dividing figure is 11 X 53, the latter number, 53 being the number of variables in the Pressure theme. Thus the dividing figure in this case is 583 and the VI_{water}= V_{water} /583.

Similarly, the number of variables in Industry Sector may be 3 in Pressure Sector, and that multiplied with the 47 variables in the State theme gives us the dividing factor of 141. Thus the VI Industry= V Industry/141.

With this methodology the Vulnerability Index at the Tehsil Level and at the Sector Level is determined.

Illustration of calculations for deriving Vulnerability Assessment

Gaps Analysis in Infrastructure

A	Potable Water Supply	National Standards	Present Status
	Rural Areas	70 lit / capita/day	32 lit / capita/day
	Urban Areas	135 lit / capita/day	72 lit / capita/day
B	Sewage Generation	80% of the Water Supply	
C	Municipal Solid Waste Generation – Rural Areas		
	Urban Areas	130 Gram / Per Capita / day	
		220 gms per capita per day	

			Potable Water			Sewerage			Solid waste		
Sr. No.	Tehsil	Population	Demand in Kiloliters	Supply in Kiloliters	Gap in Kiloliters	Generation in Kiloliters	Collection and Treatment in Kiloliters	Gap in Kiloliters	Generation in Tonnes	Collection & Treatment in Tonnes	Gap in Tonnes
1	**Arki (Rural)**	80353	5625	2571	3053	2057	0	2057	10	0	10
2	**Arki (Urban)**	2877	388.4	207.1	181.35	165.7	0	165.7	0.633	0	0.63
3	**Arki (Total)**	83230			3235			2223			11

DERIVING RATIONALIZED RATINGS

Database for all the variables (Pressure & State) are tabulated for all the Tehsils. These data, fpr each of the variables carry a value expressed in the designated units (i.e, %, lpd, ha etc). The values are expressed as V_1, V_2 etc. *Since each value is in separate units, they have to be rationalized on the same scale and in same manner of expression* These values are now rationalized in the following manner-

For any given variable, across all the Tehsils of the District, the highest value and the lowest value is selected and designated as V_{MAX} and V_{MIN}. The highest value is assigned a rating of 10 while the lowest value is assigned a rating of 1.

The intermediate values are interpolated based on the formula
V_{MAX}- V_{MIN}/10-1 = Rationalization Factor= R_F
(R_F State or R_F Pressure as the case may be)
$V_{Naturalized}$ =1+($V_{1,2,3\ldots}$-V_L) X R_F

Thus, all the interim rationalized values for all the Pressure and State variables for all the Tehsils in the District are tabulated. In this manner, the difference in units is eliminated
Example
Solan - Pressure Variables
Gap in Potable Water Supply

Variable	Tehsil Name						
	Arki	Ramshahar	Nalagarh	Krishangarh	Kasauli	Solan	Kandaghat
Gap in Potable Water Supply-Klpd	3235	1129	5914	982	2707	18380	1335

Rationalized Rating

The maximum Value is of Solan @ 18380 Klpd (Vmax) and the Lowest is Krishangarh @ 982 Klpd (Vmin) Vmax being the highest value is assigned the value of 10 whlie Vmin, the lowest is assigned the value of 1.

Thus Vmax-Vmin= 18380-982 =17398. This is divided in 10-1=9 equal parts to get the scale. One rating on the scale = 17398/9 = 1933.1

Thus, the next value from the bottom is Ramshehar with 1129. The difference between this value and the lowest for Krishangarh at 982 is 147, which in the rating scale means a value of 147/1933= 0.076 or say 0.08. Thus, the Value for Ramshehar is 1(which is the lowest value on scale) + 0.08 =1.08

Similarly, the difference between Kandaghat & Ramshehar is 1335-1129 =207 and the rationalized difference is 207/1933.1=0.107 say 0.11.

Thus, the rationalized value for Kandaghat is Value for Ramshahar+ difference = 1.08+0.11= 1.19

So on for all the values.

Thus, the rationalized ratings are

Variable	Tehsil Name						
	Arki	Ramshahar	Nalagarh	Krishangarh	Kasauli	Solan	Kandaghat
Gap in Potable Water Supply-lpcd	2.14	1.08	3.56	1	1.9	10	1.19

Similarly, the rationalized ratings for State Variables are

Variable	Arki	Ramshahar	Nalagarh	Krishangarh	Kasauli	Solan	Kandaghat
No. of Perennial Rivers/Khuds	3.27	7.81	10	5.54	1	3.27	7.81

Now on the inter-relation matrix, gap in potable water supply has a direct relation with the perennial source of water as this is the only source and that efforts to close the gap would mean extracting water from these sources.

Thus to calculate relative vulnerability, both these values are multiplied to obtain a figure of 2.14X3.27 =6.9978 say 7.0 for Arki Tehsil and only for the inter relation between potable water supply and perennial source of water.

The sum of all the inter-relationships in a Tehsil totals the relative Vulnerability score and divided by the total number of variables (57 of the Pressure themeX43 of the State theme=57X43= 2451).

This gives the Vulnerability Index for the Tehsil. (For Arki, the Sum total of all the inter related variable matrix is 2600.4 which when divided by 2451 gives a vulnerability index of 1.06. Similar calculations are done for all the variables of the pressure and the state themes and for all individual Tehsils. Sectoral Vulnerability Index

In order to calculate the Individual Vulnerability Index for each of the groups of Pressure Theme variables such as Utilities & Infrastructure, Industry etc. and the State Theme variables such as Water, Air Land etc., the following method is adopted. Example Arki Tehsil.

The variables under the Group Utilities and Infrastructure number 7 in the Pressure theme and they interact with 43 variables in the pressure theme. Wherever interaction exists the relationship matrix gets a value of 1 with the rationalized values multiplication being multiplied by 1. Where no relation exists, the multiplying value is 0 and results in a 0. Thus the total score of all the inter relations for the seven variable sum up to 443.49 (for Arki – Utilities and Infrastructure). Thus the Vulnerability Index for this Sector – Utilities & Infrastructure = 443.49/7X43 = 443.49/301 =1.47.

Similarly, in the Water Sector, there are 11 variables and they interact with 57 variables thus the dividing factor here becomes 11 X57 = 627. The Total score of water sector for Arki is 1288.85 and therefore, the VI of water sector is = 1288.85/627 = 2.055. In this manner, the VI for all the sectors are calculated.

Baseline data on each Pressure and State variables has been collected using data of Census of India 2001 (with updation of provisional figures of Census of 2011 wherever available and applicable). State variables have been defined in terms of river system, climate, precipitation, rainfall, forests, health and education at district level. Pressure variables includes demography, (population growth, population density, sex ratio, work participation rate, urban population and literacy), land-use, agriculture, irrigation, livestock, horticulture, fisheries, industries, sericulture, roads and transport, electricity and hydropower.

Based on the approach and methodology described above, vulnerability assessment has been done both sectorally and geographically. The unit for assessment of geographical vulnerability is tehsil and district. Sectoral vulnerability has been assessed at tehsil level with respect to water, air, land, natural critical habitats, climate change, hazard susceptibility, spatial areas of conflict, quality of life (health) and quality of life (education). The sectoral vulnerability has been derived by adding values of each sector. With this methodology, the Vulnerability Index at the Tehsil Level and at the Sector Level is determined.

Predicated on baseline data, computation of State variable has been done at the district level. Computation of pressure variables has been done at the district level predicated on baseline data for pressure variables. On the basis of quantification of pressure variables, vulnerability index has been derived for all tehsils/districts in the State. This helps in assessment of pressure of sectors which impact most at tehsil level.

Predicated on quantification of pressure and state variables Vulnerability Index (VI) has been derived for all tehsils/districts in Himachal Pradesh. This has been done for comparison of VI of tehsils in a given district and to understand reasons for the vulnerability.

Analysis of State and Pressure variables at tehsil level has been done to help in identification and recommendation for plan/programmes/projects at tehsil level so as to reduce the vulnerability through prioritized sectoral interventions.

An attempt has also been made to understand the vulnerability in the regional context. Regional level vulnerability has been assessed with respect to vulnerability of a given tehsils of a district and tehsils of neighboring district(s) to understand how the levels of vulnerability of adjoining tehsils of neighboring district(s) impact on the given tehsils/district in a regional context.

Further, vulnerability scenarios have been derived based on the population projections at tehsil level for year 2011, 2021, 2031 and 2041. These projections are based on arithmetic increase, incremental increase and geometric increase methods. The vulnerability index and projected population have been interlinked by evolving a per capita share of vulnerability.

The details of above said aspects of vulnerability assessment of each district are given in Vulnerability Assessment: Himachal Pradesh (Main Volume I). The graphical description of location of district, state and pressure variables, vulnerability index of tehsils of each district, pressure points, projected vulnerability (2011-2041) has been given in a compendium "Atlas: Vulnerability Assessment of Himachal Pradesh (Volume II)".

The following section summarizes vulnerability at tehsil /district level expressed in terms of Vulnerability Index (VI) in 2011, ranking of tehsil/district in the order of High vulnerability to Very high vulnerability range (VI of 3 and above) and ranking of tehsil/district in the order of Moderate high vulnerability to Very low Vulnerability range (VI 0 to below 3). This allows comparison of districts with different VI ranges and also gives a glimpse of vulnerability of the State. This will help in prioritizing development actions within districts and among districts in Himachal Pradesh. Table 2 and 4 ranks the tehsil/district in the order of High vulnerability to Very high vulnerability range (3 and above) and Moderate high vulnerability to Very low Vulnerability range 0 to less than 3) respectively.

The ranking has been done to assist in prioritizing development actions within districts and among districts in Himachal Pradesh. The ranking of Tehsils as given in Table 2 based on VI indicates that 14 vulnerable tehsils falling in High vulnerability to Very high vulnerability range are located in 11 districts.

14 vulnerable tehsils falling in High vulnerability to Very high vulnerability range in 11 districts of Himachal Pradesh

Sr. No.	District	Tehsil	VI	Normalized VI
1	Mandi	Mandi	13086.31	5.34
2	Bilaspur	Bilaspur Sadar	12070.36	4.92
3	Sirmaur	Paonta Sahib	10937.76	4.46
4	Shimla	Shimla (Rural)	10092.86	4.12
5	Hamirpur	Tira Sujanpur	9890.36	4.04
6	Una	Una	8946.29	3.65
7	Kangra	Kangra	8319.54	3.39
8	Kangra	Dharamsala	8254.22	3.37
9	Solan	Kasauli	8133.61	3.32
10	Lahaul & Spiti	Lahaul	7952.12	3.24
11	Una	Amb	7739.29	3.16
12	Chamba	Dalhousie	7700.02	3.14
13	Kullu	Manali	7539.86	3.08
14	Chamba	Chamba	7382.41	3.01

Kinnaur district doesn't have any tehsil in High vulnerability to Very high vulnerability range. The budgetary allocations may be decided on priority for 14 highly vulnerable to very high vulnerable tehsils in 11 districts in Himachal Pradesh. For further setting of priority, the top 5 highly vulnerable districts and tehsil falling in Mandi, Bilaspur, Sirmaur, Shimla and Hamirpur districts with VI value of 4.0 and above are given in Table 3.

Top 5 highly vulnerable districts and tehsils in Himachal Pradesh

Sr. No.	District	Tehsil	VI	Normalized VI
1	Mandi	Mandi	13086.31	5.34
2	Bilaspur	Bilaspur Sadar	12070.36	4.92
3	Sirmaur	Paonta Sahib	10937.76	4.46
4	Shimla	Shimla (Rural)	10092.86	4.12
5	Hamirpur	Tira Sujanpur	9890.36	4.04

Of the 11 districts, it may be noted that 3 districts namely Chamba, Kangra and Una districts have 2 tehsils each while 8 districts have one tehsil each which are in highly vulnerable to high vulnerable range as given in Table.

Predicated on the analysis of baseline data on pressure and state variables, computation of VI at tehsil/district level, assessment of vulnerability in the regional context, plan/programme/project level recommendations have been suggested at tehsil level for each district and summarized in a response matrix for all 12 districts as given in Table 4. The suggested development action with respect to State and Pressure parameters is aimed to reduce vulnerability and foster sustainable environmental and social development across the State.

Public Consultation and Communication Strategy

A strong public consultation and communication policy will enable women and men to address some of their climate adaptation imperatives and also protect key environmental resources like land, water and forests.

Public Consultation and Communication strategy is a guiding tool to address environmental concerns across key selected sectors through operational mechanisms involving a partnership between the implementing agencies, development departments, local government and the affected women and men. It is based on the understanding that where communities are part of the decision-making and management process, the likelihood of compliance will correspondingly increase; and this will also minimize conflicts between communities and natural resources as well as between them and the various government regulatory and implementing agencies.

Primary level consultation was conducted at department, blocks and community level to understand need of public consultation and communication strategy for effective implementation of EMP. Based on the need and consultation recommendation have been suggested, and some are highlighted below.

Progressive Levels of Public Participation

Level	Scope	Government's Responsibility	Public Consultation and Communication Tools (Some examples)
Inform	One-way communication from government agencies to the public	Provide the public with timely, accurate, clear, objective and complete information to spread awareness and educate the public	✓ Public notices/fact sheets ✓ Awareness campaigns ✓ Exhibitions and demonstrations ✓ Site/exposure visits ✓ Press Releases ✓ Website ✓ SMS alerts
Input (consult and solicit Input)	Seek public feedback. Requires a response from the public but limited opportunity for a two-way dialogue	Inform stakeholders how their concerns and issues are reflected in the decisions taken and provide feedback on how public input influenced the decision	✓ Public meetings ✓ Public hearings/Citizen jury ✓ Seminars and Conferences ✓ Research study recommendations ✓ Surveys ✓ Conducting a poll ✓ Public Watchdog Committees ✓ Interactive website including a response mechanism ✓ Video-conferencing
Involve	Work directly with the public to establish a two-way communication to Inform, elicit responses and incorporate feedback	Convince, and not just inform, stakeholders on how their concerns and issues are reflected in the decisions taken and provide feedback on how public input influenced the decision	✓ Stakeholder consultation ✓ Reference Groups ✓ Citizen Advisory Committees ✓ Event Forum
Collaborate	Pro-actively involve interested sections of society to integrate their knowledge and expertise into the decision-making process	Incorporate stakeholders' advise and recommendations into the decisions to the maximum extent possible	✓ Working Groups ✓ Joint Expert Panels ✓ Appointed Citizen Representative/s ✓ Citizen oversight and compliance boards ✓ Focus group research ✓ Referendums

Risk and Risk Management regarding Public Consultation

Identifying and Managing Risks

Risks	Managing Risks
Complexity of information needs to be digested before informed public participation is possible	✓ How much information needs to be communicated to the public? ✓ How much learning is required by the public? ✓ How abstract or technical is the information?
There is potential for negative environmental or social impact	✓ What is the potential for community conflict post the decision – low, medium or high? ✓ What is the potential for social, environmental, financial damage if a wrong decision is taken – low, medium or high? ✓ How many unknowns are there in the current decision-making – none, few, many?
Normally, people, especially women, do not participate in meetings	✓ Have all people – across gender, caste, class, religion, ethnic group and geographical location – been adequately informed about the public consultation? ✓ Is the meeting close to where majority of the public resides? ✓ Do women and men think their inputs will affect the outcome? ✓ Is it the harvesting time or festival time? ✓ Do women and men have adequate knowledge and understanding of the issue?
PRIs and the government administration are not in consensus with each other	✓ Is there an adequate legal requirement for public consultation and communication? ✓ Are there sufficient technical and financial resources with the implementing agency – the local government – to invest in adequate public consultation and communication? ✓ Are the roles and responsibilities of the bureaucracy and PRIs clearly articulated and understood by all? ✓ Is there a need to sensitise and build capacities to work towards a common good? ✓ Is public participation and communication strategies and action plans built into the work plans of the government departments?

Risks	Managing Risks
Departments display limited interest in public consultation process (eg Department of Information and Press Relations primary focus is to earn goodwill from the public for the government)	✓ Is the purpose and process of public consultation transparent and widely communicated? ✓ Are there checks and balances within the process to limit monopoly of control on outputs and outcomes of the consultation? ✓ Is the department clear on how it will document feedback/responses, how it will deal with these and how it will share these with the public? ✓ Is the public consultation inclusive and does it reflect a healthy diversity of views?
Community-based organization are not actively initiating, supporting or participating in public consultation and communication activities	✓ Is there enough capacity and information with CBOs to fully participate in public consultations ✓ Are Gram Panchayat's playing their role? ✓ Is the relevant bureaucracy playing its role? ✓ Are their financial constraints? ✓ Are there political reasons? ✓ Is there any social or economic emergency that is acting as a barrier? ✓ Are other stakeholders – opinion leaders, NGOs, etc – involved to make public consultation meaningful?
Private sector enterprises do not promote public consultation and communication	✓ Is there a legal provision for appropriate public consultation and communication in public-private initiatives? ✓ Has the relevant government department communicated to the private entrepreneur the non-negotiable nature of public participation and communication? ✓ What are real reasons for the private entrepreneur for not supporting public consultation and communication?
Public is unhappy with the way their inputs/comments/suggestions have been handled	✓ Were the inputs/comments/suggestions documented and was there a common understanding on these? ✓ Has the handling of the responses been transparent and fair? ✓ Were public concerns overridden due to vested interests? ✓ Is the authority handling inputs from women and men the competent authority for this responsibility?

Key guiding principles to hold public consultation and communication:

- Clarity on purpose of public consultation.
- Clarity on why the consultation is happening.
- Clarity on the process of consultation, including how inputs/feedback will be collected and dealt with.
- Identification of all the groups and individuals – women and men - who are likely to be affected or are concerned about the issue on which the consultation is to happen.
- Clarity on which authority and who in that Department/local government is managing the process and ensuring availability of required contact details to those being consulted.
- A realistic timetable will be drawn up to allow sufficient time for women and men to be informed and to prepare for the consultation as well as to give their feedback/send their responses.
- Active participation by affected marginalised women and men across class, caste, religion, ethnicity and geography will be encouraged..
- Fair access will be ensured, especially for marginalised women and men, by providing the necessary means for all to participate, e.g. through use of appropriate media including SMS, use of local language, accessible venue, child care facilities, etc.
- Co-ordination of the process of consultation with any others who may also be taking the lead to bring all stakeholders together on the same table will be ensured.
- Clarity on how outcomes will be shared and this will be done in a transparent and fair manner.
- Evaluation will be done with public participation wherever necessary regarding the effectiveness of the consultation both in an ongoing manner and at the end of the consultation process.

Key actions for the Government/DEST

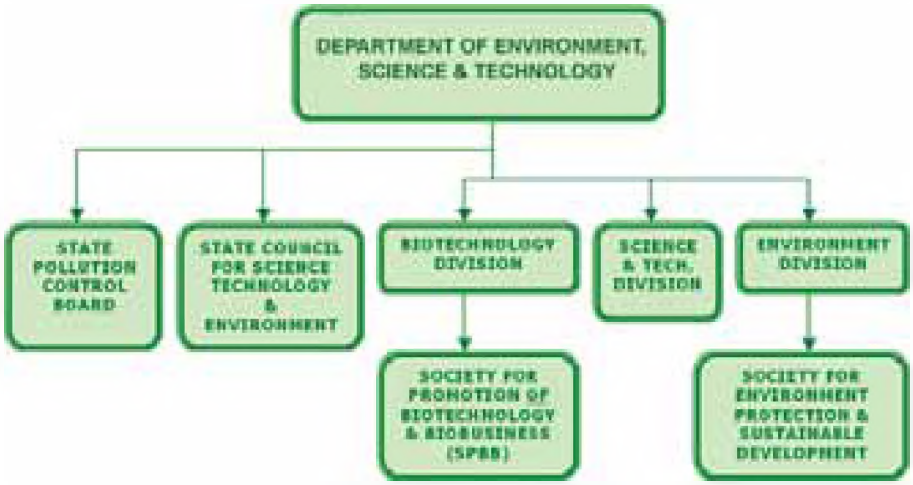
- The push for public consultation and communication will come from the highest levels of the government to ensure that this strategy permeate every government department.
- Public consultation and communication strategy will have a strong legal backing with a special focus on women.
- Gender-just participative approaches will be promoted at all levels – in designing, planning, implementing, monitoring and evaluation
- Public consultations on environmental aspects will be part of the approval process for all relevant DPRs, especially those with high carbon footprints.

- Department of Environment, Science and Technology will have a separate wing with additional/built financial and human resources to coordinate this Strategy to take the lead for monitoring and evaluation.
- Public-private partnerships will come under the purview of the legally-backed public consultation and communication provision with mandated public disclosure and reporting regulations.
- Benefit-sharing will be promoted, especially in hydro-power projects and other development projects through various means including ownership of shares.
- Critical sectors like water will include provisions like cumulative water basin plans, in line with sectoral guidelines.
- It is recommended that Local Area Development Authorities be set up to ensure that EMP sectoral guidelines are being followed.
- Government will take the lead in building capacities of PRIs and CBOs to design and implement as well as participate in public consultation and communication activities.
- Government will give more space to civil society actors, including NGOs, to participate in public consultation and communication processes as pro-active and positive stakeholders.
- Government will ensure that diversity in terms of gender, interest groups, all stakeholders, is reflected adequately in the public consultation and communication process.
- Department of Information and Public Relations as well as Department of Panchayati Raj will build their capacities in, and demonstrate stronger commitment to, public participation and communication.

Institutional Mechanism for Implementation of the EMP

The implementation of the Environment Master Plan to manage local environment issues requires undertaking certain tasks. However, implementation of such tasks requires aligned and coordinated efforts under government approved Policies, Acts, Rules and standards. However, this can only be achieved by developing an operational institutional mechanism with an objective to undertake following major tasks:

- Develop an operational mechanism for overall coordination.
- Define roles and responsibilities of departments related to the sectors in the context of environment management.
- Develop a mechanism for each department to enable issue identification, preparation and implementation of management plans, accountability mechanisms, monitoring and enforcement procedures.
- Develop mechanism to ensure that each sector has in-built monetary mechanisms to address environmental issues in their development plans.
- Establish mechanism to integrate regional and local level plans at the area level to enable a decentralized planning process.



To design the Institutional Mechanism for the EMP, a consultative approach was used. Primary data was collected mainly by using the interview method where in Nodal Officers, Secretaries, Directors and Additional Directors of various line departments and the DEST were interviewed. The data collected was checked for consistency. This process helped arrive at an analysis of the current perception of environmental concerns, existing institutional structure, the functional gaps with respect to policy, organizational resources or structure, activities and overlaps between departments. The gaps have been identified within the existing institutional mechanism of respective department related to environmental issues and effective implementation of EMP.

Some options to over-come the same has been suggested. These include establishment of an **Environmental Unit** (part of organization structure, delegated authority, functions on regular basis scrutinizes activities/projects of the department from environmental considerations including adherence to sectoral guidelines and advises accordingly), **Environment Cell** (functions like environmental unit but not part of organizational structure, have 2-3 designated environmental personnel on board – less authority, meets occasionally and scrutinizes activities/projects of the department from environmental considerations including adherence to sectoral guidelines and advises accordingly) and "designating" an **Environmental Officer** with a department (scrutinizes projects/activities from environmental considerations including adherence to sectoral guidelines and advises accordingly). Further, a list of identified support organizations which can support in bridging the gaps has been given in the report.

The proposed institutional mechanism will operate mainly through existing administrative and governance structures of the State. However, for developing the institutional mechanism, function-wise analysis has been carried out and the responsibility has been entrusted to specific entity besides providing supporting roles to other entities. The list with **"R"** as main responsible entity and **"A"** as supporting roles is given below.

Responsibility Distribution amongst Various Government Entities for Implementation of EMP

	DEST	HPCOST	HPSPCB	Energy	Other Stakeholders	Remarks
Policy	R	A	A	A	A	Empowered Committee
Advisory	R	A	A	A	A	
Coordination and Management	R					
Research, Research Management and Coordination	A	R	A	A	A	Funding could come from HP Environment Fund – by earmarking a minimum specified percentage of funds for Research
Data Management and ENVIS	R	A	A	A	A	Funding could come from HP Environment Fund – by earmarking a minimum specified percentage of annual funds for ENVIS
Monitoring and Regulation	A		R			Funds could come from fees besides fines/penalties for non- adherence
Training	Organization – to be identified					Funding could come from HP Environment Fund – by earmarking a minimum specified percentage of funds for training
Grievance redressal	R	A	A	A	A	
Fund Management	R				A	

The responsibility of coordination with various stakeholders, government departments and other development agencies would be of DEST. It should not only co-ordinate with various identified stakeholders but would also seek their opinions and communicate it to the GoHP as well as integrate it in future policy development. It should develop required formats and procedures for seeking even the public opinion on various environmental issues and as a feedback to policy improvements. Since the information is to be collected from public, Non-Government Organizations and Community Based Organizations (NGOs and CBOs) may be engaged and made partners to undertake the field activities to support DEST.

For effective and operational coordination and management, formation of **High Level Steering Committee** is suggested. This High Level Steering Committee for EMP (HLSC–EMP) may have its secretariat in the DEST, thereby forming a major part of the mandate of the department. The HLSC–EMP should be chaired by the Chief Secretary and the Secretaries/Heads of all the key departments as its ex-officio members. Respective Secretaries/Heads of all the key departments should be supported by Departmental Nodal Officers. The Committee should not only direct/steer the implementation of EMP but also monitor the progress of implementation.

Training and Capacity Enhancement

The Government of Himachal Pradesh explicitly recognises the need for training and capacity enhancement ever since it formulated the State Training Policy 2009. The Policy enjoins upon the government "a duty to ensure that it makes all efforts to improve the competence of its employees who are the principal agents of delivering all that the State strives to achieve for its people.'

The key objectives of the State Training Policy are to:

i. Promote better understanding of professional requirements in the given and emerging socio-economic and political environment.
ii. Update and enhance professional knowledge and skills needed for better performance of individuals and organizations as a whole.
iii. Bring about the right attitudinal orientation

Figure 1.1: Stakeholders for Capacity Enhancement

Further, the State Training Policy is action-oriented. The Policy:

- Targets Class IV to Class I government officers as well as public representatives like State Legislators, elected members of Panchayati Raj Institutions and Urban Local bodies.
- Provides for a 'Training Need Analysis' focusing on separate training needs for different categories of employees.
- Provides for a Training Manager in every department, to be designated as one from among the department officers.
- Earmarks 1% of the salaries head of annual budgets as the training budget in every department and to be managed by the Training Manager.
- Accords a high priority to monitoring and guidance by setting up a State-Level Empowered Committee headed by the Chief Secretary to review departments' Annual Action Plan for Training, and a Training Review Committee in each department headed by the department's Secretary.
- Promotes training through state, regional, national and foreign training universities and institutions

Adding the environmental dimension to the State's official Training Policy is imperative because the Himachal Pradesh government gives high priority to environment protection and rejuvenation and, in recent times, to the impacts of climate change. The need to integrate economic growth with environmental protection is necessary for long-term benefit from both. State-of-the-art training of government officials in environmental management will bring a better appreciation of environmental implications especially in government departments governing high carbon footprint sectors.

The Department of Environment, Science and Technology (DEST) has identified some key sectors (see Table 1.1 below) that fall under the purview of the State Environment Master Plan (EMP). The EMP is a guiding tool to address environmental concerns across key sectors which encompass the three categories of the infrastructure sector, natural resource management-related or primary sector and the services sector. The Environmental Capacity Enhancement Component (ECEC) is an integral part of the EMP to ensure availability of requisite capacities and skills within departments for the implementation of the EMP. In addition to the identified sectors, the ECEC also covers other related sectors and regulatory bodies.

Proposed Areas for Training and Capacity Building for Sectors

INFRASTRUCTURE SECTOR	NATURAL RESOURCE SECTOR	SERVICES SECTOR
▪ Tourism, Art, Architecture & Cultural Heritage ▪ Portable Water Supply ▪ Sewage ▪ Health ▪ Road & Transport ▪ Mining & Geology ▪ Industries ▪ Energy ▪ Market Infrastructure ▪ Rural Planning ▪ Urban Planning ▪ Municipal Solid Waste Management ▪ Hazardous Waste	▪ Forest & Wildlife ▪ Wetland ▪ Fisheries ▪ Horticulture ▪ Agriculture ▪ Animal Husbandry	▪ Education & Vocational Training ▪ It & Telecom ▪ Livelihood

Gap Analysis of Departments across Sectors

Departments/ Sectors	Current Training Focus	Gap Analysis
Natural Resource Management-related Agriculture, Animal Husbandry & Dairying, , Environment, Forests & Wildlife, Horticulture, Fisheries, Irrigation	▪ Presence of trained experts on environmental issues ▪ Technical and skill building environmental courses. e.g. Insect and pest management; marketing of products; fodder development; role of forestry in watershed management	▪ Focus is on productivity, outputs and yields not balanced with an equal emphasis on conservation and rejuvenation of environmental and natural resources ▪ Implications of future trends - increasing population pressure, the imperatives of development and climate change - are inadequately understood and addressed though all these are putting additional pressure on the quantity and quality of natural resources ▪ Training courses follow a sectoral approach and not an eco-system approach. Forest department conducts some excellent training courses but needs to strengthen them through an eco-system approach

and Public Health, Land Revenue department, State Pollution Control Board, etc.	▪ Some training of elected representatives on disaster management and understanding climate change	▪ Training does not take into account women's traditional knowledge on agriculture and allied activities (crop varieties, animal species, seed selection & storage, bio-pesticides, etc), nor adds value to it ▪ Legislators are not trained in adaptation measures – neither on local measures based on traditional knowledge and practice that can be scaled up successfully, nor on new measures. ▪ Training on participatory social audit needed for larger impacts and effective monitoring & evaluation
Infrastructure-related PWD, Industries, Power, Transport, Mining, Chemicals & Pharmaceuticals, Tourism, IT and Telecom, Urban development, Waste Disposal etc.	▪ Presence of at least one trained expert on technical environmental issues ▪ Training primarily on green technologies for e.g. plastic-bitumen roads, use of plantations to stop soil erosion, lining roads with trees, mandating setting up of dumping sites at all PWD works and using bio-engineering solutions in sewer works ▪ Some training of elected representatives on clean & green cities including solid waste management, use of public water purifiers for tourism and general public and clean polythene campaign ▪ Some training on social audit.	▪ Designated officers for environment too few – usually just one – and located only at the headquarters, not in field/implementation areas ▪ No focus on resource constraints and rejuvenation of environmental and natural resources as integral to operational plans ▪ Inadequate incorporation of environmental issues in trainings of regulation bodies though these bodies are key to maintaining health of environmental resources ▪ Trainings are sectoral and project-focused, not taking a macro or a 'programmatic' view for e.g. need to take the entire river basin as a parameter for each hydro-power unit ▪ Trainings do not include backward and forward linkages which are necessary for environmental considerations for e.g. mining plans, construction of roads with adequate drainage ▪ Elected representatives are not exposed to some of the best practices in eco-friendly urban development and management that are available in India and particularly in Latin American countries. ▪ Inadequate attention to use of state-of-the-art technology like GIS for planning and monitoring ▪ Inadequate knowledge about cross-sectoral linkages, understanding of convergences ▪ Attitudinal change required for more pro-environment decision-making and management practices

Services-related Health, Education, Waste Disposal, IT and Telecom, Livelihoods, etc	▪ Teachers' training plan linked to the school curriculum and pedagogy NCERT books up-to-date; not State Board books ▪ Health-related trainings focus on current diseases in current locations, inadequate for developing needs like spread of malaria and water-borne diseases due to climate change Health department – legally committed to proper disposal of medical waste	▪ Teachers' training to be linked to school subject matter on environment/climate change with up-to-date ▪ Inter-departmental linkages. e.g. Environmental health, Land use and waste disposal, on-site environmental training for teachers on environmental resources across sectors ▪ Backward-forward linkages in service industry, e.g. solid waste management with backward linkage of segregation and forward linkage of using compost, etc. ▪ Inadequate environmental training to members of PRIs, gram sabhas and Urban Local Bodies; expansion of programmes like Community Led Assessment, Awareness, Advocacy and Action Programme (CLAP) for environmental improvement and carbon neutrality required ▪ Training in central management policies like green procurement and promoting environmental citizenship among staff and beneficiaries of programmes
A major training gap across sectors is lack of cross-sectoral or cross-departmental training with regard to environmental and climate change issues.		

Based on the gaps and knowledge on Environment management, a training content, level and types of training has been suggested at the department level.

The Environmental Capacity Enhancement Component envisages **three training levels** in every department linked to presence of different competencies within each department. The administrative head will be the designated Training Manager. Basic or orientation training will be given to all operational staff. Specialist training will be given to 2-4 officers within the department and super-specialist training will be given to at least one person in every department. The basic courses try to provide wide-ranging information essential for incorporating environmental dimensions in general policy implementation.

Monitoring and Evaluation Protocols

A Monitoring and Evaluation (M&E) protocol has been developed to strengthen the existing structure through specific M&E indicators identified. Further, enabling tasks like training needs has been identified to address needs of the sectors/departments for better understanding and implementation of the EMP as part of Task 6 on Training and Capacity Enhancement.

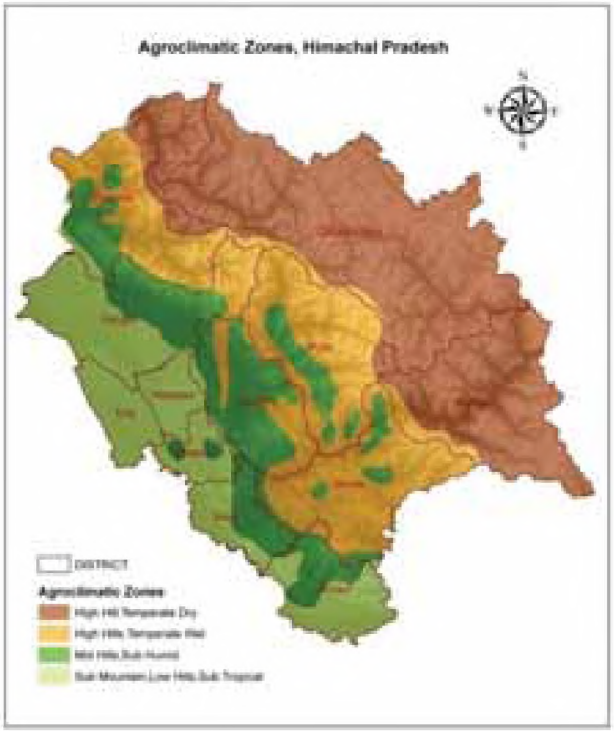
Overall, the Environment Master Plan is intended to be a platform for engagement among implementing agencies, developmental agencies and the local government, to take action w.r.t. environmental issues of local concern on priority. It would also act as a tool for monitoring environmental performance and progress for departments.

Conclusions on Scope of work

I. Identification of different eco-zones with specific environment attributes

Physiographically, Himachal Pradesh is part of the Himalayan system. From south to north it can be topographically divided into three zones: (i) The Shivaliks or Outer Himalayas, (ii) Inner Himalayas or mid-mountains, and (iii) Alpine zone or the Greater Himalaya.

Different zonations of Himachal Pradesh have been described in details in Task 1, Establish Baseline conditions. Summary of the description of zonations in Himachal Pradesh namely 1. Agro-ecological Zones and Vegetation Types, 2. agro-climatic zones, 3. zonation based on horticulture resources and 4. Eco-sensitive zones with respect to Environment Protection Act, 1986 and notification Environment Impact Assessment, 2006 is given below.



1. Agro-ecological Zones and Vegetation Types: The State of Himachal Pradesh has been divided into four agro-ecological zones based on altitudes, which are associated with different forest types each having trees, shrubs and herbs species. These are i) Sub-tropical zone, comprising low hills up to 1000 m., ii) Sub-tropical zone, covering mid- hills between 1000m-1500 m, iii) Temperate wet zone representing high hills between 1500m - 3000 m and iv) Temperate dry zone representing high hills above 3000 m (Alpine pasture zone)
2. Agro-climatically, the State has been divided into four zones keeping in view the altitude, rainfall, temperature, humidity and topography.
3. While maximum geographical area of the State falls under high hills and temperate dry zone (Zone-IV), the highest percentage of cropped area is in the mid hills and sub-humid zone (Zone-II). Likewise, the maximum precipitation is experienced in Zone II which ranges from 1,500 to 3,000 mm per annum.

The salient features of different zones have been briefly described below:

i. Sub-Montane and Low Hills Subtropical Zone (Zone-I): The soils of this zone are productive, if fertilized. The texture of the soil varies from loamy to sandy loam. The average rainfall is 1100 mm of which 80 per cent is received during July to September. The farming is rain fed as only 16.6% of the total area is under irrigation.

ii. Mid-hills Sub-humid Zone (Zone-II): The texture of the soils in Zone II is loam to clay loam.

iii. These are deficient in nitrogen and phosphorus and have poor water and nutrient holding capacity. The area from Dharamshala to Jogindernagar in the foothills of Dhauladhar ranges receives rainfall as high as 3,000 mm most of which comes between mid June to mid September. In the remaining areas, it is around 1,500 mm. While maize, rice, wheat, potato, pulses and oilseeds are major field crops, stone and citrus fruits are important fruit crops. The area under irrigation is only 17.5% and kuhls (gravitational flow channels) are the important source of irrigation.

iv. Mid-hills Temperate Dry Zone (Zone-III): The soils of this zone are shallow in depth, acidic in reaction and silt loam to loam in texture. These are deficient in nitrogen and phosphorus. The average rainfall is 1,000 mm most of which is received during the monsoon season. The zone is suitable for growing horticultural crops, particularly apple, plum and apricot. Cultivation of off-season vegetable crops like peas, cabbage, cauliflower and tomato has gained ground in some areas

v. High Hills Temperate Dry Zone (Zone-IV): The soils of this zone are mainly sandy loam, neutral to alkaline in reaction and have low fertility. This zone has the highest percent of irrigated area (40.6%). The important crops include potato, barley, buck wheat, peas and minor millets. The area is particularly suitable for growing off-season vegetables and seed production. In general, only one crop can be grown during the whole of the agricultural year because of heavy snowfall in winter from November to April.

4. From the Horticulture resources point of view, the State has been divided into 4 zones namely i. Low Hill and Valley areas near the plains, ii. Mid Hills (Sub Temperate), iii. High Hills and Valleys in the interiors (Temperate) and iv. Cold and Dry Zone (Dry Temperate).

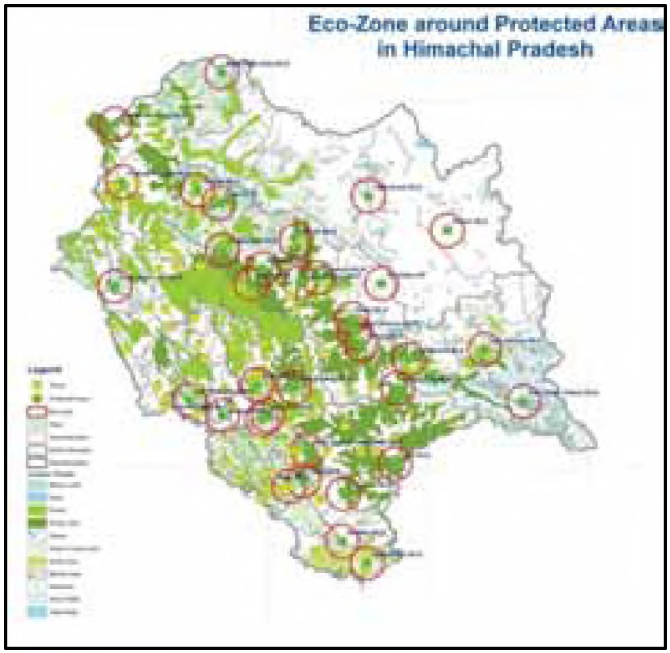
Horticultural resources (crops) and Zones in Himachal Pradesh is given in Table.

Horticultural resources (crops) and Zones in Himachal Pradesh

Sl. No.	Zone Description	Elevation Range (amsl)	Rainfall (cms)	Suitable Fruit Crops
1	Low Hill and Valley areas near the plains	365-914	60-100	Mango, Litchi, Guava, Loquat, Citrus Fig, Ber, Papaya, Early varieties of Grapes, Jack Fruit, Banana, Low chilling varieties of Peach, Plum and Pear, Strawberry
2	Mid Hills (Sub Temperate)	915-1523	90-100	Stone Fruits (Peach, Plum, Apricot, Almond), Persimmon, Pear, Pomegranate, Pecan nut, Walnut, Kiwi Fruit, Strawberry
3	High Hills and Valleys in the interiors (Temperate)	1524-2742	90-100	Apple, Pear (Soft), Cherry, Almond, Walnut, Chestnut, Hazel- nut, Strawberry.
4	Cold and Dry Zone (Dry Temperate)	1524-2656	24-40	Apples, Prunes, Drying type of Apricot, Almond, Chilgoza, Pistachio nut, Walnut, Hazel-nut, Grapes and Hops

Eco-sensitive zones

Environment Protection Act (EPA), 1986, chapter 2, section 3 (2):V provides for restriction of areas in which any industries, operations, or processes or class of industries, operations or processes shall not be carried out or shall be carried out subject to certain safeguards. Eco-sensitive Zones have been identified in India as per Environment Protection Act, 1986. However, no Eco-sensitive Zone has been notified in Himachal Pradesh under EPA, 1986 by Ministry of Environment and Forest.



Wildlife Conservation Strategy 2002 adopted by Indian Board for Wildlife, *interalia,* envisages declaring land falling with in 10 kms of the boundary of National Parks and Sanctuaries as eco-fragile zones. MOEF brought this matter to the attention to State/UT Governments. Guidelines for declaration of Eco-sensitive zone around National Parks and Sanctuaries were issued to the State/UT Governments vide D.O. no. 1-9/2007 WL (pr), dated 11th December 2012 followed by letter dated 31-

12-2013. Whereby the States/UTs were requested to submit site specific proposals for declaration of eco-sensitive zones around National Parks and Sanctuaries to MoEF by 15th February 2013. In case the State/Union Territory Government fail to submit the proposals within the stipulated period, the activities that have been prohibited as per the guidelines of the Ministry dated 9th February 2011 would stand prohibited within 10 kms of the boundary of National Parks and Sanctuaries.

Nevertheless, the Environment Impact Assessment (EIA) Notification, 2006 and subsequent amendments specifies list of projects or activities requiring prior environmental clearance and attaches general and specific conditions for screening, scoping, public consultation and appraisal of project for consideration of environment clearance. As per EIA notification 2006, the general conditions are "Any project or activity specified in Category 'B' will be treated as Category A, if located in whole or in part within 10 km from the boundary of: (i) Protected Areas notified under the Wild Life (Protection) Act, 1972, (ii) Critically Polluted areas as notified by the Central Pollution Control Board from time to time, (iii) Notified Eco-sensitive areas, (iv) inter-State boundaries and international boundaries."

EIA notification, 2006 has identified category for **project or activity** as category A and category B with threshold limits defined for **Mining, extraction of natural resources and power generation** -for a specified production capacity (Mining of minerals, Offshore and onshore oil and gas exploration, development & production, River Valley projects, Thermal Power Plants), **Primary Processing (**Coal washeries**,** Mineral beneficiation), **Materials Production (**Metallurgical industries -ferrous & non ferrous, Cement plants), **Manufacturing/Fabrication (**Manmade fibers manufacturing, Distilleries, Integrated paint industry, Pulp & paper industry excluding manufacturing of paper from waste paper and manufacture of paper from ready pulp without bleaching, Sugar Industry, Induction/arc furnaces/cupola furnaces 5TPH or more), **Service Sectors (**Isolated storage & handling of hazardous chemicals), **Physical Infrastructure including Environmental Services (**Common hazardous waste treatment, storage and disposal facilities, Ports and Harbours, Highways, Aerial ropeways, Common Effluent Treatment Plants (CETPs), Common Municipal Solid Waste Management Facility (CMSWMF) attracts general conditions.

Himachal Pradesh has a Protected Area Network comprising 32 wildlife sanctuaries and 2 national parks spread over 10 districts of the State. This is about 12.8 % of the State's geographical area. Therefore, it can be surmised that 10 kms area around the existing PAs are "eco-sensitive zones" from the perspective of EIA purposes, whether separately identified /declared/notified by Government of Himachal Pradesh/MoEF or not. However, it may be noted that Una and Hamirpur have no PA. Nevertheless, Una's district's tehsils namely Una, Amb and Haroli located in west and south share district boundaries with Punjab. For the EIA purposes, any proposed category B project located in Una, Amb and Haroli tehsils which falls within 10 kms of the boundary of Punjab will be considered eco-sensitive zone and will be treated as a category A project for consideration of environment clearance. However, in the context of EIA, it may be noted that Hamirpur has no PAs, critically polluted areas, eco-sensitive zone and interstate or international boundaries.

In January 2010, Central Pollution Control Board (CPCB), in association with Indian Institute of Technology (IIT), New Delhi, have carried out an environmental assessment of industrial clusters across the country based on Comprehensive Environmental Pollution Index (CEPI) with the aim of identifying polluted industrial clusters and prioritizing planning needs for intervention to improve the quality of environment in these industrial clusters and the nation as a whole. The assessment so carried out has been documented in the form of a report entitled, 'Comprehensive Environmental Assessment of Industrial Clusters'. In all, 99 industrial clusters have been assessed. The report has concluded that the industrial clusters/areas having aggregated CEPI scores of 70 and above should be considered as critically polluted; the clusters/areas having CEPI scores between 60-70 should be considered as severely polluted areas (in Himachal Pradesh, Baddi, Kala Amb and Parwanoo fall under this category) and shall be kept under surveillance and pollution control measures should be efficiently implemented; and the critically polluted industrial clusters/areas need further detailed investigations in terms of the extent of damage and formulation of appropriate remedial action plan. The developmental projects from industrial clusters with CEPI score between 60-70 (as listed at serial no. 44 to 75 of the Annexure), which are in the pipeline or have been received for grant of environmental clearance in terms of the provisions of EIA Notification, 2006 [including projects for stage-I clearance, i.e. scoping (TORs)], will be considered following the procedure outlined in MoEF's earlier circular no.]-11013/18/2009-IA.II (I) dated 25th August, 2009 relating to 'proposals for environment clearance for the projects located in the critically polluted areas as identified by the Central Pollution Control Board'.

In the above said context of eco zones in Himachal Pradesh, it can be surmised that 10 kms area around existing National Parks and Sanctuaries, Critically Polluted areas, inter-State boundaries and international boundaries in the state are of particular significance for identification and assessment of the impacts of development project/activities and mitigation thereof

In addition, Wildlife Division of MOEF vide F. No. *6-10/2011* WL, dated 19th December, 2012, issued Guidance document for taking up non forestry activities in wildlife habitats. These guidelines prescribe the process of obtaining recommendations of the Standing Committee of NBWL under the Wild Life (protection) Act 1972 with respect to the areas, for which this process is mandatory under the law, and also in compliance to relevant Hon'ble Supreme Court orders. These guidelines replace the guidelines dated 15.03.2011 issued earlier in this regard, along with all amendments made therein.

The Guidance document covers Activities inside Protected Areas (including activities National Parks, Wildlife Sanctuaries, Tiger reserve, Conservation Reserves), Activities in areas other than Protected Areas including Activities within 10 Kms from boundaries of National Parks and Wildlife Sanctuaries, a and activities within areas connecting the Tiger Reserves, notified by NTCA for controlling the land use. It specifies procedure to be followed for consideration of proposals by the Standing Committee of National Board for Wildlife and proposals for survey work to be carried out inside national parks and wildlife sanctuaries;

II. Preparation of a detailed resource inventories covering all environment parameters

The baseline reports of Infrastructure, NRM and services have been prepared as per common parameters (including environment parameters) for scoping baseline for NRM and services sector as given in Terms of Reference (ToR) of Task 1: Establish Baseline Conditions.

III. Inventorization of needs of different sections of the population

Inventorisation of needs of different sections of the population has been done as per ToR of task 1 Task 1: Establish Baseline Conditions item no. (x) "Data / documentation pertaining to addressing demographic issues in the context of the sectors, such as population changes; requirements of populations and changing lifestyles, migratory populations including tourists, transhumants; transit labour population; pressures felt by communities due to degraded environment conditions"

IV. Trend analysis of cumulative environment degradation

Trend analysis of cumulative environment degradation has been done as per ToR of Task 1: Establish Baseline Conditions item no. (viii) Environment Monitoring (key parameters such as Air and Water pollution) carried out for activities related to the Sector. The Air and Water quality of locations monitored by Himachal Pradesh Pollution control board have been compiled, collated and trends of improvement/deterioration have been provided. Changes in forest cover since 1972 has also been provided in the baseline report. The baseline data have been used for conducting Spatial Vulnerability Assessment and formulating planning principles (as part of Task 2).

V. Vulnerability assessment in the context of air, water and land to establish different development zones

Vulnerability assessment in the context of air, water and land has been carried out as part of the Task 2, Conducting Spatial Vulnerability Assessment and formulating Planning Principles. Methodology for vulnerability assessment includes *inter alia* identification of variables that define the entity, the natural systems or State. Air, water and land has been included in the "pressure variable" as part of identification of 'Pressure' and 'State' variables for analyses and understanding as 'how' and 'where' a particular system is exposed and hence vulnerable at different degrees. The pressure and state variables have been used to compute Vulnerability Index. The VI derived from baseline data of 2001 has been forecasted as "vulnerability scenario projections" for 30 years (2011-2021-2031-2041) at district and tehsil level. Based on computation of VI, different tehsils with different VIs have been spatially represented to establish and show different development zones (at tehsil level). Further, an attempt has also been made to understand the vulnerability in regional context. Vulnerability in regional context gives an understanding of how the levels of vulnerability of adjoining areas/ tehsil/ sub tehsil within the district or other districts are impacting the levels of vulnerability of current areas/ tehsil/ sub tehsil. This is also helpful in consideration of the prioritization of development interventions in different tehsils.

VI. Documentation of potential threats and new development policies

Predicated on the baseline data, documentation of potential threats and new development policies has been done as per ToR of Task 1: Establish Baseline Conditions, particularly item no (v) Critical Environment issues/Hotspots associated with sector and ToR item (III) Regulatory analysis to identify any regulations that have environment implications (negative or positive) and compliance with the same.

VII. Formulation of appropriate development criteria for optimization of resource use

The development criteria have been defined in Task 2 Conducting Spatial Vulnerability Assessment and formulating Planning Principles. Following steps define methodology for vulnerability assessment:

a. Identification of variables that define the entity, the natural systems or State.
b. Identification of the variables of the stressor, or the pressure.
c. Inter-linking the State (natural systems) variables and the Pressure variables (Infrastructural related).
d. Assessment of Vulnerability for the Tehsil.
e. Identification of the ability, or Response variables to resist and mitigate the stress.

Pressure variables are those which create stress on "State" i.e. natural and manmade systems. These variables have been selected based on the importance and impact these variables make on the "State" and for which data /information is available for vulnerability assessment at District/ Tehsil/ Sub tehsil level. Based on these attributes, 13 pressure variables have been identified namely Utilities & Infrastructure, Irrigation, Agriculture, Forestry, Fisheries, Tourism, Industry, Mining, Roads, Railway, Transportation, hydel power and demography. These parameters are also the key sectors which are drivers of growth in the State and contribute to the State's economy.

"Pressure" and "State" variables have been analyzed to give a level of understanding as 'how' and 'where' a particular system is exposed and hence vulnerable at different degrees. This has been expressed as Vulnerability Index.

Development criteria are defined as the "pressure" parameters that include Utilities & Infrastructure, Irrigation, Agriculture, Forestry, Fisheries, Tourism, Industry, Roads, Railways, transportation, hydel power and demography. The pressure that these parameters put on "state" variable namely water, air, land, critical habitat (natural), critical habitat (manmade), climate change, hazard susceptibility, spatial analysis, Quality of Life-Health and Quality of Life-Education with reference to national standards and benchmarks of services to be provided, has been quantified in terms of gaps. This also gives the quantitative assessment of resources, including natural resources which need to be managed optimally for sustaining natural ecosystems and dependent current and future needs of human population.

VIII. Establishing inter linkages between different sectors and points of integration between them

Inter linkages between different sectors and points of integration between them has been done as per the ToR of Task 1 Establish Baseline Conditions, item (ix) Institutional mechanisms within the sector to address identified environment issues. Inter linkages between different sectors and points of integration between them have been made as per ToR of Task 5: Develop Institutional Mechanism for implementation of the EMP.

IX. Preparation of sectoral guidelines to mainstream environment parameters in development activities

Predicated on the baseline data (Task 1), sectoral guidelines have been prepared as part of Task 4, Develop Sectoral Guidelines.

X. Forecasting for externalities and planning for corrective measures such as those arising from climatic changes

Baseline data on climate change parameters (temperature, precipitation, humidity) have been factored into assessment of vulnerability and forecasting of vulnerability (as part of Task 2 on Conducting Spatial Vulnerability Assessment and formulating Planning Principles) indicated as Vulnerability Index (VI). The VI derived from baseline data of 2001 has been forecasted as "vulnerability scenario projections" for 30 years (2011-2021-2031-2041) at district and tehsil level. The corrective measures have been addressed and given in "Response matrix" and "Analysis and Recommendations" sections.

XI. Finalisation of a comprehensive integrated EMP

A comprehensive Executive summary of the EMP has been prepared which integrates various tasks undertaken for the preparation of EMP, including the conclusions.

Recommendations

(Sector-wise)

Infrastructure Sector

Tourism, Art & Culture

- Develop tourism related infrastructure as per State and area specific Master Plan. These Master Plans should be based on zonational land use and expected tourist arrivals. Further, new tourist destinations should be developed to decongest the existing top five tourist destinations. Provide basic tourist infrastructure and reliable services at tourist destinations as per the Master Plan. Encourage spreading of tourism activities outside already developed towns and popular places of visit, like Manali by imposing restrictions on hotel construction in towns. Decongestion of roads by restricting vehicular traffic near the pilgrim centres should be carried out. Provide upgraded and new eco-friendly amenities and services to meet their needs. Water supply, sewage, Municipal Solid Waste and traffic and transportation should be essential components of these Master Plans.

- Develop and implement Public Private Partnership for new tourist circuits and destinations. Lease out all tourism related properties, like heritage bungalows, temple sites, forts, palaces and other heritage properties to private parties and strict monitoring for keeping these places clean and ensuring that no damage is done to the heritage buildings. Invite bids for leasing these properties. The term of the lease should be sort, thus leaving room for improvement for the management of such properties over the years. Lay special emphasis to attract private fund for setting up of new hill stations, water sport related resorts, ropeways including Ski Resorts, Spas, Eco-Tourism related projects, etc.
- The State should develop environmental code of conduct for tourism and ecotourism and ensure its strict implementation by surveillance and monitoring through community participation, Department of Tourism and Civil Aviation, Himachal Pradesh Pollution Control Board, Department of Forests and Wildlife, Civil Society Organizations and Non Government Organizations.
- The State should develop off-grid or community electricity supply plan for tourist circuits/destinations using solar and biogas energy. Training and capacity building of PRIs should be taken up on a priority basis. To conduct special capacity building courses and seek support from Government of India under its '*Atithi Devo Bhava*' scheme.

- Establish a system of data collection and analysis of statistics related to tourism, especially tourist arrivals in the State. Tourism monitoring data should be compiled and updated regularly. It should be linked to district level information system in the State so that area specific plans, programmes and projects can be monitored and information on tourism can be accessed.
- To seek maximum assistance from Ministry of Tourism, Government of India for funding under various schemes, like Circuits, Destinations etc. and to work towards conservation through Tourism Council and funds generated by the Manali model.

Potable Water Supply

- A demand–driven, participatory approach should be adopted. Village *Panchayat*/community should be given powers to plan, implement and manage. Adopt integrated approach to water, sanitation and hygiene, groundwater conservation and rain water harvesting.
- Capacity development of the community to plan, implement and manage the Rural Water Supply Schemes of their own choice. Implement decentralization of services and hand it over to local Governments or Panchayati Raj Institutions.
- Various mechanisms for information dissemination and awareness generation could be implemented through existing programmes as well as through Departments whose activities impact the sector. NGOs, academic institutions and other State level communication units can be deployed for the purpose. This includes Communication and Capacity Development Unit's initiatives at the State level.

Sewage

- The sewerage facility should be extended to all major towns. The treatment of sewage is necessary and urgent steps are required to be taken for the disposal of treated sewage in the rivers. In several towns, sewage water, after proper treatment, can be recycled for domestic use. Since sanitation is a Municipal function, it should be transferred to the ULBs along with staff working in the urban areas for maintaining and augmenting the sewerage system. The cost of Operation and Maintenance of sewerage should be recovered progressively.
- Waste water treatment must be made mandatory for all sizes of urban centres. The smaller urban centres could use less decentralised and less capital intensive technologies to reduce capital cost as well as maintenance cost of treatment.

- It is recommended that the use of low-cost technologies, the unbundling of services to involve the Private Sector and proper packaging, i.e., clubbing together water supply and drainage projects can reduce the project cost and improve its viability.

- Specific Recommendations for Rural Sanitation: Proper evaluation of the project objectives should be undertaken by all the districts, so as to distribute the enhanced targets as per the revised projects to all the *Gram Panchayats* in the districts. Undertake revision of the projects wherever required. Preference should be given to the twin (leach) pit technology and use of local materials for the (Individual House Hold Latrines); proper record keeping of Total Sanitation Campaign (TSC) related activities/ achievements should be carried out at the Block/*Gram Panchayat* levels; to ensure the maintenance of the Community Toilets, these could be handed over to the *Sulabh* International/other NGOs as per the requirements; establishment of effective institution level setup at District/Block/*Gram Panchayat* levels under TSC.

- Specific Recommendations for Rural Sanitation**:** Proper evaluation of the project objectives should be undertaken by all the districts, so as to distribute the enhanced targets as per the revised projects to all the *Gram Panchayats* in the districts. Undertake revision of the projects wherever required. Preference should be given to the twin (leach) pit technology and use of local materials for the (Individual House Hold Latrines); proper record keeping of Total Sanitation Campaign (TSC) related activities/ achievements should be carried out at the Block/*Gram Panchayat* levels; to ensure the maintenance of the Community Toilets, these could be handed over to the *Sulabh* International/other NGOs as per the requirements; establishment of effective institution level setup at District/Block/*Gram Panchayat* levels under TSC.

- A demand–driven and participatory approach should be adopted and Village *Panchayat*/community shall be given the power to plan, implement and manage. Adopt integrated approach to water, sanitation and hygiene, groundwater conservation and rain water harvesting. Capacity development of the community to plan, implement and manage rural water supply schemes of their own choice. Implement the decentralisation of services and hand them over to Local Governments or PRIs. Other than the Local Government, it is also important to train decision makers and other Departmental staff to understand the inter-relationships between sectors and their responsibilities towards integrated planning and sustainable development of the State. Further, awareness generation amongst the population about the environmental and social issues and accepting behavioural changes for water conservation is required.

Health

- Considering the fact that, with the changing composition of the population, changing life- styles, urbanization and industrialisation, Himachal Pradesh would have newer morbidity challenges in the future, it should work on a State Health Policy with a proper time schedule for different activities. The policy should clearly spell out the future health care requirements of the State in the field of preventive, promotive, curative and rehabilitative health care. Focused attention needs to be given to curative aspects of health care, particularly in a hilly State like Himachal Pradesh, where the share of the Private Sector in the number of illness episodes treated is almost negligible. Strengthening the existing public health services and widening their network through the involvement of private practitioners, voluntary Non-Government Organisations and research institutions will improve the health care services in the State.

- All the recommendations under National Rural Health Mission project implementation plan need to be implemented. The primary health care facilities in the rural areas and the existing number of medical institutions in the State are sufficient to meet the needs of the people, but their operational efficiency needs to be improved. Shortcomings, such as inadequate para-medical staff, buildings and equipments, must be overcome. The inconsistency in the distribution of primary health care facilities and manpower (more staffing in comfortable areas than in the rural and remote areas) must be rectified immediately.
- For efficient and smooth functioning of the health sector, adequate monitoring and supervision is necessary. The performance of various health indicators would improve to a large extent if there is regular monitoring and supervision. All the monitoring and reporting programmes identified in proposed actions should be implemented in a time bound manner.
- As per National Family Health Survey (NFHS-3 survey), only six percent of households in the State have medical insurance. Rising medical costs raises the question of available financing options. Hospitalised treatment is very expensive in both public and private sectors and leads to loss of lifetime's savings, leaving no money for future social security. It is suggested that the State Government should work out the modalities for a viable health insurance policy to meet the rising health costs in both public and private sectors.
- Introduction of telemedicine to facilitate consultation for the treatment of illnesses in the far-flung areas of the State through connectivity with the State headquarters would be useful in reducing people's hardships and the number of patients in specialised health institutions. Further, provision of mobile medical units will augment the health service to far flung areas.

- To increase the green cover, emphasis should be given on the cultivation and conservation of medicinal plants, thereby improving the financial status of the people on the one hand and contributing towards the environment on the other. Trees having medicinal properties can be promoted for plantation on the forest land, road side or even on the private land.

Road and Transport

- Training for mainstreaming environmental and social issues in road sector is required. A comprehensive training programme can be developed and implemented.

- Other training aspects include integrated planning, related laws and legislations, new and innovative technologies, monitoring techniques and surveillance methods. The above mentioned aspects can be transformed into module level training programmes and imparted to line agencies based on their requirement. Further, it is recommended that designated officer in each line agency be trained so that he/she can act as trainer at all levels of planning and implementation.
- Creation of special cells in the State Public Works Department to coordinate all activities related to environmental impacts of highway projects.
- A Corridor Management Plan should be drawn up for major State Highways, so that the problems of ribbon development, encroachments, uncontrolled access and poor safety can be tackled.
- Use of alternate material or recycling of existing pavements to reduce the need for more road building aggregates should be promoted after testing of material and clearance from institute like Central Road Research Institute (CRRI).
- Use of bio-engineering techniques for protection of slopes in hill areas and reducing risk of landslides should be promoted.
- Strict implementation and compliance to control encroachment of State roads/Highways regulations e.g., National Highway (Land and Traffic Act), 2002 for improved traffic management and control of access on National Highways and Municipal roads should be carried out.

Mining & Geology

- Strict implementation of mitigation measures identified in Environmental Management Plan should be ensured.
- Implementation of all the actions identified in post closure of mines should be ensured, especially restoration of vegetation and biodiversity. Strict monitoring of identified indicators, especially with respect to air, water, noise, waste, land use and aesthetics should be implemented and ensured.
- Small and medium scale mines and artisanal mines dominate, especially in the minor mineral sector, of less than five hectares in size, which do not fall within the purview of EIA Notification, 2006 but are required to take environmental clearance as per MoEF office Memorandum No. L-11011/47/2011-IA, II (M) dt: 18.05.2012. Inventory of such mines that operate without prior environmental and social assessment and appraisal by appropriate authorities needs to be prepared.

- Improve productivity per unit of water consumed in mining processes, by making water assessments and water audits mandatory in identified industries and utilities. This activity should be internalised as part of Environmental Management System (EMS) of the activity is ISO 14001 certified.
- Prepare and implement a comprehensive strategy for regulating the use of groundwater by large mining establishments on the basis of a careful evaluation of aquifer capacity and annual recharge.
- Waste minimisation, waste reduction and waste reuse needs to be attempted first to avoid waste accumulation. Dissemination of information on technological options to be a continuing exercise.
- Surveillance of industries by HPPCB and industry associations should be stepped up to take care of illegal dumping.
- Remediation strategy needs to focus on the 'Polluter Pays' principle with the polluter being asked to pay penalty as well as costs of cleaning up the pollution. Where polluters are not traceable, a dedicated fund needs to be created by SPCB/ PCC for remediation.

Industry

- In Himachal Pradesh, due to geographical reasons and terrain, the size of industrial areas is relatively small. In areas where there has been growth of industry around the industrial areas created by the Department, the State is providing land at very nominal cost to the Special Purpose Vehicles being promoted together with the stakeholders for setting up of these facilities in some industrial areas. In order to make such ventures viable, there has to be a minimum number of units located in these areas. The regulatory mechanism is administered by the HPPCB whereas the pricing policies have been left largely to these SPVs, which have been created to provide these services to the industry. This model would be replicated in other industrial areas in phased manner once the minimum number of units come up in those areas. There is, accordingly, a need to review the relevant pricing policy regimes and regulatory mechanisms in terms of their likely adverse environmental impacts.

- At present, Himachal Pradesh does not have in place any formal system to make water requirement assessments and water audits in identified industries and utilities. The major category of industries set up in the State, which are water consuming, relate to textiles (involving dyeing and finishing), food processing, pharma industry and consumer care products. The Industries Department could make this mandatory and IPH Department could monitor the audit results and advise about necessary interventions, which are required. This would help in improving productivity per unit of water consumed in industrial processes, by making water assessments and water audits mandatory in identified industries and utilities.
- Consider and mitigate the impacts on rivers, flora and fauna, and the resulting change in the resource base for livelihoods, of multipurpose river valley projects, power plants, and industries. Department of Industries can factor this aspect while deciding or approving a location for the siting of a major industry or an industrial area. Hence, this aspect needs to be

incorporated while formulating guidelines for siting of industry, so that both Entrepreneurs and Authorities in the Government are aware of the factors to consider while identifying land for their project.

- Surveillance of industries by HPPCB and industry associations should be stepped up to take care of illegal dumping.
- Remediation strategy needs to focus on the 'Polluter Pays' principle with the polluter being asked to pay penalty as well as costs of cleaning up the pollution. Industries causing pollution repeatedly should be blacklisted. Where polluters are not traceable, a dedicated fund needs to be created by SPCB/PCC for remediation.
- Small and medium scale mines and artisanal mines dominate, especially in the minor mineral sector which are of less than five hectares in size and which do not fall within the purview of EIA Notification, 2006 but are required to take environmental clearance as per MoEF office Memorandum No. L-11011/47/2011-I A II (M) dt: 18.05.2012. Inventory of such mines that operate without prior environmental and social assessment and appraisal by appropriate authorities needs to be prepared.
- Setting up of a sectoral clean Technology Centre dealing with mining, beneficiation, transportation, utilisation and waste disposal: In the pulp and paper manufacturing sector, several clean technologies, such as anaerobic treatment, lignin recovery, etc. can be adopted for pulp and paper production as the success of these efforts has been established with pilot plant tests. Other examples of clean technologies relate to use of lignin to develop value added products, use of fly ash generated during burning of lignin for brick-making and reduction in raw material consumption.

Energy

- River Basin Plans and Energy Master Plans (consisting of generation / transmission / distribution) should be prepared as the first step in order to optimise energy sector development in harmony with river basin plans. The River Basin Plan should include basin level 'Strategic Environmental Assessment' (SEA) and determination of the carrying capacity of the basin in the context of competing water requirements. This should also include mapping of catchments and surveying and assessing land use patterns with emphasis on drainage, vegetation cover, silting, encroachment, human settlements and human activities and its impact on catchments and water bodies. SEA should identify 'alternatives', which could be implemented at policy, plan and project levels. However, accord of environment and forest clearance may be allowed to continue simultaneously with the formulation of the basin level plan(s).

- River basin plans should specifically focus on 'determination of flow' on rivers and tributaries,

which will assist in determining 'ecological flow' versus 'available flow' along the main stream and tributaries. River basin plans should also focus on 'zonation' of the basin, e.g., delineation of ecosensitive zones based on 'carrying capacity' concept.

- Construction of dams, barrages, canals etc. for development should keep in view the potential for ecological requirements and maintain adequate flow in the rivers for the breeding and conservation of fish, especially indigenous species. The determination of the ecological flow in the context of each of the development intervention should be fixed based on river basin plan and the carrying capacity determination. Further, a mechanism should be devised to maintain this minimum flow all the year round to maintain the ecology of the river.

- Dam and reservoir fisheries should be closed for about two months, during the rainy season, to safeguard pre spawning and spent fishes. Fish sanctuaries should be established in consultation with experts from the

- State Fisheries Departments and local people, particularly those inhabiting the river basin and depending upon the fishery resources. Deep pools in rivers should be designated as sanctuaries.

- An interdisciplinary advisory committee should be formed at State level to advise the State Government on hydropower development and coordinate with the Central Government ministries, like MoEF/Ministry of Power. This advisory committee should consist of eminent experts, like basin planners / hydrologists / environmentalists / ecologists / socio-economic experts, etc. The committee should provide guidance to the State based on the basin plans as well as coordinate with MoEF/other line Ministries of the Government of India to arrive at sustainable hydropower development solutions in the State in the context of managing ecological flow and the need of the State to meet electricity deficit during the lean season as well as for future.

Market Infrastructure

- A review is required in respect of all laws, which regulate participation in the market, such as registration/licensing, commodities traded, controls on packaging and labelling, laws affecting market place, laws affecting supply including controls on movement of produce and volume of commodities traded.
- Encourage farmers to undertake grading of farm produce at the farm gate, thus enabling farmers to improve price realisation considerably with the help of direct marketing, which enables farmers to meet the specific requirements of wholesalers from the farmers' inventory of graded produce and of retail consumers based on consumers' preferences, thus enabling farmers to dynamically take advantage of favourable prices and improve their net margin.

- Direct marketing by farmers' organizations needs to be promoted in the light of continued criticism that both farmers and consumers suffer economic losses in the existing agricultural marketing system/structure. A similar logic holds good for consumer organizations also, who can procure directly from producers and distribute the same to the consumers commensurate with their purchasing powers.
- The Government should support these organizations with schemes like providing back end subsidy for refrigerated as well as general transport; setting up of grading and packing houses; credit at low interest, etc., till they become financially self-sufficient on commercial lines; and development of communication links.
- Direct marketing to wholesalers and agro-industrial processors presupposes prior knowledge of buyers' needs among farmers and presupposes prior knowledge of the capability of farmers among wholesalers and agroindustrial processors. Such prior knowledge cuts costs related to the gathering and assimilation of needs and capabilities. Such knowledge also has a favourable impact on the exchange of goods and payments thereof.

Rural Planning

- Maintain and upgrade the existing rural infrastructure and promote facilities, such as cold chains, marketing intelligence network to facilitate the agro-processing industries.
- To discourage over dependence on funds from outside, the PRIs should be encouraged and empowered to mobilise their physical and human resources.
- *Gram Panchayats* should be encouraged to involve themselves actively in planning, implementing, monitoring and evaluating the poverty alleviation programmes for better results.
- All poverty alleviation programmes at the village level should be put at the disposal of the *Gram Panchayat* and implemented with the help and cooperation of the local-level bureaucracy. Further, the *Gram Panchayats* should be selective in this regard and take into account the needs of the people and the scope of real employment generation, before taking up the programmes for implementation.

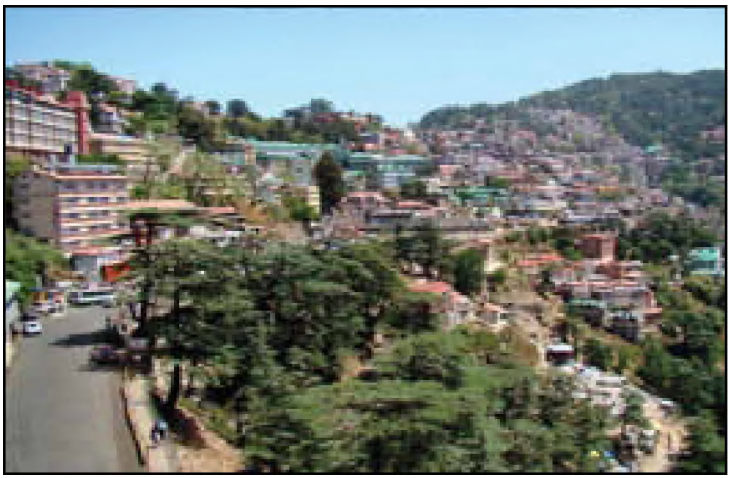
- For proper identification of the BPL families, the role of the NGOs, *Panchayats* and the community must be ensured.
- Proper training of officials/non officials at the district and block levels is to be ensured. There is also a need to strengthen the field functionaries at all levels. This calls for strengthening the existing training institutions and identifying certain other institutions where these functionaries may be imparted training about the implementation of anti-poverty employment generation and other social welfare programmes.

Urban Planning

- As part of the Vulnerability Assessment done in EMP, following attributes have been selected, which have direct implications for prospective town and country planning and urban development:
    - Gaps in potable water supply, sewerage and Municipal solid waste collection and treatment;
    - Existing basic civic amenities and social infrastructure facilities;
    - Existing industries at *tehsil* and district levels;
    - Present and projected population, population density and correlation with basic civic amenities and social infrastructures;
    - Literacy, health, livelihoods etc.

- The Vulnerability Assessment (VA) based on the above said attributes for determining vulnerability can be integrated with Town and Country Planning and Urban Development. The towns/*tehsils* can be prioritized for action by UD/TCP based on the Vulnerability Indices thus arrived. The perspective planning by TCP/UD can factor in Vulnerability Assessment in town development plans/sector plans as well.

- Sustainable urban planning should aim at achieving social and environmental equity while improving the lives of the people. Thus, in order for a city or urban area to be sustainable, it needs to produce and manage basic services, like water, waste, energy, and transportation in a way that conforms to the principles of sustainable development. In other words, the city should be able to produce and distribute the services in an economic, environment friendly and equitable way. Cities/towns do not adequately provide basic services that pollute the environment. In general, urban infrastructure systems are not adequately designed without much attention to environmental and social impacts. Mostly, the delivery of services, like water, energy, waste, transportation etc. is based on nonrenewable energy sources. Moreover, the inequality in the provision of these services is very high.



- It has observed and recommended that:
    - Frequent sampling should be done if river water is used for drinking and the water for drinking should be properly treated and disinfected.
    - All towns on the banks of the rivers should be provided with sewage treatment facilities and should not be allowed to discharge urban waste without treatment into or on the banks of the river.
    - A number of hotels and tourist resorts are coming up on the banks of the rivers. These must have proper sewage treatment plants.
    - Industrial units should not be allowed to discharge untreated effluents into rivers/*khads*/*nallahs*.

- It is recommended that the cost of collection, treatment and disposal of solid waste be reduced through various mechanisms. Technological innovations to improve the reusability of the recycled waste will increase the returns and make the projects viable. Privatisation of as many operations as feasible will improve efficiency and reduce the cost. Further, following measures are also recommended:
    - Greater attention should be given to segregation of different kinds of waste at the collection point to reduce the cost of disposal.
    - Bio-degradable waste should be tackled locally to avoid storage and transportation over long distances.
    - Wherever environmentally acceptable, disposal can be decentralized to reduce the transportation cost.

- Separate collection and disposal of toxic waste.
- Use of right technologies to improve the quality of processed waste.
- Landfills can be scientifically organised to minimise pollution.

- The provisions of the Town and Country Planning Act, 1977 should be extended to all the Urban Centres of the State including all the ULBs and Cantonment Board Areas as well, in order to ensure planned and regulated development. The Extension of the Act to all the Urban Centres would be initiated by notifying the Planning Areas and then move further as per the provisions of the Act.
- In accordance with the provisions of the Town and Country Planning Act, 1977, Regions should be identified, delineated, and Regional Development Plans should be prepared, published and adopted. The Regional Plans have a potential to address all the State level pressure variables included in the Vulnerability Assessment and, thus, would dovetail the Planning Process with the Environmental Master Plan. This would also help in addressing civic infrastructural gaps at the regional levels as a Regional landfill may be viable for serving solid waste management needs surrounding ULB's.
- As a suggestion, the entire State could be divided into three main Regions, namely, the Foothills - Plains Region comprising of Sirmaur, Solan, Bilaspur, Hamirpur, Una and Kangra; the Mid Himalayan Region comprising of Shimla, Mandi, Chamba, Kullu and the High Himalayan region comprising of Lahaul and Spiti and Kinnaur. The publication and adoption of Regional Plans would also make the Town and Country Planning Department a major player in the Developmental Process and shall also justify the 'country' component of the Departments' names.
- The clause in the Act stating that the Sector Plan is an enlargement of the provisions of the Development Plan should be amended to state that "the Sector Plan is the working detail Plan within the broad framework of the Development Plan." This is necessary as the Development Plan is on a city scale and not in a position to provide details like provision of local shopping centre, or a localised service centre or facility, which can be indicated in the Sector Plan.
- The clause in the Act stating that the Sector Plan is an enlargement of the provisions of the Development Plan should be amended to state that "the Sector Plan is the working detail Plan within the broad framework of the Development Plan." This is necessary as the Development Plan is on a city scale and not in a position to provide details like provision of local shopping centre, or a localised service centre or facility, which can be indicated in the Sector Plan.
- *Nagarpalika Suvidha Kendra* should be established at district level. The district headquarter ULB can be the nodal agency to mentor such *kendras* and the management of these *kendras* could be outsourced. Proposed *Nagar Palika Kendra* should have the mandate of providing facilities and services, such as, assessment of training needs and other Human Development issues. Such *kendras* may have two branches – Community Development Corporation (CDC) and Micro-business, which may be headed by female and male representatives, respectively. Community Development Corporation (CDC) may have the mandate of community based services by collecting community based information, while Micro-business may have the mandate of conducting household surveys, preparing profile of the households/communities etc.

Municipal Solid Waste

- The Municipal Solid Waste collection, treatment and disposal facility should be extended to all towns. The treatment of Municipal Solid Waste is necessary and urgent steps are required to be taken for the disposal. The cost of Operation & Maintenance of sanitation should be recovered progressively.

- Municipal Solid Waste treatment must be strictly implemented for all sizes of urban centres. The smaller urban centres could use less decentralized and less capital intensive technologies to reduce capital cost as well as maintenance cost of treatment.
- Recycling/reuse of Municipal Solid Waste is practiced in very few urban centres. Recycling/reusing waste should be adequately factored at the project design and operational stage so as to reduce the demand for fresh products and raw materials, e.g., chemical fertiliser, electricity, plastic paper etc.
- It is recommended that the use of low-cost technologies, the unbundling of services to involve the Private Sector and proper packaging, i.e., clubbing together water supply, sewerage and drainage projects can reduce the project cost and improve its viability.
- Private Sector participation to be promoted to increase stakes in MSW management and to meet additional capital investment requirements.
- Demand-driven, participatory approach should be adopted and village *Panchayat*/community shall be given the power to plan, implement and manage waste using integrated approach.

Hazardous Waste

- Private Sector participation to be promoted to increase stakes in Hazardous Waste management and to meet additional capital investment requirements.
- A hazardous waste management facility has been created in the State in PPP mode, which is operational. It is at a stage of infancy and facing some teething problems largely related to pricing of services and scale of operation. Perhaps, it may require some statutory backing to ensure that the established industries use this facility and the extent of its usage needs to be audited and monitored by the Himachal Pradesh Pollution Control Board before extending permissions to units to operate.
- Further, in view of the above, survey and develop an inventory of toxic and hazardous waste dumps, and an online monitoring system for movement of hazardous wastes. Strengthen capacities of institutions responsible for monitoring and enforcement in respect of toxic and hazardous wastes.

- Further, in view of the above, strengthen the legal arrangements and response measures for addressing emergencies arising out of transportation, handling and disposal of hazardous wastes, as part of the chemical accidents regime.
- Give legal recognition to, and strengthen the informal sector systems of collection and recycling of various materials. In particular, enhance their access to institutional finance and relevant technologies.
- Develop and enforce regulations and guidelines for management of e-waste, as part of the hazardous waste regime.

- Promote, through incentives, removal of barriers and regulations, the beneficial utilisation of generally non-hazardous waste streams, such as fly ash, bottom ash, red mud, and slag in cement and brick making, and building railway and highway embankments. Certain performance based incentives, like transport and interest subsidies may be provided to such units.
- The Treatment, Storage and Disposal Facility need to cater to meticulously delineated hazardous waste catchment areas taking into consideration their distances from the generators and availability of wastes. State Pollution Control Board could ensure that in a given hazardous waste catchment area, no multiple operating Treatment, Storage and Disposal Facility exist to help maintain viability of the facilities.
- All Treatment, Storage and Disposal Facility operators should be asked to implement the provisions of Escrow Account as per the directive of MoEF to ensure that a separate Escrow fund is created for post closure monitoring and to deal with liability arising due to mishaps, calamities, etc.
- Remediation strategy needs to focus on the 'Polluter Pays' principle with the polluter being asked to pay penalty as well as costs of cleaning up the pollution. Industries causing pollution repeatedly should be blacklisted. Where polluters are not traceable, a dedicated fund needs to be created by SPCB/PCC for remediation.
- Harmonisation of Export, Import regulations with the provision of the Rules, training of Custom Department personnel engaged in inspection and sampling and also up-gradation of Customs Department laboratories should be carried out to prevent illegal imports of hazardous waste.
- In order to deal with inter-State transportation as well as disposal of hazardous wastes in a facility, the following options should be considered: to have these processed wherever possible by the industry which supplied them; to appropriately incinerate either through dedicated incinerators of individual industries or through incinerators available with common facilities such as Treatment, Storage and Disposal Facility (TSDFs).
- Small and medium scale mines and artisanal mines dominate, especially in the minor mineral sector. These are of less than five hectares in size and do not fall within the purview of EIA Notification, 2006 but are required to take environmental clearance as per MoEF office Memorandum No. L – 11011/47/2011 – IA. II (M) dt: 18-05-2012.. Inventory of such mines that operate without prior environmental and social assessment and appraisal by appropriate authorities needs to be prepared.

Natural Resource Management

Agriculture

- Review of existing land use in the State and exploration of possibilities of taking steps to putting lands to use according to their capabilities. This would inter – alia include programme for plantation of fuel and fodder trees, development of pasture, etc in areas not fit for agriculture production.

- Effective measures to be taken to protect good agriculture land against depletion on account of: Soil Erosion due to wind, water and shifting cultivation; water logging and salinity; loss of fertility including micronutrients and urbanisation and industrialisation.
- Implementation of Command Area Development Projects and Dry Land Farming Techniques include: Reclamation of land with alkaline, saline and acidic soils, and ravines; review of agriculture laws, in general, with particular reference to the problems relating to consolidation of holdings; formulation and implementation of plans for rehabilitation of allottees of ceiling surplus land.
- Progressive fragmentation of agricultural farmlands leading to unremunerative agriculture: It is not enough to provide for prevention of fragmentation in the Prevention of Fragmentation and consolidation of Holdings Acts of different States. A careful study has to be made of the relevant provisions of the consolidation of Holdings Acts and the Acts relating to succession and the suitable amendments made wherever necessary to prevent the re-emergence of fragmentation.
- The publicity work for consolidation should be directed at showing the advantages of consolidation and at pointing out the irrationality of attachment to a particular piece of land. For demonstrating the advantages of consolidation, organised publicity at official level is necessary and the organisational and administrative arrangements as well as the publicity should be carefully worked out.
- In order to ensure the smooth and satisfactory progress of consolidation programme, the valuation of the land should be done by a high powered committee consisting of retired senior official of the Revenue department and two men of public importance Whatever be the agency to value the land or to hear the appeals, the whole procedure should be streamlined and followed expeditiously.

Horticulture

- A strong network should be made between farmers and researchers of the horticultural advanced countries to prevent post-harvest loss of horticulture produce. This interaction should take place at the national level and it should further percolate to the district and village level. For this purpose, a Horticulture Information Centre (HIC) should be established in every district where horticulture production is substantially high.

- To boost horticulture export, transport should be upgraded and cold storage facilities should also be expanded. Government should give financial incentives to purchase refrigerated vehicles and to establish multichamber/ multi-product cold storage and for the existing cold storage, adequate finance should be made available at concessional rate of interest so that they can be upgraded and converted for multi product storage.
- All the project and programmes related to horticulture and related infrastructure facilities such as road and transport, storage facilities, marketing facilities and inadequate environmental, issues like chilling, relative humidity, soil erosion should be implemented both in rural & urban areas.
- Government should introduce new courses in different streams of horticulture in the universities at State level to spread knowledge in an effective way. Further, upgradation of university infrastructure should be carried out.
- Emphasis on formulation of a strategy to discourage the use of pesticides and chemical fertilisers by popularising and demonstrating the use of bio fertilisers and bio-pesticides.

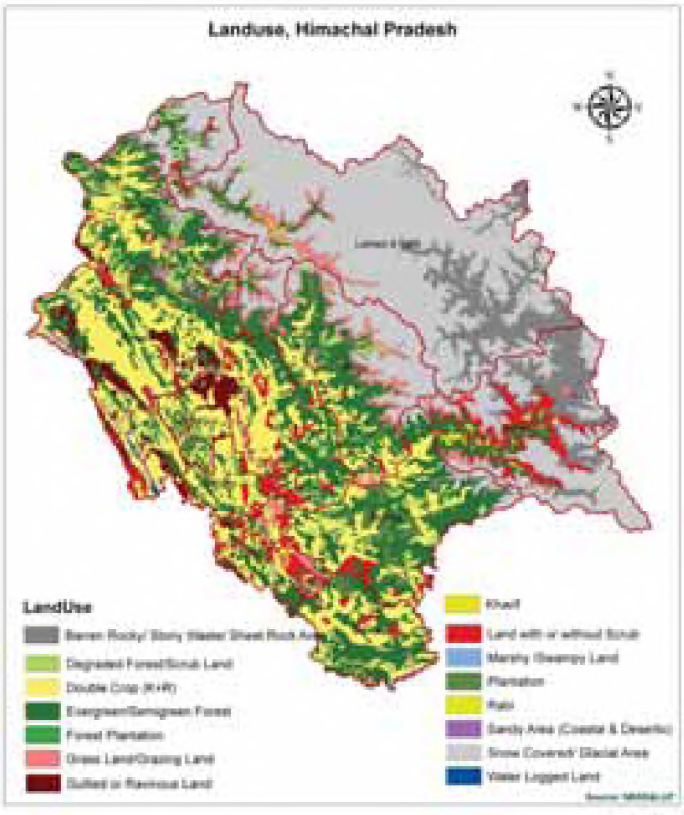
Animal Husbandry Live Stock

It is recommended to use responsible and prudent use of anti microbial agent in veterinary medicine with an aim of protecting both animal and human health. The Competent Authorities responsible for the registration and control of all groups involved in the production, distribution and use of veterinary antimicrobials have specific obligations. Prudent use is principally determined by the outcome of the marketing authorisation procedure and by the implementation of specifications when antimicrobials are administered to animals. Prudent use includes a set of practical measures and recommendations intended to prevent and/ or reduce the selection of antimicrobial-resistant bacteria in animals.

Forests, Wildlife and Wetlands

- There is a need to suggest necessary changes to amend forest policy for Himachal Pradesh in view of their high vulnerability to climate change; conservation of forests for providing clean water and fresh air, their critical role as watershed for the northern Indian plains; and unique eco-systems and forested landscapes rich in biodiversity.

- Map climate change driven adaptations in natural resource use and livelihood patterns across eco-zones. Development of a database on Carbon sequestration potential of forest flora in the State is also required. Further, periodic assessment of carbon stock including soil carbon under different ecosystems is required.

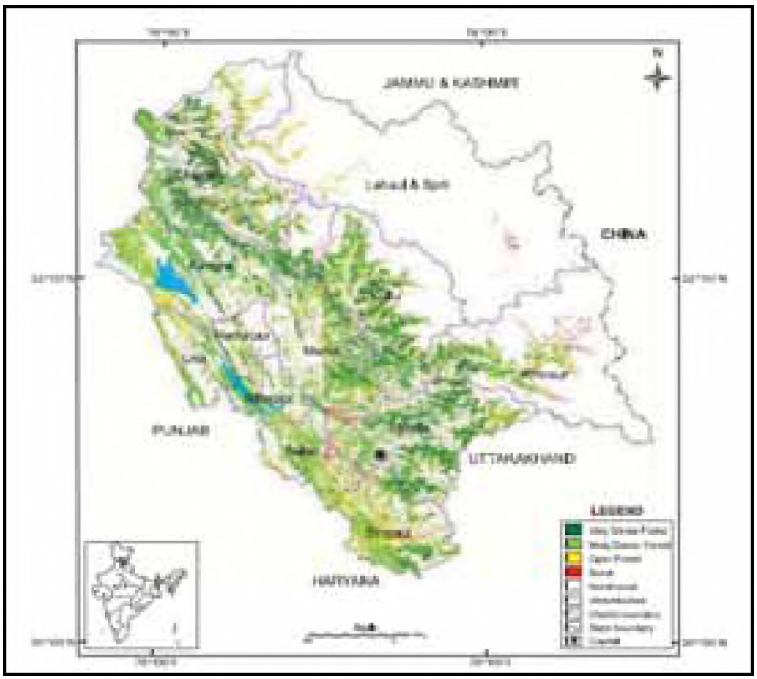


- Integrating and extending the concept and practice of Payment for Ecosystem Services (PES) within the States to compensate for foregone landuse and occupation options adversely impacting the environment. Impress upon Government of India to move beyond Green Bonus to adequately compensate these States for eco-system services flows. The Central Finance Commission should take cognizance of the concept of interdependence and interconnectivity of the forest-producer States and the user States in developing a sustainable environmental relationship and mutual economic benefits. Incentivise local protection and restoration through PES: Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD)/CDM/CAMPA.

- Forest Cover: In the current scenario, there seems to be limited options except to consider the unculturable areas forming vital eco-systems and wildlife habitats as part of forest/tree. Therefore, in order to increase forest cover, the area under Moderately Dense (7883 sq. kms.) forest requires protection and enrichment operations (ANR) for improvement of crop density; The area need to be afforested; the scrub area (389 sq. km..) needs to be converted into some useful tree cover; the post 1980 plantations (6807 sq.km.) which may be still surviving require, re-visit/re-forestation (say about 40% = 2700 sq. km.). For all practical purposes, the area above 4000 meters altitude, which is also referred to as 'tree line', is not suitable for increasing forest cover through afforestation activities. However afforestation activities may not be limited up

to 4000 m altitude only, as shift of geological niche due to climate change may result in even higher altitude beyond 4000m becoming favourable for afforestation in the near future.

- Integrate community based water and forest management committees at village level: Forest Department should formalise partnerships for local watershed and provisioning services, as per Shimla declaration on Sustainable Himalayan Development, October 30, 2009.
- Plantation on forest and community lands to supplement green cover and to increase the overall forest cover of the State in the context of a project framework should receive adequate attention. Propagate 3 tier forestry and promote use of locally useful and indigenous species particularly planting on community lands. In order to increase their ownership, communities should be consulted for the choice/selection of species.
- A comprehensive and integrated National and State wetlands policy needs to be developed in sync with National/State water and National/State Environment Policy guidelines. Formulating and implementing a regulatory regime should be done to ensure wise use of wetlands at the national, the State and district levels. Further, "Wetlands Authority" at the State level should be constituted. Under the HP Forest Department keeping in view that the wetlands at the Central level are under the Ministry of Environment and Forests. This will help facilitate biodiversity conservation of wetland by the HP Forest Department.



- Data deficiency has been observed with most of the Wetlands in the State. This can be addressed by mapping of catchments and surveying and assessing land use patterns with emphasis on drainage, vegetation cover, silting, encroachment, human settlements and human activities and its impact on catchments and water bodies. GIS database including satellite imageries should be developed for the wetlands. The delineation of wetland's boundary should include catchment area and notified as part of protected area (National Park/Wildlife Sanctuary). Such delineation of boundary of wetland increases the effectiveness of protected area management. Preparation of Biodiversity registers will also help in generating data on community knowledge of wetlands natural resources and management.

- An institutional mechanism should be established for wetland/lake management at State level. In this context guidance can be taken from the Wetlands (Conservation and Management) Rules, 2010.
- Capacity building of lake/wetland managers from the line departments: The State may undertake measures for capacity building in the area of lake conservation by deputing the concerned officers to MoEF sponsored programmes on capacity building (e.g. 2 years M. Tech and short term programmes being offered by AHEC, IIT Roorkee) or any other State level programmes.
- Annual and seasonal monitoring of the avifauna and arrival of migratory birds to understand and correlate with instances of poaching and hunting. This is required for assessment of seasonality aspect during which such instances are recorded so that preemptive, punitive and incentive measures can be taken. Further, enforcement mechanism (human resources, structure and material) could be beefed up during such identified periods. Besides, role and scope of honorary wardens needs to be revisited in order to increase their efficacy and increasing and improving community participation in regulatory activities.

Fisheries

- Detailed Environmental Impact Assessment (EIA) should be carried out before implementing any project which might have negative impacts on fish and their habitats and management plans for ecologically sustainable development should be adopted.
- Construction of dams, barrages, canals, etc. for development should keep in view the potential for requirements of fishery development and maintain adequate flow in the rivers for the breeding and conservation of fish, especially indigenous species.

- Dam and reservoir fisheries should be closed for about two months, during the rainy season, to safe-guard pre-spawning and spent fish. Fish sanctuaries should be established in consultation with experts from the State Fisheries Department and local people, particularly those inhabiting the river basin and depending upon the fishery resources. Deep pools in rivers should be designated as sanctuaries.
- Rules should be formulated to control the introduction of exotic species and diseased fish. The enforcement of rules and the protection of river fisheries require the creation of a river police force under the Fisheries Department; provided with necessary equipment, including motor boats.

Service Sector

Education and Vocational Training

- Create more universities/institutions of higher education: The higher education system in the state needs a massive expansion of opportunities that would enable Himachal to attain a gross enrolment. Such expansion would require major changes in the structure of regulation.
- Change the system of regulation for higher education: The present regulatory system of higher education in India has gaps with respect to some important aspects. There are multiplicities of regulatory agencies where mandates are both confusing and overlapping. A clear need to establish an Independent Regulatory Authority for Higher Education (IRAHE) has been identified to overcome multiplicity of regulation.
- Increase public spending and diversify sources of financing: The expansion of higher education is not possible without enhanced levels of financing. This must necessarily come from both public and private sources in the state.
- Reform existing universities.
- Restructure undergraduate colleges: The system of affiliated colleges for undergraduate education, which may have been appropriate 50 years ago, is no longer adequate or appropriate and needs to be reformed. There is an urgent need to restructure the system of undergraduate colleges affiliated to universities. Higher academic/research should be incentivised through vocational/job opportunities to encourage more students opting for research.

- Promote enhanced quality in education system: The higher education system must provide for accountability to society and create accountability within. An expansion of higher education which provides students with choices and creates competition between institutions is going to be vital in enhancing accountability.
- A major aim of the higher education system must be to ensure that access to education for economically and historically socially underprivileged students is enhanced in a substantially more effective manner.

IT & Telecom

- The State Government should design and implement extended producer responsibility policy and regulatory framework for e-waste management in the state. This should be based on "take back" mechanism derived from "polluter pays" principle in line with MoEF guidelines and regulations. Further, the Government of Himachal Pradesh should update the inventory of IT equipment installed in Government offices. One of the software, Computer Management System of HP DIT covers every IT equipment installed in any Govt. office of HP. This software could be useful in projecting IT equipment status and disposal mechanism in the Govt. Sector. The e-Waste, transmission wave pollution and its monitoring ongoing scientific research and its effect on the globe, its environment, mankind, other flora and fauna need to be observed keenly and diligently.
- The State Government should make compliance to Energy Conservation Building Code mandatory for all BPOs/IT parks and related infrastructure.

- The State Government should make mandatory, a report from all cell phone operators on level of radiations near towers service providers should share the existing infrastructure e.g. towers, IT back bone building etc. Government shall conduct and provide funding and support for ICT education programs for persons with disabilities, related family and parent associations and DPOs.
- The State's development strategy should be to develop quality human resource for IT industry. Draw a charter for implementing the training program, regular interaction and exchange with institute of higher learning in state to upgrade professional level of existing faculty. Set up a statutory body like State Council of IT Education to monitor the quality and standardization aspects in both Govt. and Private Institutions.
- For efficient and smooth functioning of the sector, adequate monitoring and supervision is necessary. The performance of various indicators would improve to a large extent if there is regular monitoring and supervision. All the monitoring and reporting programs identified in proposed actions should be implemented in a time bound manner.
- The State Government should establish an Integrated E-waste Management Facility (IEWMF) as per Guidelines in the state.
- Guidelines for establishment of E-waste Recycling & Treatment Facility should be in line with the existing Guidelines/best practices/requirements in India for establishing and operating "Treatment storage and Disposal Facilities" for hazardous wastes. Such facilities shall be set up in the organized sector. However, the activities presently operating in the informal sector need to be upgraded to provide a support system for the integrated facility.
- General Suggestions
    - The land for e-waste treatment facility shall be provided on the similar lines as for the TSDF facility by the State Government.
    - CRT breaking and glass recycling is being practiced in organized sector in India. These facilities fall under the purview of existing environmental regulations for air, water, noise, land and soil pollution and generation of hazardous waste. Lead either joins the recycling stream or can be disposed off in TSDF facility.
    - Existing ferrous and non ferrous metal recycling facilities fall under the purview of existing environmental regulations for air, water, noise, land and soil pollution and generation of hazardous waste.
    - The equipment used in dismantling facility is recommended to be covered under pollution control equipment so that the treatment facility can charge 100% depreciation in the first year. This will improve financial viability of the e-waste facility.
    - The complete recycling of e-waste including the Metal Recovery should be promoted for setting-up of IEWMF.

Livelihood

- A Demand–driven, participatory approach should be adopted. Village Panchayat/community shall be given powers to plan, implement & manage. An integrated approach to water, sanitation & hygiene, ground water conservation and rain water harvesting needs to be adopted.
- Capacity development of the community to plan, implement and manage the Rural Water Supply Schemes of their own choice. Implement/ decentralise the services and hand over to local governments or PRIs.
- HP population; training to Government personnel on environmental issues, their responsibilities, planning, implementation, monitoring and surveillance; other education and information dissemination forums.

- Diversifications from traditional crops to commercial crops in area where irrigation facilities have been created. The farmers should be motivated to produce organic vegetables without the use of pesticides and chemical fertilizers.
- Development of rain fed areas through watershed approach on a large scale for efficient use of natural resources. Increased funding should be arranged under RIDF.
- Rainwater harvesting is another area, which will not only provide irrigation to the crops but shall also recharge the ground water and check erosion. The department shall seek financial assistance from Government of India for small irrigation tanks / shallow wells and pumping sets.
- Farm mechanisation with special reference to hill agriculture shall be given major thrust in the years to come. This is necessary to reduce cost of cultivation in view of high cost of labour.
- Along with expansion of irrigation facilities, it should be ensured that water is distributed equitably and used efficiently. The pattern observed in the past where tail-enders are denied water because upper end-users appropriate it for highly water intensive crops which must be avoided. Participatory Irrigation Management (PIM) should be promoted by facilitating and setting up democratically organized water user associations to set and collect water charges, and retain a substantial part of the collection, which would help to maintain field channels, expand irrigated area, distribute water equitably and provide the tail enders their just share of water.
- In promoting private sector marketing systems, the Government needs to examine existing policies, rules and regulations with a view to minimizing conflict in successful private sector operations.

District wise response matrix indicating Policy/Plan/Program/Project level recommendations

Variable	Policy	Plan	Program	Project	Remarks
District: Bilaspur					
State					
Water		*	*		Water Resource Conservation Plans, Ground Water recharge program
Natural Critical Habitat			*	*	Program and Projects to cover the gap. Program for maintenance of moisture content and ground water recharging
Quality of life (Health)			*		Program to improve access
Quality of life (Education)			*		Program to improve access
Pressure					
Roads	*				Policy Guidelines for environmental concerns
Tourism					Tourism Plan at State, District, and Destination Level
Utilities & Infrastructure		*		*	Tehsil level plan Cluster level projects
Hydel Power	*	*			Policy regarding Catchment Area Treatment, Ecological Flow etc Water Utilization Plan
Proposed Industrial Corridor		*	*		
District: Chamba					
State					
Water		*	*		Lake Conservation Plans, Ground Water recharge program
Natural Critical Habitat		*	*	*	Plans for Buffer zones Program and Projects to cover the gap Program for maintenance of moisture content and ground water recharging
Hazard Susceptibility		*			Study and Plan
Quality of life (Health)			*		Programme to improve access
Quality of life (Education)			*		Programme to improve access
Pressure					
Roads	*				Policy Guidelines for environmental concerns
Tourism		*			Tourism Plan at State, District, and Destination Level
Utilities & Infrastructure		*		*	Tehsil level plan Cluster level projects
Hydel Power	*	*			Policy regarding Catchment Area Treatment, Ecological Flow etc Water Utilization Plan

Variable	Policy	Plan	Program	Project	Remarks
District: Hamirpur					
State					
Natural Critical Habitat			*		Programme and Projects to cover the gap Programme for maintenance of moisture content and ground water recharging
Quality of life (Health)			*		Programme to improve access
Quality of life (Education)			*		Programme to improve access
Spatial Areas of Conflict		*			Plan preparation to mitigate possible conflict
Pressure					
Roads	*				Policy Guidelines for environmental concerns
Tourism		*			Tourism Plan at State, District, and Destination Level
Utilities & Infrastructure		*		*	Tehsil level plan Cluster level projects
District: Kangra					
State					
Water		*	*		Water Utilization Plan
Quality of life (Health)			*		Programme to improve access
Quality of life (Education)			*		Programme to improve access
Natural critical Habitat		*			Creation of Buffer Zones
Pressure					
Roads	*				Policy to take care of State variables
Tourism		*			Tourism Plan at State, District, and Destination Level
Utilities & Infrastructure		*		*	Tehsil level plan Cluster level projects
Agriculture	*				Policy regarding Diversion of land for non-agricultural use
Industrial Corridor		*			Detailed EIA and EMP
Hydel power	*				
District: Kinnaur					
State					
Water		*	*		Lake Conservation Plans, Conservation plans for Hot Springs Ground Water recharge programme
Natural Critical Habitat		*	*		Plans for Buffer zones Programme to remove the gap Programme for maintenance of moisture content and ground water recharging

Variable	Policy	Plan	Program	Project	Remarks
Quality of life (Health)			*		Programme to improve access
Quality of life (Education)			*		Programme to improve access
Pressure					
Tourism		*			Tourism Plan at State, District, and Destination Level
Utilities & Infrastructure		*		*	Tehsil level plan Cluster level projects
Hydel Power	*	*			Policy regarding Catchment Area Treatment, Ecological Flow etc Water Utilization Plan

District: Kullu

State					
Water		*	*		Water Utilization Plan
Quality of life (Health)			*		Programme to improve access
Quality of life (Education)			*		Programme to improve access to Vocational Institutes
Natural Critical Habitat		*			Plans for Buffer zones
Spatial Areas of Conflicts		*		*	
Pressure					
Roads	*				Policy to take care of State variables
Agriculture	*				Policy regarding Diversion of land for non-agricultural use
Tourism		*			Tourism Plan at State, District, and Destination Level
Utilities & Infrastructure		*		*	Tehsil level plan Cluster level projects
Hydel Power		*			Detailed EIA and EMP

District: Lahaul & Spiti

State					
Water		*	*		Lake Conservation Plans, Ground Water recharge programme Water Utilization Plan
Natural Critical Habitat		*			Plans for Buffer zones
Quality of life (Health)			*		Programme to improve access
Quality of life (Education)			*		Programme to improve access
Pressure					
Roads	*				Policy to take care of State variables*
Tourism		*			Tourism Plan at State, District, and Destination Level
Utilities & Infrastructure		*		*	Tehsil level plan Cluster level projects

Variable	Policy	Plan	Program	Project	Remarks
Hydel Power	*				Policy regarding Catchment Area Treatment, Ecological Flow etc
District: Mandi					
State					
Water		*	*		Water Utilization Plan
Quality of life (Health)			*		Programme to improve access
Quality of life (Education)			*		Programme to improve access
Natural Critical Habitat		*		*	Improvement of Resource through Buffer Zones and developmental projects
Pressure					
Roads	*				Policy to take care of State variables
Utilities & Infrastructure		*		*	Tehsil level plan Cluster level projects
Agriculture	*				Policy regarding Diversion of land for non-agricultural use
Tourism		*			Tourism Plan at State, District, and Destination Level
District: Shimla					
State					
Water		*	*		Water Utilization Plan
Quality of life (Health)			*		Program to improve access
Quality of life (Education)			*		Program to improve access
Natural Critical Habitat		*		*	Improvement of Resource through Buffer Zones and developmental projects
Pressure					
Roads	*				Policy to take care of State variables
Utilities & Infrastructure		*		*	Tehsil level plan Cluster level projects
Agriculture	*				Policy regarding Diversion of land for non-agricultural use
Tourism		*			Tourism Plan at State, District, and Destination Level
District: Sirmaur					
State					
Water		*	*		Water Utilization Plan
Quality of life (Health)			*		Programme to improve access
Quality of life (Education)			*		Programme to improve access

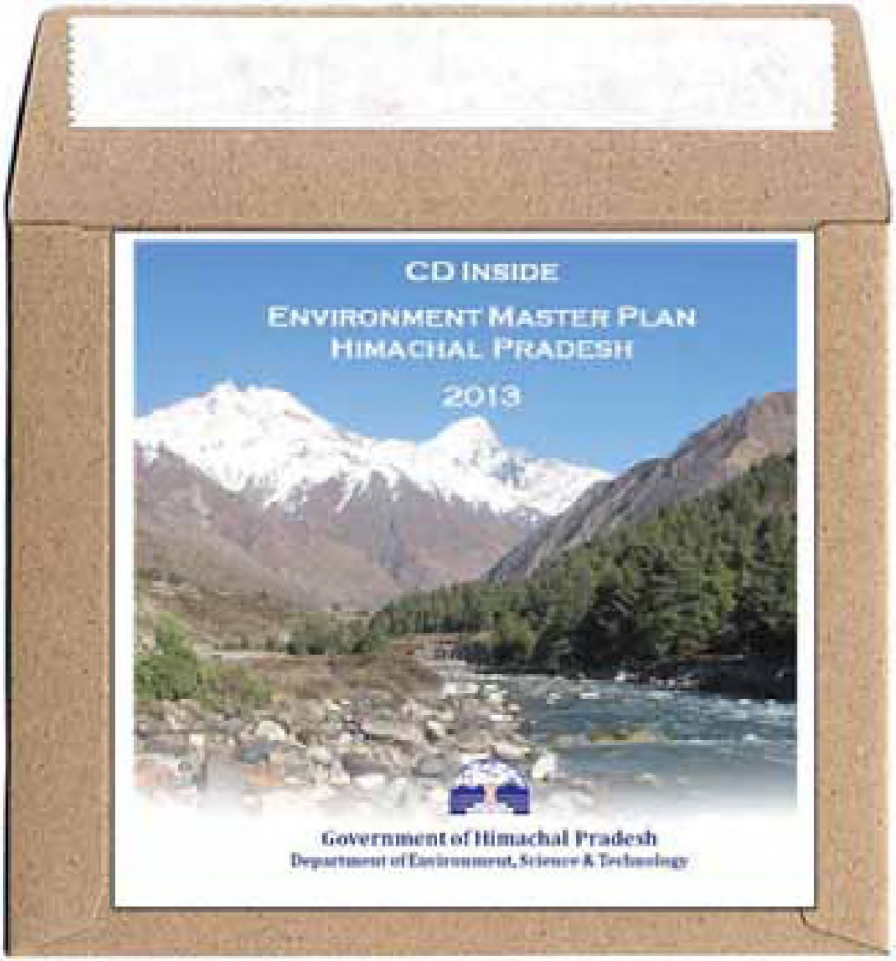
Variable	Policy	Plan	Program	Project	Remarks
Pressure					
Roads	*				Policy to take care of State variables
Tourism		*			Tourism Plan at State, District, and Destination Level
Utilities & Infrastructure		*		*	Tehsil level plan Cluster level projects
Agriculture	*				Policy regarding Diversion of land for non-agricultural use
Industrial Corridor		*			Detailed EIA and EMP

District: Una

State					
Water			*		Charging through non perennial khuds Groundwater recharge programme
Natural Critical Habitat		*	*		Plans for Buffer zones Programme for maintenance of moisture content and groundwater recharging
Quality of life (Health)			*		Programme to improve access
Quality of life (Education)			*		Programme to improve access
Pressure					
Tourism		*			Tourism Plan at State, District, and Destination Level
Utilities & Infrastructure		*	*		Tehsil level plan Cluster level projects
Industry					Environment Impact Assessment for Industrial corridor

District: Solan

State					
Water		*	*		Water Utilization Plan
Natural Critical Habitat		*			Plans for Buffer zones
Quality of life (Health)			*		Programme to improve access
Quality of life (Education)			*		Programme to improve access to Vocational Institutes
Pressure					
Roads	*				Policy to take care of State variables
Tourism		*			Tourism Plan at State, District, and Destination Level
Utilities & Infrastructure		*		*	Tehsil level plan Cluster level projects
Agriculture	*				Policy regarding Diversion of land for non-agricultural use
Industrial Corridor		*			Detailed EIA and EMP


CD INSIDE
ENVIRONMENT MASTER PLAN
HIMACHAL PRADESH
2013
Government of Himachal Pradesh
Department of Environment, Science & Technology

Department of Environment, Science & Technology (DEST)
Narayan Villa, Shimla, Himachal Pradesh, India - 171002
Web Site: www.himachal.gov.in/environment E-mail: dbt-hp@nic.in
Tel.: +91-177-2620559, +91-177-2627608 Fax.: +91-177-2627609